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Santa Fe National Forest Plan Draft Assessment Report

Volume II. Socioeconomic Resources

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Forest Plan Assessment Report

Santa Fe National Forest

Volume II. Social and Economic Resources

Contents

Introduction 1
Purpose 1
Organization of report 1
Ecosystem Services 1
Chapter 1. Assessing Cultural and Historic Resources and Uses 3
Introduction 3
Context for Assessing Cultural Resources and Uses 4
The Legal Context 5
History of Cultural Resource Management on the Santa Fe National Forest 6
Cultural Resource Data for the Santa Fe National Forest 6
Native American Views of their Historic Origins 22
Description of Cultural and Historic Resources 22
Description of Historic Properties 24
Distribution of Cultural Resources 29
Characteristics of Cultural and Historic Importance 35
Current Condition of Known Cultural and Historic Resources, and Trend Affecting their Condition and Use 36
Contribution of Cultural and Historic Resources to Social, Economic, and Ecological Sustainability 40
Chapter 2. Assessing Areas of Tribal Importance 45
Indian Tribes associated with the plan area 45
Existing tribal rights 46
Areas of known tribal importance that are in the plan area or affected by management of the plan area 47
Input Received at Public Meetings 52
Chapter 3. Assessing Social, Cultural, and Economic Sustainability 53
Section I: The Social, Cultural, and Economic Context of the Santa Fe National Forest 53
Section II: Social and Economic Influences on the Plan Area 72
Section III: How the Plan Area Influences Key Social, Cultural, and Economic Conditions 77
Input Received from Public Meetings 87
Conclusion 88
Chapter 4. Extractive Multiple Uses and Their Contributions to Local, Regional, and National Economies 89
Timber 89
Ecosystem Services 96
Range and Grazing 97
Water 103
Ecosystem Services 113
Fish and Wildlife 115
Ecosystem Services 121
Chapter 5. Recreational Settings, Opportunities, Access, and Scenic Character 123
Introduction 123
Recreational Opportunity Spectrum 123
Trends in Recreation 128

Summary 164
Scenic Character 166
Chapter 6. Assessing Designated Areas 185
Contribution to social, economic, and ecological sustainability 187
Wilderness 187
Wild and Scenic Rivers 193
Chapter 7. Infrastructure 217
Roads 217
Road System Condition and Maintenance 218
Chapter 8. Assessing Land Status and Ownership, Use, and Access Patterns 229
Fire and the Wildland-urban Interface 229
Land Status and Ownership 232
Land Status and Boundary Management 240
Local and Regional Land Use 242
Chapter 9. Renewable and Nonrenewable Energy and Mineral Resources 257
Three Classifications of Minerals 258
Renewable and Nonrenewable Energy Resources, Mineral Resources, and Geological Resources and Hazards 260
References Cited: 284

List of Tables

Table 1. Site and project information for cultural resource databases used on the Santa Fe National Forest 6
Table 2. Santa Fe National Forest Plan management areas and associated acres with cultural resource emphasis 8
Table 3. Chronology for the Santa Fe NF 12
Table 4. Acres inventoried for historic properties, by district 25
Table 5. The distribution and densities of historic properties across the Santa Fe NF and broken out by district 29
Table 6. Elevation of historic properties by district 32
Table 7. Number of historic properties in each district for each ecological response unit (ERU), which is a vegetation classification type 33
Table 8. Historic property occupation types by district 34
Table 9. Cultural affiliations for historic property components, by district 34
Table 10. National Register eligibility of historic properties by district 37
Table 11. Recorded impacts to historic properties 1960 to present, by decade 39
Table 12. Number and percentage of residents within each county of the AOI with different education levels, representing an average of data from 2008 to 2012* 60
Table 13. Average household income statistics (in 2012 dollars and percentages) for counties in the AOI and the United States from 2008 to 2012* 62
Table 14. Numbers and percentages of people employed by Industry for all counties in the AOI, the Santa Fe NF region, and the entire U.S in 2012* 67
Table 15. Number of hunting licenses issued for various game species by the New Mexico Department of Game and Fish for Hunt Units on the Santa Fe NF* 74
Table 16. Current contribution of the Santa Fe NF to the AOI economy in number of jobs and dollars, and by different sectors 82
Table 17. Current economic contribution of the Santa Fe NF activities by program area* 83
Table 18. The top six activities that were the main activity for recreation visitors on the Santa Fe NF 83
Table 19. Annual total spending in 2014 by Santa Fe NF visitors in various categories, categorized by local and non-local visits (USDA Forest Service 2009) 84

Table 20. Average spending in 2014 in dollars per group per trip and by category for different types of Santa Fe NF visitors (USDA Forest Service 2009) 84
Table 21. Payments in lieu of taxes and secure rural school payments for each county within the AOI from 2010 to 2012 86
Table 22. Hydrologic unit codes explained 103
Table 23. Sub-basins (HUC8) and percent of Santa Fe NF NFS lands contained within sub-basins 104
Table 24. Projected climate change example 111
Table 25. Comparison of expenditures in New Mexico by U.S. sports persons for 2001 and 2011 120
Table 26. Recreation opportunity spectrum classes (in acres and percentage) on the Santa Fe NF and as established under the 1987 Forest Plan 128
Table 27. Population estimates for counties that include Santa Fe NF (U.S. Census data for 2000 and 2010) 129
Table 28. Recreational activity participation as self-reported by visitors on Santa Fe NF in 2008 (NVUM FY2009) 130
Table 29. Recreation fees collected on the Santa Fe NF by fiscal year (2010 to 2013) 158
Table 30. Miles of trails maintained and improved in Santa Fe NF, FYs 2012, 2013, and 2014 160
Table 31. Costs per mile of trail for various trail classes throughout national forests in New Mexico and Arizona 160
Table 32. Estimated costs for maintaining trails, by trail class, for the Santa Fe NF 160
Table 33. Trail allocations on the Santa Fe NF 161
Table 34. Self-reporting race/ethnicity for the National Visitor Use Monitoring survey of Santa Fe NF visitors for 2003 and 2008 163
Table 35. Visual quality objective definitions and acreage summary for the Santa Fe NF, summarized from the 1987 Forest Plan 168
Table 36. Road maintenance level miles 219
Table 37. Road maintenance costs by maintenance level 219
Table 38. Maintenance targets for level 2 through level 4 roads in miles and percentage of total roads . 220
Table 39. Acres burned in forest fires 221
Table 40. Size and lease expiration dates for leased buildings 222
Table 41. Buildings and ratings on the Forest 222
Table 42. Telecommunication sites and condition 223
Table 43. Name, status, and condition of drinking water systems 224
Table 44. Dams, ownership, and hazard rating 225
Table 45. Santa Fe NF (SFNF) acreage contained within adjacent rural counties (USDA, FS-383, 2014) 230
Table 46. Population growth rates in Santa Fe County by growth management area 247
Table 47. Undiscovered oil and gas resource potential for the San Juan Basin summarized from USGS San Juan Basin Assessment Team, 2013 262
Table 48. Potential fossil yield classification for the Santa Fe NF 278

List of Figures

Figure 1. Distribution of 1987 Plan cultural resource management areas on the Santa Fe NF 9
Figure 2. Cultural geographic subdivisions on the Santa Fe NF 13
Figure 3. Density of cultural resource sites on the Santa Fe NF, in sites per square mile 24
Figure 4. Distribution of cultural resource inventory across the west side of the Santa Fe NF including valid and nonvalid survey 26
Figure 5. Distribution of cultural resource inventory across the east side of the Santa Fe NF including valid and nonvalid survey 27
Figure 6. Distribution of historic properties (cultural resources) across the west side of the Santa Fe NF 30
Figure 7. Distribution of historic properties (cultural resources) across the east side of the Santa Fe NF . 31

Figure 8. Santa Fe NF Supervisor Maria Garcia and Tesuque Pueblo Governor Mark Mitchell sign Memorandum of Understanding on May 14, 2013 46
Figure 9. Smoke plume from the Las Conchas Fire as viewed from Placitas, New Mexico, July 6, 2011. The Las Conchas Fire was the largest fire in the history of New Mexico, burning more than 150,000 acres across multiple land jurisdictions including the Santa Fe NF. Burned areas are impacting tribes' traditional collection activities, and post-fire flooding continues to degrade watersheds that tribes rely upon. 50
Figure 10. Micro-mill at Walatowa Timber Industries located on Jemez Pueblo Tribal Lands. This mill is an example of a partnership between a non-Indian logging company and the Jemez Pueblo and emerging tribal uses on the Santa Fe NF. 51
Figure 11. Santa Fe NF with county boundaries 54
Figure 12. Population change by county from 1970 to 2012 56
Figure 13. Population growth rates by county within the AOI population, 2000 to 2012 56
Figure 14. Historical and projected population of Santa Fe NF counties 57
Figure 15. Average net migration by county for two decades. Migration varies greatly among counties within the AOI, with all counties experiencing less migration between 2000 and 2010, except Sandoval County. 58
Figure 16. Hispanic or Latino population across Santa Fe NF AOI counties and in New Mexico 59
Figure 17. Total employment in Santa Fe NF counties, 1990 to 2011 64
Figure 18. Employment distribution in the analysis area (IMPLAN 2011) 65
Figure 19. Analysis area employment and labor income specialization (IMPLAN 2011) 68
Figure 20. Labor income distribution in the analysis area (IMPLAN 2011) 69
Figure 21. Employment change by county from 1970 to 2012 70
Figure 22. Distribution of land ownership for each county within the Santa Fe NF AOI 71
Figure 23. Distribution of wildland-urban interface (WUI) across counties in the Santa Fe NF AOI including (a) total square miles by county and (b) distribution of WUI acres with and without homes 77
Figure 24. Three-year running average of total volume of timber sold (Thousand board feet) on the Santa Fe NF between 1977 and 2013 91
Figure 25. Amount and type of timber products sold on the Santa Fe NF from 1977 to 2013 92
Figure 26. Sub-basins covering the Santa Fe NF 104
Figure 27. Water rights on and adjacent to the Santa Fe NF 106
Figure 28. Important sub-watersheds for drinking water, Santa Fe NF 108
Figure 29. Recreation opportunity spectrum map, east side of Santa Fe NF 126
Figure 30. Recreation opportunity spectrum map, west side of Santa Fe NF 127
Figure 31. Purpose of visit by Santa Fe National Forest visitors who agreed to be interviewed as part of the 2008 National Visitor Use Monitoring survey (NVUM FY2009) 129
Figure 32. Number of new retail sales and estimated total number of off-highway vehicles in the United States, 1993–2003 (modified from (Cordell, Betz et al. 2005) 131
Figure 33. There are approximately 269 miles of motorized dispersed camping corridors (orange lines) on the Santa Fe NF 134
Figure 34. Location of ranger districts on Santa Fe NF 136
Figure 35. Tea Kettle Rock Interpretive Site 143
Figure 36. Tsi Pin Pueblo 144
Figure 37. Nogales Cliff House 144
Figure 38. Gilman Tunnels on Forest Road 376 of the Santa Fe NF 146
Figure 39. Soda Dam 147
Figure 40. Map depicting the cross-country and snowshoe trails maintained by the Southwest Nordic Ski Club 149
Figure 41. The 13,000-acre blowdown in the Pecos Wilderness, prior to Jaroso Fire including an aerial view (above) and close-up (below) 155
Figure 42. Visual quality objectives for the west side of the Santa Fe NF 169

Figure 43. Baldy Lake with Truchas Peak in the background, an example of very high existing scenic integrity. Photo from Forest website. 171
Figure 44. Chama River Canyon Wilderness, an example of very high existing scenic integrity as shown on the map in figure 49 171
Figure 45. Mesas in the Jemez National Recreation Area, an example of high existing scenic integrity. 172
Figure 46. Jacks Creek Campground and Trailhead, an example of moderate existing scenic integrity in close views transitioning to high and very high existing scenic integrity in farther views of the Pecos Wilderness 172
Figure 47. Oil and gas activity, an example of moderate existing scenic integrity 172
Figure 48. Stumps remaining from past timber harvest, an example of low existing scenic integrity 173
Figure 49. Existing scenic integrity map 174
Figure 50. View of the Tres Lagunas Fire on hillside showing a variety of effects to vegetation. Photo taken in June 2013. 177
Figure 51. Map showing location of fires referenced above 179
Figure 52. View of Los Alamos Canyon 13 years after the Cerro Grande Fire, showing revegetation dominated by shrubs. Photo taken in June 2013. 180
Figure 53. Views of Cochiti Canyon after the Las Conchas Fire, showing widespread tree mortality and remaining standing dead trees. Photos taken in June 2013. 180
Figure 54. National Scenic and Recreation Trails and Scenic Byways Map 181
Figure 55. Designated areas map 186
Figure 56. Chama River Canyon (Wilderness and Wild and Scenic River) 189
Figure 57. San Pedro Parks Wilderness 190
Figure 58. Pecos Baldy Lake, Pecos Wilderness 191
Figure 59. Rio Chama Wild and Scenic River 195
Figure 60. Inventoried roadless areas of the Santa Fe NF 198
Figure 61. Jemez National Recreation Area 204
Figure 62. Jemez Mountain Trail Scenic Byway 206
Figure 63. Santa Fe National Forest Scenic Byway 207
Figure 64. Designated areas adjacent to the Santa Fe NF 209
Figure 65. Example of fragmentation on private land 235
Figure 66. Relative population of cities, towns and small communities near the Santa Fe NF 244
Figure 67. Location and extent of the Southwest Jemez Restoration Project, showing the land ownerships involved 246
Figure 68. Santa Fe County growth management areas 248
Figure 69. Ownership pattern in Rio Arriba County 252
Figure 70. U.S. Geological Survey National Oil and Gas Assessment provinces on the Santa Fe NF 261
Figure 71. Coal resources on the Santa Fe NF 264
Figure 72. Geothermal energy favorability on the Santa Fe NF (modified from DeAngelo and Williams 2010) 265
Figure 73. Wind speed map (modified from NM EMNRD 2007) of New Mexico 266
Figure 74. Sources for crushed rock and stone 269
Figure 75. Locatable mineral sites on the Santa Fe NF 272
Figure 76. Abandoned mined lands on the Santa Fe NF 274
Figure 77. Map of principal aquifers from the USGS Groundwater Atlas 275
Figure 78. Water wells and springs mapped over the USGS aquifers 276
Figure 79. U.S. Geological Survey earthquake probability map with earthquake epicenters between 1962 and 2014 279
Figure 80. Potential for mass-wasting events such as landslides and rockfalls 280

Introduction

Purpose

Volume I of this assessment report covers all the ecologically based resources on the Santa Fe National Forest (Santa Fe NF or Forest) (e.g., wildlife, water, vegetation, soils). Volume II assesses the social and economic resources of the Santa Fe NF, in other words, the ways in which humans interact with and use the Santa Fe NF (e.g., recreation, roads, wood products, scenery). As with Volume I, Volume II assesses the current condition of the social and economic resources on the Forest, the trends impacting those resources, and the ability of the Santa Fe NF to continue to provide these resources into the future (potential risk to sustainability). Since assessments are meant to "rapidly evaluate existing information," no further measures were taken at this time to fill gaps in information.

Organization of report

In creating volume II of the assessment report the IDT aimed to paint a picture of what currently exists on the Santa Fe NF. To achieve this, volume II has been organized so the reader begins with a historical understanding and context of the Santa Fe NF, including Tribal importance (Cultural and historic resources and uses, Areas of Tribal Importance). Next, we delve into the current social and economic status of the Santa Fe NF (Social, Cultural, and economic conditions, Multiple Uses). Volume II wraps up with the assessments of the current ways in which people use the Santa Fe NF (Recreation, Scenery, Designated Areas, Infrastructure, Lands, and Energy/Minerals).

Ecosystem Services

In Volume I of this combined Santa Fe NF Assessment Report, functional activities that provide *supporting* and *regulating* ecosystem services were discussed in five key underlying resource areas: vegetation, fish and wildlife, soils, water, and air. This volume will review the wide array of *cultural* and *provisioning* services that directly benefit human communities, and which rely on the continued healthy functions of the systems in Volume 1. Because of that dependence, risks to sustainability noted in Volume 1 will also apply to these associated benefits. Additional risk factors brought to light in Volume II, however, are also highlighted in brief Ecosystem Services summaries at the end of appropriate sections here.

Again, where trends are considered stable or improving, existing management guidance is thought to be sufficient for maintaining benefits. Where trends indicate some risk to the continued provision of the described benefits, stakeholders are encouraged to consider what kinds of management direction changes may better move resource and system trends in a sustainable direction. Suggestions for these changes will be sought in a series of public meetings beginning in fall of 2015 when the Santa Fe NF starts to draft "Need for Change" statements.

Chapter 1. Assessing Cultural and Historic Resources and Uses

Introduction

This chapter assesses the known cultural and historic resources and uses on the five ranger districts of the Santa Fe National Forest (Santa Fe NF or Forest) ("the plan area") primarily including a discussion of the condition and trend of those resources. The first part of this chapter provides the context for understanding the condition and trend of cultural resources on the Forest.

The plan area contains historic properties that demonstrate human occupation and use for approximately the past 12,000 years. 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 over this entire time span. Occupation and use of the plan area by Euro Americans and other peoples from the Old World has occurred over approximately the past 400 years. The plan area has been managed by the USDA Forest Service for a little more than 100 years. Native American, Hispanic, and Anglo-American traditional communities continue to use the plan area for economic, social, and religious purposes.

Cultural and historic resources and uses in the plan area are important to the social, economic, and ecological sustainability of the plan area, the southwestern region, and the Nation. Historic properties within the plan area are a record of historic processes and events important to the identity of local communities, the state of New Mexico, the region, and the Nation. Contemporary uses of resources and characteristics of the plan area by Native American, Hispanic, and Anglo-American traditional communities are critical to maintaining the identity of these communities. Cultural tourism is a significant component of the economy of the plan area. Tourists are attracted by the nature and significance of historic properties, and by the character of traditional communities, a character maintained by the resources and uses of the plan area. Historic properties contain a wealth of information for scientific researchers regarding ecological conditions and changes over the past 12 millennia, and human successes and failures in coping with these changes. This information is valuable to managers making decisions regarding the contemporary ecological management of the plan area. This information is also valuable for educating the public about ecological sustainability.

Information used in compiling this assessment includes published sources, site and report records for the Santa Fe NNF, corporate geographic information system (GIS) and INFRA databases for the Santa Fe NF, State of New Mexico GIS, and New Mexico Cultural Resources Information System (NMCRIS) database information relevant to the plan area. As directed by the Code of Federal Regulations in Chapter 2, regarding the Forest Service, Department of Agriculture, Planning Section and specifically Assessment (36 CFR 219.6(a)(2)) , we contacted interested parties who are knowledgeable about the cultural and historic resources and uses of the plan area, including American Indian tribes, traditional communities, scientific researchers, and professional and avocational organizations to request information regarding the plan area.

We developed a cultural resources contact list of individuals representing the interests mentioned above. Email notification was made to that list starting on April 2, 2014. We specifically identified around 50 scientific researchers, professional organizations, and avocational societies as having information regarding the nature, condition, and significance of cultural and historic resources and uses in the plan area. We sent follow-up emails soliciting information to the researchers and organizations between

December 1, 2012, and January 15, 2013. We incorporated the responses from this solicitation into this assessment. A list of the individuals and organizations contacted can be found in the project record.

Context for Assessing Cultural Resources and Uses

Land management planning direction regarding the assessment phase directs forests to rapidly assess readily available relevant information regarding specific topics including areas of tribal importance, and cultural and historic resources, and uses. Also we are required to assess social, cultural and economic conditions with the assessment. A big difference between the 2012 planning rule and early planning rules, such as the 1982 Planning Rule is the emphasis on culture.

Culture is not necessarily the same as cultural resources, although culture is what is responsible for cultural resources appearing on the landscape. Culture is defined as the learned patterns of behavior (i.e., traditions and customs) characteristic of a society (American Anthropological Association (AAA) - http://www.aaanet.org/committees/commissions/aec/resources.htm#Definitions). When evaluating culture and effects of decisions on culture we need to take into account such areas as health, work, ecology and environment, education, agriculture and development, and social change all of which are bound up in what we generally refer to as the uniqueness that is northern New Mexico and human use of the Santa Fe NF. Discussions of cultural processes should convey an understanding of "…how local knowledge is put to work in grappling with practical problems of everyday life and with basic philosophical problems of knowledge, truth, power and justice." (http://www.aaanet.org/about/whatisanthropology.cfm).

Cultural resources are the manifestation of cultural processes created when humans act out their cultural existence. They can be concrete remains such as archaeological sites, or they can be locations, settings, or features associated with cultural activities. On the Santa Fe NF, the connection between cultural resources and the culture or human behavior responsible for them have significant time depth and representation on the landscape. This representation on the landscape can be a physical manifestation such as a 200-room pueblo, a 50-year-old adobe building, or a natural feature on the landscape that has achieved traditional significance in the social mind of a community with strong cultural ties to that landscape.

Highlighting culture and cultural resources in the 2012 rule makes them comparable to other social and economic considerations during land management plan revision. It is critical to understand the distinction between social, cultural, and economic conditions. In the case of the 2012 land management planning directives, the Forest is supposed to identify and evaluate the social, cultural, and economic context and influences of the landscape and how each of these are influenced by the plan area (Forest Service Handbook (FSH) 1909.12, Chapter 10, sec. 13.2). Traditionally, social and economic information are accessible via traditional socioeconomic analysis and some aspects of cultural information might also be derived in the same way. However, cultural context is usually derived from ethnographic and sociological sources describing important cultural traditions for an area, as well as inventories of cultural resources at State museums and Federal databases for sites and projects documenting those resources. Cultural influences are frequently related to traditional uses of the plan area by various communities with longevity in the area such as tribes, pueblos and land grant associations.

There is both a historic and current cultural perspective that can contribute to our understanding of the cultural condition on the Forest. Another perspective involves the distinction between the condition of the material and the social expression of the culture in terms of traditions and practices of communities associated with lands managed by the Santa Fe NF. Local community ties to the Forest are strong and persistent and deeply rooted in the history of those communities. In the case of the Pueblos of the Northern Rio Grande, that community history extends back over 1,000 years and their relationship to the archaeological history of that landscape is identified in the ceremonial practices and in the way they speak

about the land. After all, their ancestors are buried on those sites and they recognize those places in their ceremonies.

This strong tie to the landscape by local communities resulted in a strong belief by those communities that the land "belongs" to them. Regardless of the current jurisdiction of the land ownership the persistent belief by these communities is the land is "theirs" as demonstrated by the material culture remains on the landscape and the oral traditions that perpetuate the belief. Residents claim their history is in the land as demonstrated by the presence of their communities and the communities' persistent use of those lands. At some level, these communities rely on these lands for subsistence, but the tie is stronger than that characterized by subsistence alone. The psyche of these communities is deeply rooted within their connection to the land. Pueblo Indian land depends on the community maintaining a continuous relationship with that land, be it for agricultural or ceremonial purposes. They are of the land rather than guests upon it. The cultural identity of local communities lies with the land. In some instances, the persistent ills of local communities such as drug addiction and poverty are linked to the loss of common lands and a diminishment of peoples' relationship to the land (Garcia 2010).

The Legal Context

There is a long tradition of providing for the protection and management of cultural resources on Federal land. The earliest formal recognition of the need for cultural resource protection begins with the 1906 Antiquities Act. Subsequent acts including the 1935 Historic Sites Act and the 1960 Reservoir Salvage Act indicate recognition of the importance of cultural resources on public lands.

By the mid-1960s, an increasing awareness of the potential for the actions of government agencies to have an adverse effect on the condition of cultural resources led to passage of the National Historic Preservation Act (NHPA) in 1966 as amended through 2006. The Act and its subsequent amendments in Section 106 of the Act direct federal agencies to account for the effects of their activities on cultural resources. Significant cultural resources under NHPA are called historic properties which are eligible for the National Register of Historic Places. The Forest also conducts work to meet the guidelines provided for in Section 110 of the NHPA that directs agencies to develop their own historic preservation programs for identifying, evaluating, and protecting historic properties, in addition to meeting the requirements of Section 106. On the Santa Fe NF, this work is guided by the contents of a cultural resource overview (Scheick 1996, 2005) and a cultural resources planning assessment that was completed in 1987 in response to the lawsuit settlement discussed below. Additional laws include the Archaeological Resource Protection Act of 1979 and the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990.

There are 31 federally recognized American Indian tribes with which the Santa Fe NF routinely consults on a Forest-wide basis for Section 106 consultation. Twenty of the tribes are of Pueblo ethnic affiliation: Acoma Pueblo, Laguna Pueblo, Isleta Pueblo, Santo Domingo (Kewa) Pueblo, Cochiti Pueblo, the Hopi Tribe, Jemez Pueblo, Sandia Pueblo, San Ildefonso Pueblo, Tesuque Pueblo, Pojoaque Pueblo, Nambe Pueblo, Santa Clara Pueblo, Ohkay Owingeh Pueblo, San Felipe Pueblo, Santa Ana Pueblo, Zia Pueblo, Zuni Pueblo, Taos Pueblo, and Picuris Pueblo. Three tribes are of Athabaskan ethnic affiliation: the Jicarilla Apache, the Mescalero Apache Tribe, and the Navajo Nation. The Forest also consults with the Ute Mountain and Southern Ute tribes of Colorado. Also included are tribes with ties to the western periphery of the Forest with reservations in Texas and Oklahoma, including the Apache Indian Tribe of Oklahoma, the Comanche Nation, the Cheyenne-Arapaho Tribes of Oklahoma, the Ft. Sill Chiricahua-Warm Springs Apache Tribe, the Kiowa Tribe of Oklahoma, and the Wichita and Affiliated Tribes. While united by common origins, within each ethnic group there is tremendous cultural diversity.

History of Cultural Resource Management on the Santa Fe National Forest

The Santa Fe NF has a long history of having cultural resources research conducted on land within its boundaries. Active cultural resource management on the Forest began in the mid to late 1970s when the Forest's cultural program was developed to conform to the requirements of Section 106 of the NHPA and its accompanying code of Federal regulations formulated in 1979 (36 CFR 800). Between 1979 and 1985 evaluation of effects to cultural resources was inconsistent and frequently out of compliance with the requirements of Section 106 of the NHPA. A lawsuit in 1987 against all the national forests in the Southwest was settled out of court, resulted in a settlement agreement that enhanced compliance with Section 106 and strengthening of the cultural resources program to meet management and protection requirements. Currently, projects that have the potential to affect historic properties require cultural resource clearance prior to signing a decision document authorizing work to begin.

Cultural Resource Data for the Santa Fe National Forest

Cultural resources on the Santa Fe NF are documented in two large datasets stored in a variety of different databases that include information on projects and information on cultural resources (table 1). Generically, these databases are referred to as the survey/projects database and the sites database. Since the Forest started documenting cultural resources in the 1970s, nearly 10,000 sites have been documented in the Forest system from nearly 4,000 different projects.

Table 1. Site and project information for cultural resource databases used on the Santa Fe National Forest

System Name	Years Active	Number of Projects/Events	Number of Sites on Santa Fe NF	Coverage Area	Scope of Database
CRAIS[a] Database	1979-1992	3,902	6,040	USDA Forest Service-Southwest Region	All cultural resources
NMCRIS[b] Database	1992-Present	2,209 (All Survey)	9,764	New Mexico State-Wide	All cultural resources
NRM[c]-Heritage Database	2008-Present	3,868 (11 Other, 288 Unknown, 1,036 N/A, 1,109 Less than Complete, 1,435 Complete)	9,577	Forest Service wide	All cultural resources
VEP II Database	2009-Present	N/A	366	Northern Rio Grande	Ancestral Pueblo habitations
Southwest Social Networks Database	2003-Present	N/A	150	Southwest-wide	Ancestral Pueblo habitations with more than 12 rooms

[a] Cultural Resources Automated Information System
[b] New Mexico Cultural Resources Information System
[c] Natural Resource Manager

The Natural Resource Manager (NRM) is the database of record for site and project data on the Forest and incorporates the GIS data and tabular data for both survey/projects and sites. However, the Forest also has data in the New Mexico Cultural Resources Information System (NMCRIS) resulting from submission of project records to the New Mexico Historic Preservation Office. Each of these databases

has its strengths and weaknesses. For this assessment, the NMCRIS database was used to assess existing condition of cultural resources on the Forest because of the level of detail inherent in the database.

Additional automated cultural resource databases have been created for a variety of research and management projects. Examples include those created for the Village Ecodynamics Project Settlement Model (Ortman, n.d.) and the Southwest Social Networks Database (http://www.archaeologysouthwest.org). In general, these databases do not include all resources on the Forest because they either focus on specific resource or management issues for a smaller geographic subset of the Forest.

Cultural Resources, the 1987 Forest Plan, and the Cultural Resources Planning Assessment

Current planning and management guidance for cultural resources on the Santa Fe NF derives from the direction provided in the Santa Fe National Forest Plan published in July 1987, and the Cultural Resources Planning Assessment completed in 1988. Both documents were completed at a time when management of cultural resources on the Forest had captured significant attention and, consequently, both documents offer specific direction with regard to cultural resources. The plan is significant in that it was completed at the same time as the lawsuit settlement was completed and initiates management in line with the stipulations of the lawsuit settlement mentioned above (see History of Cultural Resource Management on the Santa Fe National Forest in this chapter).

At the time of the Forest Plan, approximately 205,000 acres of the Forest had been examined for cultural resources at varying levels of intensity for around 13 percent of the total forest acreage. Up through 1985, 4,300 sites were recorded, suggesting a site density of 13 to 14 sites per square mile and between 30,000 and 36,000 total sites on the Forest. In the affected environment, the Plan EIS calls out Native American use of Forest lands for subsistence and ritual purposes. At the time of the Forest Plan there were 36 sites on the National Register including 33 large pueblo sites. The Plan EIS also discussed future trends including predicting large amounts of survey associated with compliance activities for ground-disturbing projects. The projection was that between 10,000 and 12,000 acres of new survey would be completed annually. The alternative chosen for the 1987 Plan set aside nearly 38,000 acres of survey and was to "…include an active program of inventory, nomination, protection, and restoration, as well as interpretation and research, as appropriate." The nearly 38,000 acres included a specific management area (Management Area I) containing high value cultural resources. Other management areas contained cultural resource management emphasis including Management Areas P, Q, R, and S. In these areas, and most especially in Management Area I, emphasis was placed on active management of cultural resources including protection, stabilization, interpretation, evaluation, and opportunities for research. The total acreage across the Forest between these five management areas totals slightly more than 272,000 acres (17 percent of the Forest) in which cultural resources were to be the primary management emphasis as described above (table 2 and figure 1).

Table 2. Santa Fe National Forest Plan management areas and associated acres with cultural resource emphasis

Management Area	Acres
I	45,554.78
P	33,651.50
Q	19,567.62
R	156,770.56
S	41,219.47
Total:	270,341.32*

*Total includes total area covered by management areas with cultural resource emphasis. Actual total of column is 296,763.93 but some of Management Area I overlaps Management Areas P, Q, R, and S, which inflates the count. Number presented is actual number of acres on the ground set aside in the 1987 plan for cultural resource emphasis.

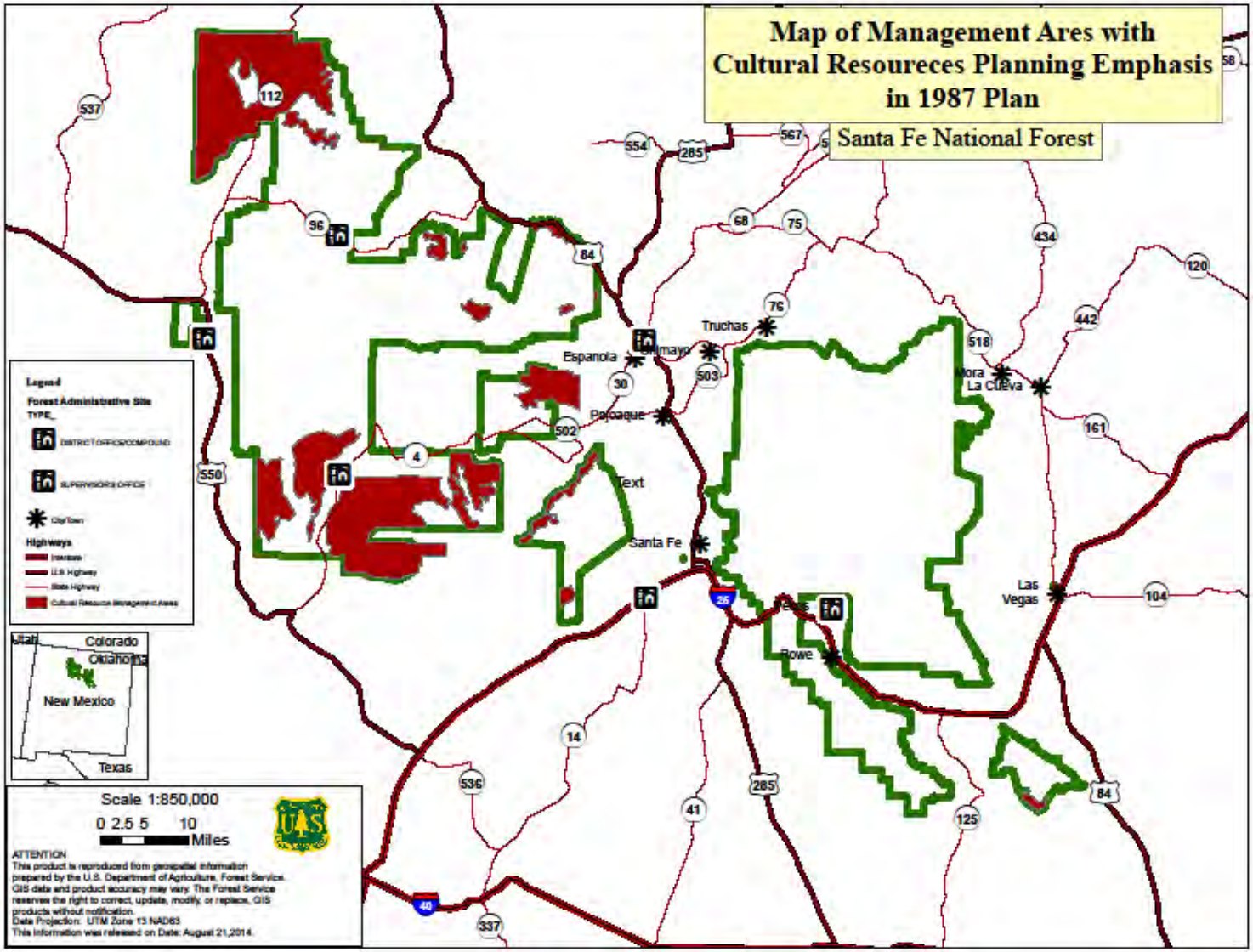


Figure 1. Distribution of 1987 Plan cultural resource management areas on the Santa Fe NF

As a condition of the 1986 lawsuit settlement, each forest in Region 3 was required to complete a cultural resources planning assessment. The Santa Fe NF's planning assessment (1988) consisted of five sections addressing: (1) the Cultural Resource Database, (2) Cultural Resource Data by Management Area and Additional Survey Needs, (3) National Register Nominations and Maintenance, Stabilization and Protection Measures, (4) Identification of Study Evaluation Units, and (5) Identification of Opportunities for Interpretation of Cultural Resources and Coordination with the State. The planning assessment is tied to the Santa Fe National Forest Plan and the Environmental Impact Statement, Santa Fe National Forest Plan. The planning assessment met the obligation of the Forest under the lawsuit settlement and provided instructions for meeting the management emphasis stressed in the 1987 Forest Plan.

Shortly after the planning assessment was completed in 1988, the Forest contracted to have an overview completed to "…synthesize the pre-Columbian history and prehistory of the region and to address, more specifically, those sites on SFNF [Santa Fe NF] lands" (Scheick 1996). This forest overview, *A Study of Pre-Columbian and Historic Uses of the Santa Fe National Forest: Competition and Alliance in the Northern Middle Rio Grande*, was intended to be an update of an earlier overview completed in 1979 (Cordell). Both of these documents present a comprehensive discussion of the nature of cultural resources with the most recent focusing on the Santa Fe NF and also focusing on the nature and distribution of archaeological resources.

Context for Historic Occupation and Use

Between 12,000 B.P. and A.D. 1542, Native Americans were the only people to occupy and use the land in and around the plan area. Their use of the plan area is concurrent with the earliest human occupation of the Western Hemisphere, and persists to the present day. In the American Southwest prior to A.D. 1600, Native American history is divided into three broad eras: Paleoindian, Archaic, and Pueblo.

The content of this section relies heavily on the Forest cultural resources overview (Scheick, 1996) and other sources. The first part of this section on the history of occupation and use by precolonial Native Americans was prepared from archeological studies using historical documents and records, and studies using the oral history and traditions from Native Americans and others, especially those from Native American communities who worked with researchers. While this history incorporates information from Native American oral history, it is written from a Western archeological and historical perspective. The second part derives from secondary sources, published historical studies, and major archeological project reports, regional syntheses and scholarly papers incorporated into the section of the overview on the archaeology and history of the geographic subdivisions. The sequence of occupation in the plan area is described below and portrayed in table 3.

Pre-European Contact

The Santa Fe NF overview divides the Forest into three major geographic subdivisions (Scheick, 1996) (figure 2): the Española Basin, the Jemez Mountains, and the Sangre de Cristo Mountains. Each of these subdivisions is divided into cultural provinces. The Española Basin extends along the Rio Grande River between Velarde in the north and the La Bajada escarpment on the south with the Pajarito Plateau on the west and the west side of the Sangre de Cristo Mountains on the east with Arroyo Hondo and Glorieta on the southeast. Major tributaries within the subdivision include Rio Grande, Rio Chama, Santa Fe River, Rio Nambe, Rio Santa Cruz, and Rio Tesuque. Major cultural subdivisions include Española Basin, Pajarito Plateau, and Lower Chama Valley. The Jemez Mountains includes the Gallina area, the Upper Jemez Valley and the Lower Jemez Valley. The Sangre de Cristo Mountains subdivision includes the Upper Rio Pecos Valley and the Front Range. The cultural/historical landscape of the Forest contains the remains of human activities extending as far back as 11,000 years ago. The following presents a brief version of the prehistory and history of the subdivisions described above.

Paleoindians and Big Game Hunting: Human occupation of the Western Hemisphere, and the American Southwest, began around 12,000 years ago, as nomadic hunters and gatherers entered the hemisphere from northern Asia via Alaska. These earliest Native Americans are known as Paleoindians. Their arrival in the hemisphere coincided with the end of the Pleistocene (last ice age), and rapidly changing climatic and ecological conditions. In northern New Mexico, Paleoindian occupation and use focused on upland areas near significant lithic resources and along major tributaries that would have provided habitat for species of use to them.

The Paleoindian era is associated with the initial colonization of the region during the end of the Pleistocene, when dramatic environmental changes took place within the region. The first Paleoindian occupants were nomadic hunters and gatherers. Between 9000 and 5000 B.C. Paleoindian big game hunters used lands currently occupied by the Santa Fe National Forest as indicated by the presence of large projectile points and limited campsites. Given the erosive and depositional character of the soils on the Santa Fe NF as well as the intensity of subsequent occupation, one explanation for the lack of visibility of Paleoindian materials may be the obliteration or covering up of materials in the millennia since they were originally deposited. Across the three geographic subdivisions on the Santa Fe NF, the evidence for Paleoindian remains is sparse and consists of isolated projectile points and other stone tools. In some areas, there are indications of more permanent occupation but, in general, occupation is either obscured by long-term deposition or materials have eroded away.

Archaic Hunter Gatherers: The subsequent Archaic era was a long span of time in the early and middle Holocene when environmental conditions stabilized and became approximately the same as contemporary conditions. The transition between the Paleoindian and Archaic eras took place around 8,500 to 8,000 years ago. During the Archaic era, Native Americans continued the hunting and gathering lifestyle seen during the Paleoindian period. The Archaic era saw increases in population, social and technological changes, along with the initial introduction of maize (corn) and other domesticated plants from Mesoamerica, but with a continued focus on hunting and gathering. The Archaic era is divided into three periods based on this chronology: Early (8,000 to 5,500 years ago), Middle (5,500 to 3,500 years ago) and Late (3,500 to 2,000 years ago). Around 5500 B.C., occupation and use of the lands that would become the Santa Fe NF changed to a lifestyle associated with less reliance on large game and more of a reliance on hunting supplemented by gathering of wild plant foods including a variety of small game and plant species by Archaic populations. Sites dating to this time period are relatively more abundant than the previous period. The Archaic is expressed differently across the three geographic subdivisions. In the Española Basin, little evidence exists for the Early Archaic and the initial stages until about 3,500 years ago. The best documentation for Archaic use was during the Late Archaic when site numbers increase, especially along river courses. The most abundant evidence for the time period is numerous projectile point types associated with the Late Archaic throughout all three of the geographic subdivisions. In the Española Basin the Early and Middle Archaic are poorly represented although the Caja del Rio in the vicinity of the type site for the la Bajada Phase (LA9500) and materials at the north end of the Caja indicate Early and Middle Archaic use of the uplands on the plateau of the Caja above the Rio Grande River.

Table 3. Chronology for the Santa Fe NF

CRAIS Phase Names	CRAIS Phase Dates	CRIAS Regional Variants (Gallina Area)		Archaeological Records Management Section (ARMS) *Periods*	ARMS *Dates*	Combined/Collapsed Cultural-Temporal Groupings
Pueblo V	A.D. 1600					Historic* Protohistoric*
						Classic Classic
				Pueblo IV-V	A.D. 1300-1700	Largo-Gallina or Coalition
Pueblo IV	A.D. 1300-1600					
				Pueblo IV Pueblo III-IV Pueblo III	A.D. 1300-1600	
					A.D. 1100-1600	Coalition
					A.D. 1100-1300	Late Developmental
		Gallina Phase	A.D. 1100-1275			Largo-Gallina or Developmental
Pueblo III	A.D. 1050-1300			Pueblo II-III Pueblo I-III		
				Pueblo II Pueblo I-II	A.D. 900-1300	
				Pueblo I Basketmaker III- Pueblo I	A.D. 700-1300	
						Middle Developmental Developmental
			A.D. 950-1100	Basketmaker III Basketmaker II-III	A.D. 900-1100	
Pueblo II	A.D. 900-1050	Largo Phase			A.D. 700-1100	Early Developmental Early Developmental
				Basketmaker II Late Archaic	A.D. 700-900	
Pueblo I	A.D. 700-900			Middle Archaic	A.D. 500-900	
						Early Developmental Late Archaic
			A.D. 600-900		A.D. 500-700	Late Archaic/Basketmaker II Late Archaic
Archaic	5000 B.C. - A.D. 0	Rosa Phase		Early Archaic	A.D. 1-700	Middle Archaic Early Archaic Paleoindian
					A.D. 1-500	
	9000-5000-B.C.				1800 B.C. - A.D. 1	
Paleoindian				Paleoindian	3000-1800 B.C.	

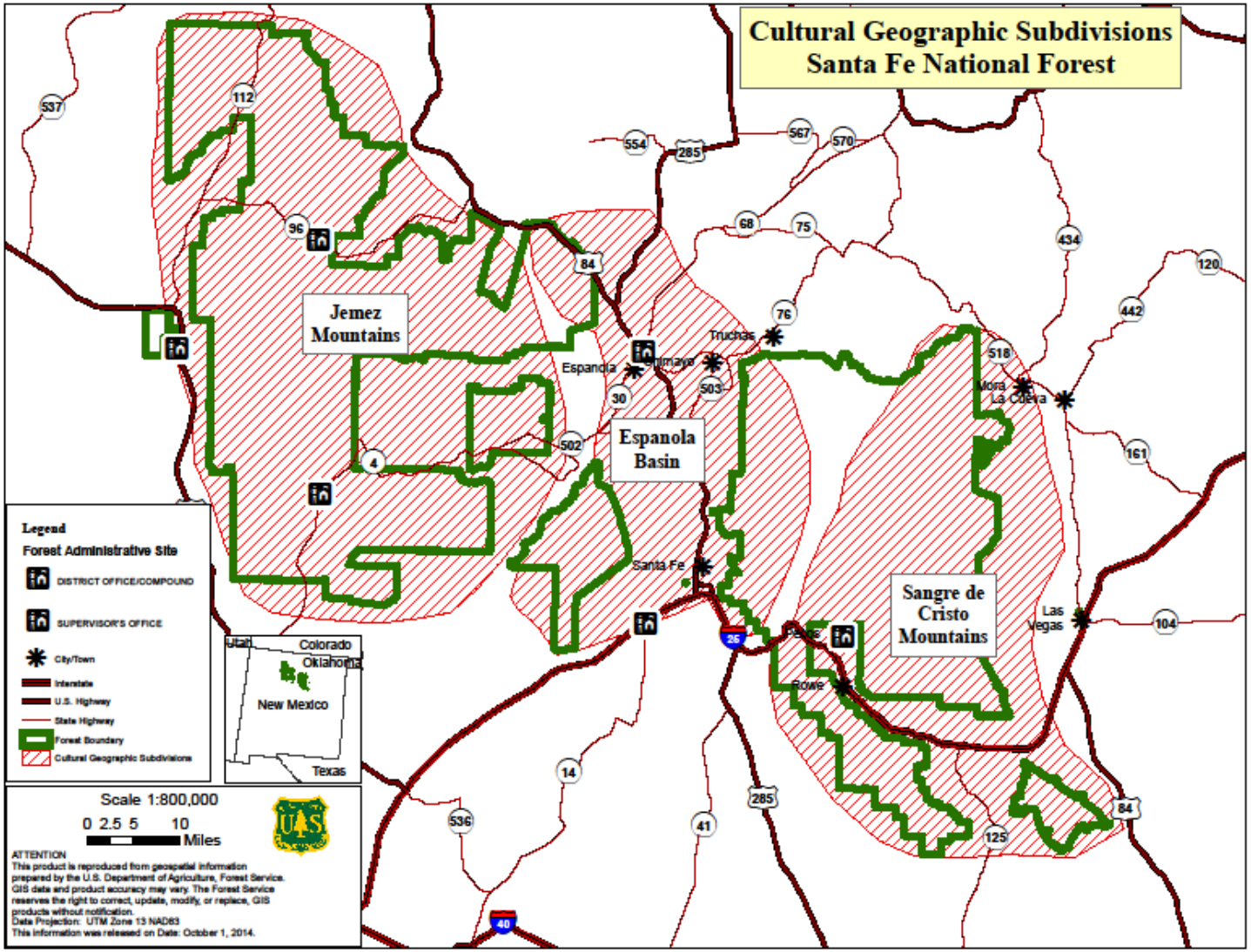


Figure 2. Cultural geographic subdivisions on the Santa Fe NF

In the Jemez Mountains, few if any Archaic sites are known. The exception is in the area immediately north of the village of Coyote in the vicinity of the Salitral area where it appears Late Archaic populations were taking advantage of lowland resources and their proximity to raw material resources on Pedernal and Polvadera Peaks. The bulk of Archaic materials for the area increase steadily as we move west toward the San Juan Basin and the western flanks of the Jemez Mountains. There does seem to be some differentiation between the Upper and Lower Jemez River Valleys in terms of the presence of Archaic materials. In the Upper Jemez site, data suggest the area was used primarily for seasonal hunting of game animals, gathering of plants, and acquisition of obsidian and other stone for tools. In the vicinity of the obsidian and rhyolite sources in the Valles Caldera and adjacent quarries on Forest land, it remains difficult to assign dates although the presence of the datable materials suggests a preponderance of use during the Late Archaic dating back to 2,500 years ago. One critical site in the area is Jemez Cave, where some of the earliest corn dating to around 2,500 years ago during the Late Archaic, suggests the beginnings of agriculture were early in the area. As with the Española Basin, the abundance of Ancestral Pueblo development much later potentially wiped clean the signature of Archaic occupation

In the Sangre de Cristo Mountains and the Front Range on the Forest, like the other two geographic subdivisions, this area has little evidence for Early or Middle Archaic populations. Late Archaic use of the area differs somewhat because of the differing terrain. The Upper Pecos Valley is characterized by temporary campsites associated with hunting or plant gathering endeavors. Farther up the river system and into the Pecos Wilderness, sites tend to have less evidence of plant gathering and more indications of hunting activities. On Rowe Mesa, there are three sites with horizontal rock images depicting Archaic-style petroglyphs dating to the latter part of the Middle Archaic and the beginning of the Late Archaic. The Front Range and the southern extent of the Forest along the Pecos River and Rowe Mesa exhibit open Archaic campsites or procurement areas assumed to represent hunting and gathering activities or procurement of raw materials in the gravel terraces along the Pecos River. This area of the Forest is important as the southern extent of the transition between the Rocky Mountains and the southern Plains. The area as early as the Late Archaic represents a transition zone between mountains and plateau Archaic adaptations and plains traditions to the east.

Archaic to Pueblo Transition: The beginning of the Pueblo era within the northern American Southwest was marked by a shift from a mobile lifestyle focused on hunting and gathering to more sedentary settlement and a primary reliance on subsistence farming for food. In archeological assemblages, the adoption of pottery for containers is a marker that distinguishes it from the preceding Archaic era. The Pueblo era corresponds to the last millennium of Native American occupation prior to A.D. 1600. It was characterized by the advent of settled life and a shift to a reliance on farming for food, and significant population growth in the region. Toward the end of the Archaic period, there was no clear transition from an Archaic lifestyle to a Pueblo life way. In other areas of the Southwest, the transition from the Late Archaic to the early Ancestral Pueblo periods occurred anywhere between A.D. 300 and 600. On the Forest, the persistence of the Late Archaic appears to have lasted well into the 7th century and as late as the 10th century (table 3). The chronology for Ancestral Pueblo life in the northern Rio Grande begins with the Developmental Phase although there is little or no evidence for Developmental use and occupation anywhere on the Forest. There is extensive evidence for Developmental occupation immediately along the Rio Grande and its tributaries as far north as Pojoaque, but use during the period drops significantly. Intensive occupation by Ancestral Pueblo populations appears to have increased around the end of the 12th century as described below.

Coalition to Classic Period Pueblos: The origins of the modern ethnic identities of contemporary Pueblo peoples also lie within this era. Athabaskan peoples colonized portions of the American Southwest during the end of the Pueblo era, although initially as small bands of hunters and gatherers. A host of other social, economic, and religious changes appear to have accompanied this transformation in way of life. In

particular, greater cultural differentiation between groups is indicated by increasing differences in settlement types and patterns, styles of artifacts (such as pottery), and land use practices. Broadly, this era can be divided into an *ancestral* period, generally before A.D. 1300, where cultural divisions are identified on the basis of material culture, and a *modern* period after A.D. 1300 when cultural divisions can be distinguished based on Native American oral history and correlated by descent with contemporary Native American ethnic divisions. By the end of the 13th century, conditions changed radically in upland situations in the Jemez, along the Rio Chama, in the Pecos Valley, and in the Gallina country. During this time, the size of sites grew exponentially, although the number of habitation sites appears to decline as smaller sites are abandoned in favor of aggregation into larger communities, some with over 1,000 rooms. This indication of aggregation supports ideas concerning a rise in population and intensification of land use. The mid-15th century represented the pinnacle of Ancestral Pueblo development on Forest lands. Similar to earlier times, the Jemez Mesas, the Pajarito Plateau, and the Rio Chama drainage were the focus of occupation on Forest lands. These communities continued to aggregate, grow, divide, grow again and develop lands into the Historic Period.

The Coalition Period spans from A.D. 11 to around A.D. 1325. At this time, it appears that Developmental populations in the Rio Grande Valley and its tributaries expanded the range of their occupation owing to a substantial population increase. The most noticeable early Coalition growth and expansion occurred in the vicinity of the Santa Fe NF as communities expanded to take advantage of beneficial climate enabling movement upslope from the river valleys into the foothills. Toward the middle of the Coalition Period, there was an even more noticeable uptick in the population represented by the occupation and construction of larger 25- to 50-room plaza pueblos on the Pajarito Plateau. This uptick occurred simultaneously with depopulation of the Mesa Verde region. At the same time, these new sites started having an array of new cultural characteristics not traditionally found in Rio Grande archaeology, and some interpretations discuss the probability that the increased number of sites and the different array of cultural characteristics resulted from the influx of migrants from the Mesa Verde region. This is most obvious in the Española Basin geographic subdivision where expansion onto the Pajarito Plateau bled into the Rio Chama section of the Española Ranger District (RD). There is also some indication of Coalition occupation along the Rio Grande River on the Caja del Rio, but little research has been done in the area. In the Jemez Mountains subdivision, Coalition occupation was confined to the lower part of the Jemez River Valley in the Canada de Canon and is poorly understood at this date. One distinct development during the Coalition Period was the rise and decline of the Gallina Culture in the Gallina sub-region of the subdivision. In this area, it appears a group of Eastern San Juan people migrated from the Upper San Juan River Basin into the uneven canyonlands of the Llaves Valley near the confluence of the Rio Gallina and the Rio Chama. These people lived in small farmstead settlements situated in dramatic locations on hogback ridges and other prominences as well as in similar-sized settlements adjacent to arable lands in the valley bottoms of the area. Their culture was distinguished by massive masonry construction of single to small connected room blocks accompanied by pit houses, granaries, towers, reservoirs, and agricultural field systems. By A.D. 1300, all evidence of this cultural group disappeared from the archaeological record, most likely as a result of conflict arising from the depopulation of and subsequent migration from the Mesa Verde region.

There is no evidence for Coalition Phase settlement in the Sangre de Cristo geographic subdivision except potentially in the Pecos River Valley surrounding the town of Pecos. Early in the Coalition Phase, two pueblos are documented from the later Classic Period: Rowe Pueblo and Forked Lightening Pueblo on Pecos National Monument. Later, during the Coalition, several more pueblos were constructed but known Coalition Phase sites were confined to the Upper Pecos River Valley and are not known to occur above the modern-day village of Pecos (Head and Orcutt 2002)

The period between A.D. 1325 and 1600 is typically referred to as the “Classic Period” and was a time of cultural florescence in the Upper Rio Grande Valley and adjacent uplands (Cordell 1979, Scheick 1996). This is the time period when many contemporary Pueblo communities defined their modern origins. The migrations from the north were largely finished, and the religious traditions practiced at the Pueblos today are first seen defined in rock art and the layout of Pueblo villages (Bernardini 1998). The movement of farmers from small settlements into large villages was almost complete by the beginning of the Classic Period, and widespread trade and social interaction between villages across the region is indicated by the manufacture and exchange of distinctive glaze-painted pottery. On the Santa Fe NF, there were two regions expressing distinct cultural development during the Classic Period including the Jemez Mesas in the Jemez Mountains geographic subdivision and the Rio Chama region in the Española Basin geographic subdivision. On the Jemez Mesas, there is significant expansion into numerous large plaza pueblos consisting of between 400 and 1,200 rooms in multiple stories. These communities form the heart of the modern Jemez Pueblo traditional homelands and continue to occupy a prominent place in the cultural identity and cultural geography of that community. In fact, many of these mesa-top communities were occupied into the initial stages of the Spanish entrada into the area.

In the Rio Chama region, the numerous Coalition Period communities formed by plaza pueblos and other linear pueblos aggregated into numerous large pueblos located along the Rio Grande, the Rio Chama, and their tributaries. The Española RD includes many of these sites identified as the cultural homeland and traditional territory of the modern day Tewa communities occupying the Española Basin. The modern day Tewa pueblos, similar to Jemez Pueblo, trace their ancestry and origin to these communities. Both of these larger settlement areas on the Forest have extensive limited use sites associated with them, consisting of field houses and agricultural field systems. The southern end of the Española Basin formed by the Caja del Rio Plateau also experienced similar cultural development during the Coalition and Classic Periods, but appears to have a cultural divide distinguishing the ancestral sites to the north from the south that corresponds to the distinction between the modern day Tewa communities to the north and the Keres communities to the south. As with Jemez, these communities were occupied up to the Spanish entrada and resulting depopulation from them appears to have contributed to the development of the current locations of modern pueblo communities.

Before the Spanish arrived, other Native American groups including the Ute, the Apache, the Comanche, and more sedentary bands of Apache that were to become the Navajo, expanded onto lands that are now the Santa Fe NF. One consequence of this expansion was predation by these groups on Pueblo and Spanish communities lying on the edge of the Spanish frontier.

Contact and Post-Contact

Spanish Colonial Entrada and Settlement: In 1542, with the entry of the Coronado expedition, the nature of the cultural landscape changed. Contacts with explorers from this expedition resulted in an awareness of the Spanish on the part of local Pueblo communities, but little settlement or contact occurred on Forest lands. Evidence of this first contact includes low numbers of metal tools and European ceramics. Initial settlement of areas around the Forest occurred in 1598 with an expedition led by Don Juan de Oñate of Zacatecas who acquired the right to colonize New Mexico in 1595 (Simmons, 1993). Between 1598 and 1821, the Spanish consolidated their colony in New Mexico by establishing mission communities and awarding land grants. The Camino Real or the Royal Road from Mexico provided the lifeline between the seat of Spanish power in Mexico and the far northern frontier in northern New Mexico. Oñate’s expedition to colonize New Mexico began in Santa Barbara, Mexico, traveled up the Rio Grande drainage, and terminated in what is now northern New Mexico. Between 1598 and 1607, Oñate and some 500 settlers imposed themselves upon the two northern Tewa Pueblos: the *Ohke* (San Juan) Pueblo and the *Yunge* (San Gabriel) Pueblo. This expedition established a pattern in which the Spanish inserted

themselves into Pueblo villages and began to control labor and resources. During his tenure as governor, Oñate contacted all of the major Pueblos, including the Jemez Pueblos on the Jemez RD and the Tewa Pueblos in the Española Basin.

Oñate's colonization efforts were shadowed by the arrival of Franciscan missionaries. By 1629, 50 missions had been established in pueblo villages along the Rio Grande Valley as well as villages within the western pueblos of Hopi, Zuni, and Acoma (Hudson 2011, Montgomery 2002, Schroeder 1979). This period caused dramatic upheaval in the settlement, community structure, and demographics of native populations in the plan area. The Pueblo population was significantly reduced and several large pueblos were abandoned. In 1680, the Pueblo populations along the Rio Grande revolted leading to Spanish depopulation of the area until 1692. In 1692, Don Diego de Vargas led forces back into northern New Mexico to re-establish the Spanish capital at Santa Fe. Pueblo communities reacted differently to the re-conquest with some capitulating and others establishing refugee communities leading to a longer period of re-conquest that lasted until 1696.

Population trends among Pueblo people during the Colonial Period are not well understood. Traditionally, it has been assumed that Spanish introduction of disease led to population decline, but there is some indication that factors leading to population decline or depopulation of areas are more complicated than previously assumed. On lands that would later become the Santa Fe NF, large pueblo communities were abandoned as the Spanish collected people into mission communities. On what is now the Jemez RD, many of the large mesa-top pueblos were depopulated as their occupants moved into large mission villages along the Rio Jemez. In the Rio Grande, it appears that the large pueblos on the Forest were depopulated concomitant with the arrival of the Spanish; this may have been a result of local depopulation due to drought, loss of arable land, and aggregation into communities as populations learned of the incoming wave of Europeans.

To further reestablish their claim to the area after the revolt, the Spanish established more land grants in areas along the northern frontier in the hopes those communities would provide a defense against intrusion and to control Pueblo communities. The Spanish also established a more formalized relationship with the Pueblos by recognizing them as independent communities without the concept of *encomienda* or the enforced system of tribute previously expected by the crown. Many of these grants were established on land currently managed by or adjacent to the future Santa Fe NF. Population growth, settlement expansion, and economic diversification occurred across New Mexico and markedly affected settlement.

As the success of the Pueblo Revolt reveals, the early Spanish occupation of New Mexico was tenuous and vulnerable. Far from establishing a continuous and major Spanish settlement, the occupation was disconnected from the larger Spanish empire and was largely confined to a thin strip along the Rio Grande Valley. In the years following the Revolt of 1680, there was significant population movement across the plan area. In the Jemez Mesas on the Jemez RD, the villages of Patowkwa, Astialakwa, and Boletsakwa were occupied through the 1600s, but were depopulated along with the other communities on the mesas in the 1670s. In the Española Basin, it is more difficult to tell if communities on the Forest were occupied into the Spanish Period although it appears the larger pueblos in the Rio del Oso drainage on the Española RD, such as Ku owingeh, Te'ewi-owingeh and Pesede-owingeh may have been occupied. There is also some chance that pueblo communities in the Abiquiu area underlying the modern Indo-Hispanic village such as Poshuouinge and Santa Rosa de Lima and Moqui may have been occupied by ancestral Tewa. On lands that would become the Santa Fe NF, there was significant movement in response to post-Revolt events, most notably the reconquest by de Vargas led to construction of "refugee pueblos" in defensive locations, most notably on the Jemez RD at Hanat Kotyiti and Astialakwa. By the late 1690s, most of these villages had been depopulated either forcibly from Spanish military action or through abandonment in favor of the modern day locations of the Pueblos.

In the aftermath of the Pueblo Revolts of 1680 and 1696, the Spanish authorities relaxed their controls over Pueblo communities, and a period of peace and cooperation ensued between the Pueblos and the Spanish, extending into the early 19th century. Episodes of conflict continued, however, between the Spanish colony and Pueblos on one side and Athabaskans on the other. In addition, other Native American groups increasingly entered the American Southwest in the 18th century. Geopolitical conflict between the Spanish Empire and other European nations resulted in the militarization of western North America in the 18th century, as European powers armed Native groups and encouraged them to make war on colonists from other European nations and their Native American allies. The early 18th century saw protracted military conflicts between Apache groups and Comanches on the high plains, and between Navajos and Utes in the San Juan basin. Spanish and Pueblo communities were also attacked. This increased level of warfare limited both Spanish and Native American use of the plan area in the A.D. 1700s, with only a handful of historic properties dating to this time period.

Despite sporadic conflict with Navajos, Apaches, and other tribes, Spanish settlement expanded from the northern and central Rio Grande Valley following the Pueblo Revolt. The Spanish crown (followed by the Mexican government after 1821) issued grants of land to individuals and communities to settle and use lands along the margins of the Spanish colony. Numerous land grants were issued on lands within or adjacent to the plan area within all three geographic subdivisions. Many of these grants formed the basis of many of the larger traditional Hispanic villages occupying land adjacent to the Forest today. These grants mainly provided grazing lands and Forest resources to these communities. By the late 1700s, these grants and those elsewhere in the colony supported a substantial sheep industry (Denevan 1967).

Mexican Revolution and Dissolution: Mexican independence from Spain in 1821 resulted in a lack of available resources to manage its far northern communities. Withdrawal of support and oversight by the Mexican government led to self-government for communities leading to a loss of the recognition of the special status of Native American communities, primarily the Pueblos, under Spanish rule. The change of government resulted in less official oversight of local politics and permitted a greater degree of religious and secular autonomy for Native American groups in New Mexico. The lack of oversight, however, also resulted in additional losses of Pueblo lands that were once protected by the Spanish Crown (Hudson 2011, Weber 1982). This meant non-native settlement of Pueblo lands resulted in the expansion of Hispanic communities on to tribal land and further loss of land base for those communities, as well as expansion on to lands that were to become the Santa Fe NF. The process of granting lands increased and led to growth of Hispanic communities. In addition to the Camino Real, the establishment of trade with the United States to the east via the Santa Fe Trail and to the west via the Old Spanish Trail led to further commercial expansion into New Mexico.

Conflicts over trade and contacts as the area continued to expand led to conflict between the United States and Mexico. The ensuing conflict ended in 1848 with the signing of the Treaty of Guadalupe Hidalgo in which the territory of New Mexico became part of the United States.

American Territorialism and Opening of the West: Throughout the early part of the 19th century, western expansion of the United States increased the level of American influence over the southwestern region. Following disputes over the Unites States' annexation of Texas in 1845 and incursions into the United States by Mexico, the United States declared war on Mexico in 1846, and seized New Mexico by military force. To resolve the conflict, in 1848, the Treaty of Guadalupe Hidalgo was signed and established New Mexico as part of the United States. Unlike other portions of northern Mexico annexed by the United States (Texas, California, and Arizona), New Mexico did not see a large influx of Anglo settlers, and the Hispanic population remained a majority until later in the 19th and early 20th centuries. However, the adjudication of land ownership claims from the time of Spanish and Mexican rule were protracted and contentious, and many Hispanic communities and individuals lost lands to legal maneuvering, fraud, and

court decisions of questionable legal merit (deBuys 1985). Some of the areas in dispute included grants that abut the plan area. The current boundaries of the grants are a result of the land adjudication that took place after 1848, but for several grants, claims extended to include parts of the plan area, particularly on the current Española, Coyote, and Cuba RDs. The Homesteading Act passed in 1862 also resulted in assignment of lands to people, in many cases on lands that were formerly considered to be grant lands. Population growth at the end of the 19th century and the beginning of the 20th century resulted in continuing expansion on to Forest lands. In 1912, New Mexico entered the United States as the 47th state.

Late in the Territorial Period was the first time lands were set aside as forest reserves. In 1892, the Pecos River Forest Reserve was set aside, and in 1905, the Jemez Forest Reserve was created on the west side of the modern day Forest. Eventually, in 1915, the two forest reserves were combined into what is now the Santa Fe NF. In addition to the original proclaimed boundary of the Forest, its current size and shape has been augmented by additional purchases, exchanges, and donations. In fact, many of the "acquired" lands on the Santa Fe NF encompass much of the common lands originally held by Spanish and Mexican land grants (Scheick 1996).

Summary of Land Grant History and Issues: The loss of community lands in the past continues to be a point of contention between land grand heirs and the Federal Government. The ultimate feeling by these individuals and their communities is a profound sense of loss of community lands that once provided subsistence resources and grazing lands for those communities (Gonzalez 1967, Forrest 1989, Quintana 1991, deBuys 1985, Scarborough 2011). Even though the community use of grant lands might have ceased with the acquisition by the United States, the feeling persists and is perpetuated by continued use of the land and the oral history of the heirs and their families. At its most basic, this issue arises from the distinctive interpretations of land ownership held by the Spanish/Mexican governments between 1598 and 1848 versus that of the United States government after cessation of the Mexican-American War. The United States viewed land ownership in terms of a grid placed over the landscape where exact locations within that grid formed the basis for demarcating ownership. In contrast, the Mexican and Spanish governments viewed land ownership from a community perspective where land was to be used by the local community for subsistence. Land boundaries at the time of grants awarded by the Crown or Mexico tended to be consensual in that the process of confirmation meant authorities and grantees met on the land and agreed on the general location of grant boundaries. The differing interpretation of land ownership created an inherent conflict during confirmation of land grants arising from the Treaty of Guadalupe Hidalgo. In addition, cultural patterns in northern New Mexico at the time of confirmation were not conducive to being supportive of land grant owners and heirs who were not familiar with the United States system of justice, as many were unable to communicate in English, or were unable to understand or undertake the requirements for confirming grant lands.

The Treaty of Guadalupe Hidalgo resulted from the settlements arranged after the Mexican-American War in1848. Originally, the Treaty provided protection of property rights perfected under Spain and Mexico to both Native American and Hispanic settlers (Scheick 1996). Land not held under titles perfected under Spanish and Mexican law passed into the public domain of the United States. Determining validity of land grant title claims was the responsibility of the Surveyor General's office established in 1854. The office's recommendation would eventually make it to Congress, which was responsible for accepting the evidence and patenting the land to the parties. Between 1854 and 1880, the recommendations of the Surveyor General's office were considered and resulted in some land grant applications going to patent. However, the process was ponderous and inefficient, and only 46 out of 135 claims state-wide were confirmed. In addition, Congress issued patents to 18 pueblo communities (Scheick 1996).

Because of problems associated with the process in the Surveyor General's office, Congress established the Court of Private Land Claims (CPLC) in 1891. The court consisted of a panel of judges, the U.S.

Attorney, and a court-appointed translator. The CPLC operated between 1891 and 1904, and confirmed 82 New Mexico land grants and 58 were referred to the Supreme Court for consideration. Of the confirmed grants, many consisted of lands currently located within and adjacent to the Santa Fe National Forest. From an historic distance, the grant confirmation process seems somewhat arbitrary as, in many cases, the area confirmed was enlarged greatly, while in others, area was reduced significantly or title was obliterated by the adjudication process. For New Mexico, the Sandoval Case of 1897 was pivotal in determining that common lands were not owned by the claimants or their heirs and belonged to the public, which eliminated the common lands from title confirmation (Scheick 1996) for grants confirmed after the Sandoval decision. In addition, shady politics, fraudulent representations, and economics at the time heavily influenced the outcome of numerous land grant claims (Gonzalez 1967, Forrest 1989).

This eventually led to the loss of grant lands by original grantees and their heirs through the acquisition by lawyers in payment for legal fees or loss for unpaid taxes as well as unscrupulous activities by other landholders that led to the acquisition of lands by people who were attempting to create large landholdings for the purpose of resource extraction. In some cases, after the resources were removed from these lands or after they fell into disuse, the lands were sold or otherwise exchanged to the Federal Government. Some land currently under the jurisdiction of the Santa Fe NF was acquired by the Federal Government subsequent to these activities and forms the basis for conflicts between modern land grant heirs and the Federal Government. After the Treaty of Guadalupe Hidalgo, many communities felt that Article 8 of the Treaty (Quintana 1991) would protect their right to the common lands although consistent legal interpretation has not supported that argument (GAO 2004). The GAO report (2004) says that in addition to “loss” of grant lands from a lack of confirmation by the Surveyor General or the CPLC that in the past heirs had voluntarily transferred lands to third parties, heirs had agreed to use lands as contingent fees with their attorneys, heirs had divided community lands into individual parcels through partitioning suits and heirs had lost lands in tax foreclosures. In addition, the Sandoval decision in 1897 restricted seven of 105 community land grants to their individual allotments by determining that common lands were held by the sovereign (Mexico) and transferred to the new sovereign (United States), effectively resulting in 1.1 million acres of common land in those grants not being acquired by the heirs to the grants. For example, on the Santa Fe NF, the Canon de Chama grant claimed 472,737 acres in its CPLC case, but was awarded 1,422.62 acres. These issues further complicate and exacerbate the land grant issues on forests throughout northern New Mexico like the Santa Fe NF.

This sense of loss among heirs of land grants persists into the present. In the 1960s the rise of the Alianza Federal de Mercedes brought the issue to the attention of the Forest Service and the larger public. The contention of the Alianza was that the Federal Government had not honored the obligations of the Articles of the Treaty of Guadalupe Hidalgo (Correia 2013). Specifically, for the Santa Fe National Forest, the period saw significant unrest in communities with lands on the Forest that were understood to have previously been included with the community lands of grants, specifically on the Canon de Chama and other community lands within the Forest boundary. Issues associated with land grants were significant enough for the Congressional delegation to request analysis of the land grant situation by the Government Accounting Office (GAO). The main conclusion of the report was that the Federal government had met its legal responsibility to the articles of the Treaty of Guadalupe Hidalgo but also made recommendations to Congress to address the concerns of land grant heirs (GAO 2004). It was, however, not the final word as land grant heirs and their supporters felt the GAO report did not address some significant legal issues and in 2008 the New Mexico Attorney General, crafted a response critiquing the GAO analysis and conclusions (Benevides and Golten 2008). The visibility of land grant issues in the state legislature was significant enough for the state to form the New Mexico Land Grant Council in 2009. Since that time land grant issues continue to play an important part in Forest management.

New Mexican Statehood: New Mexico applied for statehood soon after its annexation by the United States in 1850, but was rebuffed for a variety of reasons including the feeling New Mexico was too "foreign" in language, culture and religion, territorial politics, other overriding national issues, protracted war with America Indians in the territory and an image of the territory as a "lawless" enclave (Melzer, Torrez and Mantthews-Benham 2011). The Territory formally attained statehood in 1912. Most of the plan area came under the jurisdiction of the Forest Service with the establishment of two forest reserves and national forests between 1892 and 1915. The initial establishment of Forest Service jurisdiction over the plan area likely had a small impact on its use by traditional Spanish and Native American communities, with the greatest effect being the regulation of grazing. Many small operations were granted free use permits by the agency, but this practice was phased out after World War II with a strong negative impact on small operators (deBuys 1985, Raish and McSweeney 2008). The advent of industrial logging and mining in the early part of the 20th century in the plan area arguably had a greater impact on the Native American, Hispanic, and Anglo peoples that lived in the vicinity of the plan area.

Development of the logging and mining industries in the plan area was driven by the development of the transcontinental railroad system in the United States. The railroad reached Albuquerque in 1880, and the Santa Fe Railroad connected with the Southern Pacific Railroad at Needles in 1883, cutting the travel time to New Mexico from Chicago from three months to five days. Along the spine of this railroad connection was built a network of railroad lines throughout Arizona and New Mexico, and the commercial logging industry in New Mexico boomed (Baker et al. 1988). Between 1912 and the beginning of World War II, the Santa Fe NF experienced a significant growth in resource extraction. Uses prior to this time included primarily subsistence activities such as fuelwood removal and grazing. As populations began to expand in the plan area after World War I, there was an increase in the extraction of raw materials from Forest lands including mining. Some mining had been practiced in the Bland Mining District on the Jemez RD before statehood, but there was major growth in the mining in Pecos River Canyon in the 1930s in the Terrero Mining District. Logging grew significantly on the Forest especially in the Jemez Mountains. The growth of logging was sufficient enough in the Jemez to facilitate the construction of a logging railroad to remove the lumber. Homesteading and grazing continued on the Forest with peaks in Homestead activity during 1909, 1920, and 1935. The Great Depression was the worst economic disaster the United States has ever experienced and it marked a turning point in American history. Young people entering the work force were most affected by the economic crisis. Jobs were not available for unskilled laborers and there were limited opportunities for people entering the job market to gain experience. In 1933, President Roosevelt introduced the New Deal program to the American people. The New Deal combined short-term strategies designed for immediate relief, and longer-term strategies designed to promote the economic recovery. It included banking practice reforms like Federal Deposit Insurance Corporation, the Farm Security Administration, and the Civilian Conservation Corps (CCC). Men in the New Deal programs operated under several Federal agencies, including the Soil Conservation Service and the National Park Service, but more than 50 percent of all the public works projects administered by the New Deal were undertaken by the Forest Service (Otis et al. 1986). In the plan area, two New Deal programs were at work: the CCC and, later, the Works Progress Administration. During the 1930s, the Santa Fe NF benefited from the CCC program where at least three camps housed men who constructed fish structures in the Sangre de Cristo Mountains, in addition to constructing erosion control features, roads and recreational sites. They also constructed fire towers, telephone lines, and roads to facilitate communication for the fire program.

During the 1920s and the 1930s, outdoor recreation increased as a result of direction undertaken by the Forest Service in response to the rise of the automobile and the beginning of construction of a transcontinental highway system. One of the components of this increased emphasis on recreation was intentional focus placed on getting the public onto their National Forest System (NFS) lands. One idea for promoting this was the issuance of permits for recreation residences in certain parts of forests where the

public could build a cabin on Forest land and use it for recreation purposes. Although falling out of favor with current direction, many forests in the system have recreation residence tracts or other forms of authorizations that enable members of the public to have cabins or other residences on Forest land. The Santa Fe NF has several of these; all are located on the Pecos/Las Vegas RD including the Holy Ghost, the Winsor Creek, and the Grass Mountain, and Gallinas Summer Home Areas. In addition, the Forest also has several leases on acquired land in the Cowles area for similar recreation residences. Many of these residences were constructed in the 1920s and the 1930s, and are now historic. As a consequence of their age, changes to them fall under the requirements of the NHPA. They pose a management challenge from the perspective of NHPA because the Forest administers the land they occupy and provides the authorization for their occupancy. The Forest regulates what owners can do with their residences with regard to making changes to the historic character of the structures.

Native American Views of their Historic Origins

Native Americans who have occupied and used the plan area understand their own history in ways that are distinct and sometimes different from that derived by Western scholarly traditions. The historical traditions of Native Americans with ties to the plan area are oral in nature, and historical knowledge is maintained by passing it from one generation to the next verbally, rather than having it written down. Until recently, Native American societies tied to the plan area did not have written languages. A few groups, most notably the Navajo, have developed written forms of their language within the last 150 years. The majority of the Native American societies affiliated with the plan area, however, do not have a written form of their language. In some cases, the lack of written language is an intentional act, reflecting traditional beliefs that historical knowledge, along with other types of religious and sacred knowledge, should be restricted. The version of Native American history presented here reflects what has been written in English by Native writers or told to non-Native researchers.

For Native American groups in the Southwest, geographical features on the landscape are integral to their understanding of history and cultural identity. Vine Deloria, Jr. (1994) described the Native American conception of history as being geographical rather than chronological, as spatial connections are more important for understanding cultural identity than a chronological sequence of events. In this conception of history, stories are linked with specific places in the landscape. Because of their permanence as geological features, these places are used to remember historical narratives and traditions, and thus, become a way of linking the present to the past (Ball 2000). For the Native American tribes that claim affiliation with the Santa Fe NF, there are numerous places within the plan area that link Native American oral histories to their traditional homeland in the Southwest, including such stories as group's creation stories. Although all Native American groups affiliated with the plan area trace their historical roots to the American Southwest, origin histories are diverse amongst the various groups.

Description of Cultural and Historic Resources

Cultural and historic resources can be divided into two overlapping categories: Historic Properties and characteristics of properties of historic and cultural importance to traditional communities, or Traditional Cultural Properties (TCPs) (Parker and King, 1990/1998). The types of historic properties are defined under Section 101 of the National Historic Preservation Act (16 U.S.C. 470(a)(1)(A) and (B)) and NPS Bulletin 15 (National Register of Historic Places Staff 2002) as objects, structures, buildings, and sites. Districts consist of a combination of one or more of the four property types. These property types are significant either as National Historic Landmarks, or as "Historic Properties" that are "Listed" or "Eligible" for listing to the National Register of Historic Places (NRHP), based on their importance to local, regional, or national history. By definition, Historic Properties are considered to be eligible for the National Register of Historic Places. In accordance with the Region 3 Programmatic Agreement,

properties for which eligibility cannot be established ("undetermined" properties) are treated as if they are Eligible for the NRHP, and are included as historic properties in this discussion. Also included in this discussion are properties that have been evaluated and found to be Not Eligible to the NRHP. Although not considered historic properties under U.S.C. 470(a)(1)(A) and NPS Bulletin 15, because the information gathered as part of their NRHP evaluation can be valuable for the interpretation of historic occupation and use of the plan area, properties not eligible are also considered here. TCPs are a subset of historic properties. TCPs are historic properties eligible for the NRHP because of their "association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (Parker and King 1990/1998)." The sources and descriptions of the data used to describe historic properties in this and the remaining sections of this assessment are found in Appendix 2.

The places and characteristics of the plan area that are of cultural and historic significance to the traditional communities in the vicinity of the plan area can include TCPs and other historic properties, but are not limited to them. More broadly, characteristics of cultural and historic importance are places within or qualities of the plan area that are important to maintaining the cultural and historic identity of traditional communities. These characteristics can be defined as historic properties, general areas corresponding to the distribution of physical attributes such as types of plants or geographic features, or non-place-based characteristics such as solitude. In August of 2015, the Santa Fe NF officially received a request from the All Pueblo Council of Governors for designation of the Jemez Mountains as a Traditional Cultural Property. This was in response to a geothermal leasing and development project proposal, and cites the need to protect all of the associated resources in the Jemez Mountains area from leasing and mining activities and their potential impacts (All Pueblo Council of Governors (2015)).

A total of 9,944 sites are used in this analysis. This number is derived from the total number of sites (9,896) documented in the NMCRIS database located on forest lands and the 48 sites located on system roads or located outside of Forest lands. The sites are widely distributed across the Forest with concentrations occurring in certain parts of the Forest that were suitable for occupation (figure 3).

Across most of the Forest, the site density is low with 20 or fewer sites per square mile. Parts of the Forest have moderate and high site density. Moderate site density varies between 10 and 50 sites per square mile and high site density is greater than 50 sites per square mile. Site density also has a direct relationship to elevation. Site density tends to decline as elevation rises with the exception of the Jemez Mesas, where site densities are moderate to high above 8,000 feet in certain areas. Generally, site density declines precipitously above 9,000 feet.

Much of this evaluation of site density on the Forest is tied to the distribution of survey on the Forest. For this analysis the Forest used Geographic Information System (GIS) layers for cultural resource sites and cultural resource survey. Cultural resource survey includes the systematic investigation using crew members to intensively examine transect swaths that are generally no greater than 15 meters in width. The GIS layer for the Forest shows that approximately 250,000 acres (247,473 acres) have been adequately surveyed for cultural resources resulting in approximately 16 percent of the Forest having been surveyed. Larger areas have been subject to reconnaissance but not at levels that are expected for valid survey per Forest Service policy (FSM 2360 and FSH 2309.24). Survey on the Forest corresponds primarily to areas where large scale land management activities have occurred. A large percentage of the survey occurred when the Forest conducted large timber sales. Smaller scale surveys have occurred for small projects and for research projects on the Forest.

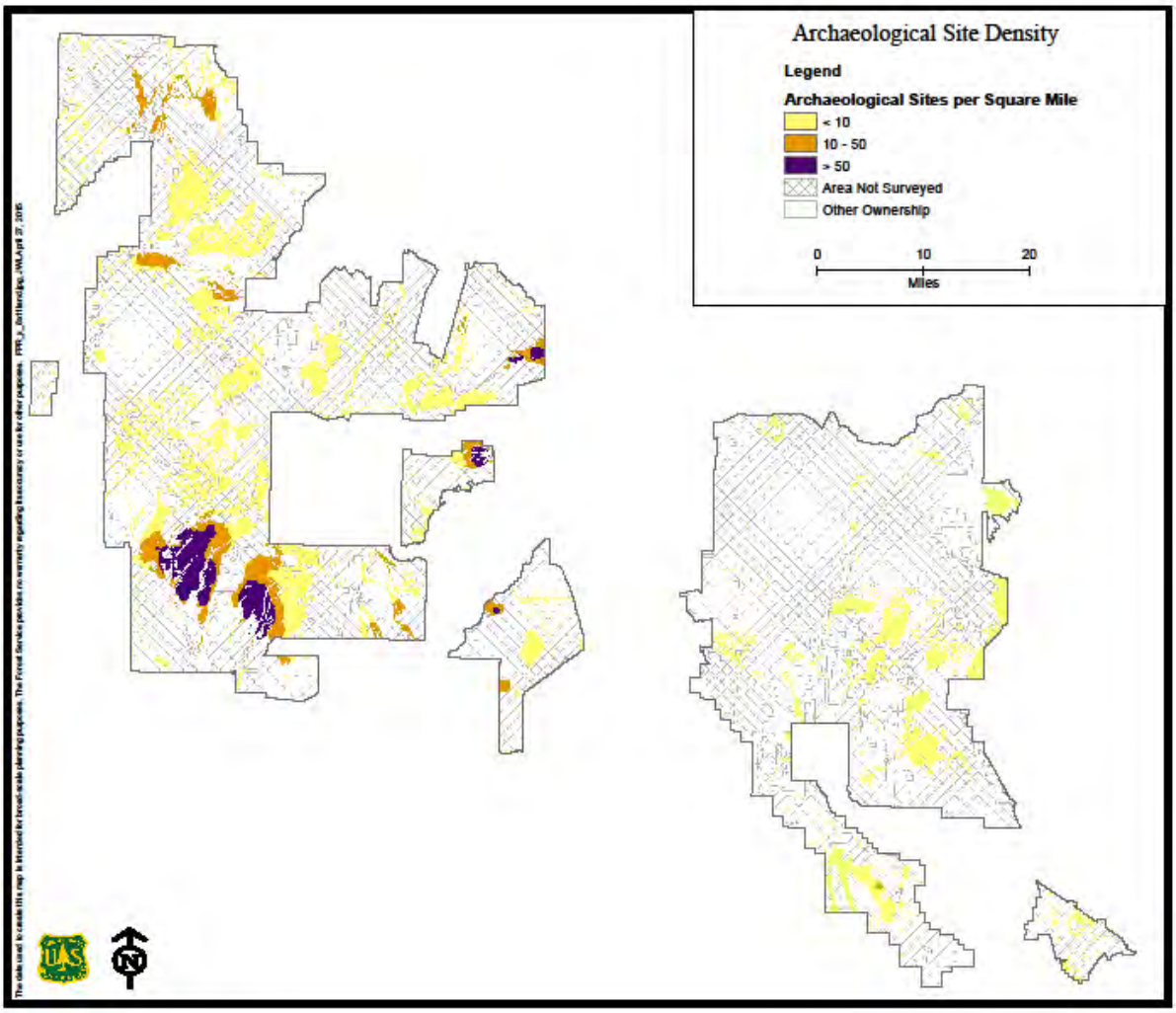


Figure 3. Density of cultural resource sites on the Santa Fe NF, in sites per square mile

Description of Historic Properties

Distribution of Cultural Resource Inventory

On the Santa Fe NF, the discussion of historic properties is limited by the extent of inventories conducted to identify those properties. Inventories typically referred to as cultural resource inventories, also called surveys, are conducted to identify those properties. Such inventories have been conducted systematically on the Santa Fe NF since the early 1970s as part of the Section 106 (NHPA) process. Additional surveys have been conducted under Section 110 (NHPA), and by other entities for research purposes unrelated to forest management. As of August 2014, approximately 563,375 acres, or approximately 34.5 percent of the plan area, have been inventoried at some level. Of this, approximately 261,246 acres, or 15.5 percent of the total plan area, are considered to have been inventoried to current standards. Inventory has not been conducted evenly across the five districts, or within each district (Table 4).

Table 4. Acres inventoried for historic properties, by district

Acres Inventoried	Coyote	Cuba	Jemez	Pecos/ Las Vegas	Española	Total
Not to Standard	65,722	68,674	55,744	74,273	37,716	302,129
To Current Standard*	57,564	43,285	35,874	65,358	59,165	261,246
Total	123,286	111,959	91,618	139,631	96,881	**563,375**
Total District Acres	268,211	254,616	365,960	245,560	546,602	**1,680,949**
Percent Total Inventoried	46%	44%	25%	57%	18%	**34.5%**
Percent Valid Survey	21%	17%	10%	27%	11%	**15.5%**

* The “standard” for cultural resource survey on the Santa Fe National Forest is determined by the Region 3 Programmatic Agreement, Forest Service Manual, Section 2360 and Forest Handbook 2309.24. The standard is specified to not exceed 25 meters width for individual pedestrian survey transects and varies between 15 and 20 meters on the Santa Fe NF. The survey or inventory must also be conducted by qualified individuals with standards specified in the same references. On the Santa Fe NF inventory is considered completed to standard if the survey width was 15 meters and has not exceeded 20 meters. Survey to standard has also been completed by qualified cultural resource specialists.

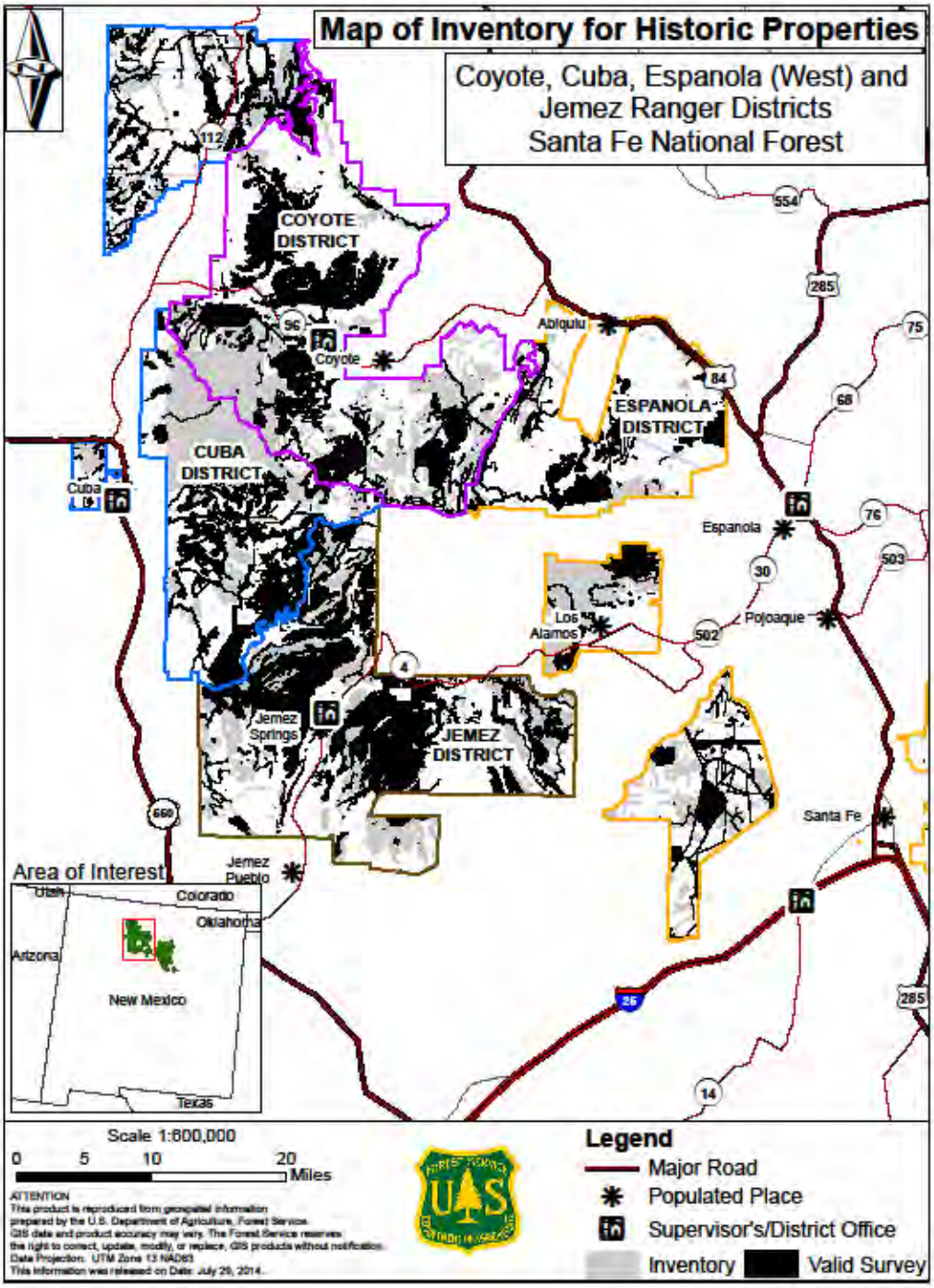


Figure 4. Distribution of cultural resource inventory across the west side of the Santa Fe NF including valid and nonvalid survey

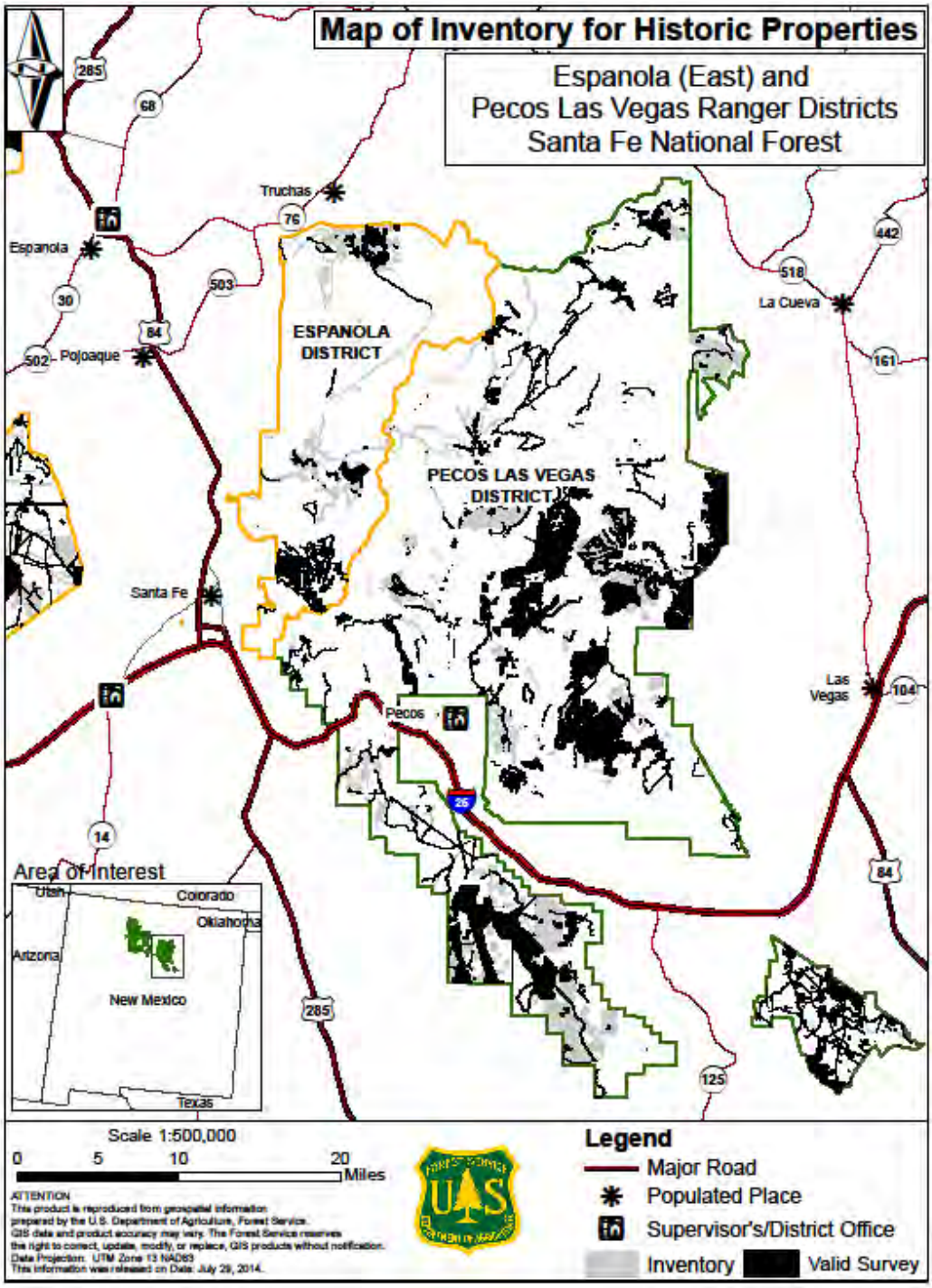


Figure 5. Distribution of cultural resource inventory across the east side of the Santa Fe NF including valid and nonvalid survey

Because the vast majority of inventory within the plan area was conducted for Section 106 (NHPA) purposes, the amount of inventory for each district (table 4) is a consequence of the extent of land management activities the district conducted during the past four decades. An emphasis on timber harvesting and fire-adapted ecosystem restoration has meant that inventory has been concentrated in the ponderosa pine and mixed conifer overstory types located on ranger districts. In the Sangre de Cristo Mountains, geographic subdivision inventories were excluded in some areas because much of the area is located in the Pecos Wilderness, where guidelines limit mechanical treatments, or much of the district has lands unsuitable for timber harvest. On areas such as Rowe Mesa and Anton Chico on the Pecos/Las Vegas RD, and on the Caja del Rio and the El Invierno Pasture area on the Española RD, there is less inventory because the lands were also unsuitable for harvest although some inventory was conducted for fuelwood extraction or landscape management projects. The Pecos/Las Vegas RD has the largest amount of inventory, owing to large-scale timber sales from the late 1970s to the early 1990s. Much of the survey across the forest was conducted in the late 1970s and early 1980s, before the lawsuit settlement, and does not meet the current standards of survey acceptable to the Forest Service. This explains discrepancies between levels of valid survey and total inventories (table 4).

The great bulk of inventory was conducted in response to the requirements of Section 106 of the NHPA. On the Santa Fe NF, most survey was also conducted in areas of extensive harvest of marketable timber during the 1970s, 1980s, and early 1990s. About 1995, the market for merchantable timber declined and the demand for survey associated with timber sales tailed off as the program declined on the Forest. More recently, large-scale surveys have been conducted in response to ecosystem restoration activities in areas of wildland-urban interfaces and in areas with dense fuels that have the potential to contribute to catastrophic fires. Much of this work corresponds to areas of ponderosa pine distribution on the Forest.

On the Coyote RD, almost the entire inventory is the result of contract inventory conducted in response to demands for timber. The district has a wide discrepancy between overall inventory and valid cultural resource survey. Much of the inventory was conducted early during the compliance program associated with logging, and the survey intervals do not meet the current standards for survey in Region 3.

Surveys correspond to logging operations conducted in the 1980s and the 1990s in the high-altitude ponderosa pine forests on the western flanks of the Jemez Mountains. On the northern end of the district, much of the survey corresponds to oil and gas development at the eastern edge of the San Juan Basin oil field.

On the Jemez RD, as on the Coyote RD, much of the survey corresponds to areas of timber harvest. However, more recent survey corresponds to areas that have been resurveyed in response to a large-scale ecosystem restoration project that has been proposed for the Jemez Mesas. Most of the survey on the Mesas has been conducted on the mesa tops and not in the canyon bottoms.

As stated earlier, inventory on the Pecos/Las Vegas RD corresponds to timber harvest activities in non-wilderness areas of the District in ponderosa pine and mixed conifer vegetation types. In addition, there has been some survey on range lands outside the timber zone for large-scale range projects. Little or no survey has been conducted in the Pecos Wilderness. Trace amounts shown (figure 5) correspond primarily to trails and wilderness management activities. The discrepancy between valid survey and inventory on the district, as on the other districts, corresponds to the intensity of survey, where older surveys conducted at a lower intensity are not considered valid.

On the Española RD, survey is distributed between the mountain areas where projects were done in ponderosa pine and mixed conifer vegetation types for purposes of timber harvest, and at lower elevations for range and fuelwood activities. Most of the inventory for timber harvest was at higher elevations on the northeast corner of the Jemez Mountains between Chicoma Peak and Polvadera Peak. In the El Invierno

Pasture and on the Caja del Rio, inventory was primarily for range activities and fuelwood harvest. On the east side of the district in the vicinity of Borrego Mesa, inventory corresponds to areas that were harvested for timber.

Distribution of Cultural Resources

While the spatial distribution of inventories has biased our understanding of the location of historic properties within the plan area, there is enough information to describe the nature, cultural affiliation, and distribution of properties in the plan area. A total of 9,784 historic properties (including properties determined not eligible to the NRHP) have been recorded in the plan area as of August 2014 (figure 6 and figure 7). As virtually all of the inventories conducted for historic properties have been carried out for management purposes, almost all of the properties recorded were located by these inventories. The distribution and densities of historic properties vary by district across the Forest (table 5).

Affiliated materials from the Santa Fe NF, as defined under NAGPRA, include 285 sets of affiliated remains distributed between numerous museums and associated with 12 excavations and other types of projects. Of these remains, 258 sets are associated with sites from the Gallina Culture area and are currently Culturally Unidentifiable under the provisions of NAGPRA. Of the remaining 27 sets of remains which are culturally affiliated, 11 sets have been repatriated.

Table 5. The distribution and densities of historic properties across the Santa Fe NF and broken out by district

Historic Properties	Coyote	Cuba	Española	Jemez	Pecos/Las Vegas	Total
Total Number of Sites	1,258	1,876	1,780	3,987	883	9,784
Density/100 acres surveyed	1	2	2	3	1	2
Density/miles sq. surveyed	7	100	12	18	6	14

Note: Total site counts are slightly higher due to double counting of sites located on shared district boundaries.

Generally, site location is limited to areas that are suitable for habitation or resource procurement. In the southwestern United States, studies have shown that settlement generally occurred below 8,000 feet above mean sea level because sedentary agriculture is generally not practical at higher elevations because of a shorter growing season. Around 80 percent of the historic properties in the plan area occur below 8,000 feet (table 6). There are more sites at elevations above 8,000 feet on the Jemez RD than on the other districts (table 6). The presence of agricultural fields and field houses above 8,000 feet on the Jemez RD, particularly in the area of Banco Bonito, is due to the specific orographic condition of the Jemez Mesas in that location. Research has shown the mesas' orientation to the sun contributes to an increase in the number of frost-free days, which would contribute to a longer growing season and possibly explain the presence of field houses and agricultural fields at that higher elevation.

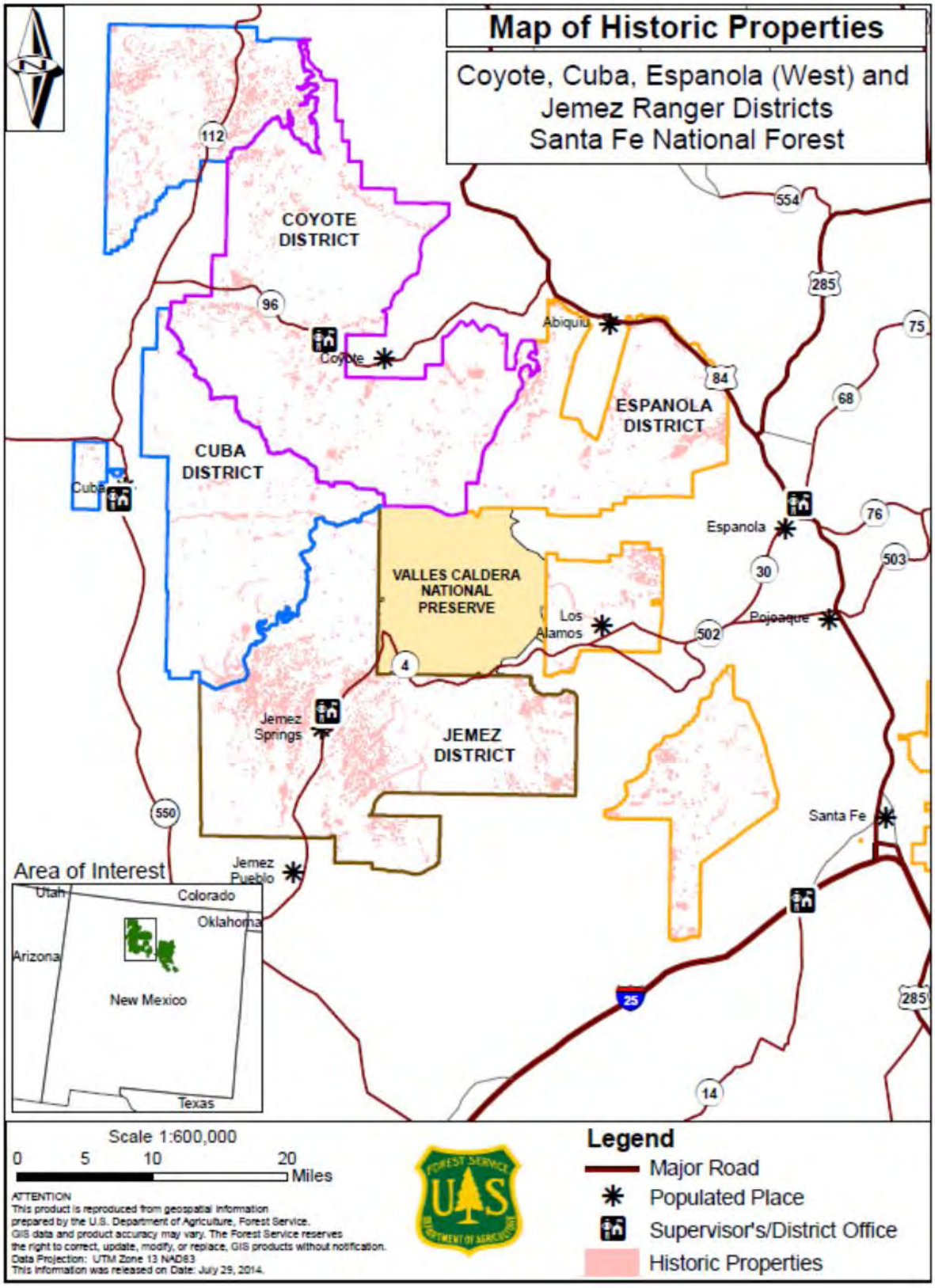


Figure 6. Distribution of historic properties (cultural resources) across the west side of the Santa Fe NF

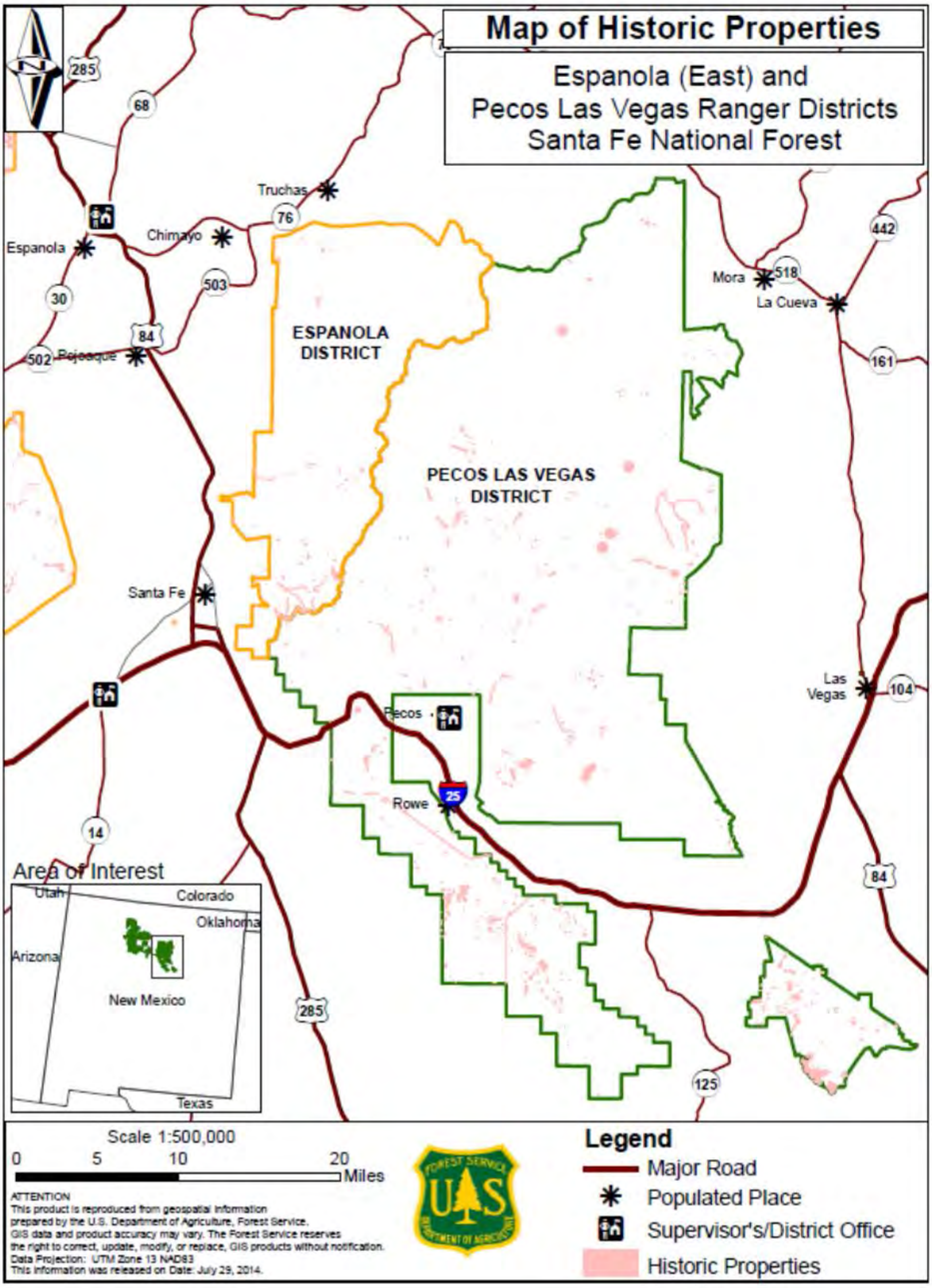


Figure 7. Distribution of historic properties (cultural resources) across the east side of the Santa Fe NF

Table 6. Elevation of historic properties by district

Elevation (feet)	Coyote	Cuba	Española	Jemez	Pecos/Las Vegas	Total
Less than 5,999 ft.	3	3	268	81	59	414
6,000 – 6,999 ft.	111	17	751	419	57	1,355
7,000 – 7,999 ft.	657	1,265	418	2,402	381	5,123
8,000 – 8,999 ft.	274	324	203	757	108	1,666
Over 9,000 ft.	103	39	64	11	82	299
No information	110	228	76	317	197	928
Total	1,258	1,876	1,780	3,987	884	9,785

Note: Total site counts are slightly higher due to double counting of sites located on shared district boundaries.

The distribution of historic properties correlates regularly to major vegetation and ecological communities across the plan area (table 7), specifically those with piñon-juniper and ponderosa pine included in the community. These correlations offer some support for making predictions about site location with regard to vegetation and ecological community. Forest vegetation stand data (Ecological Response Units, ERU) were used to compile this table to correspond to the vegetation analysis presented in Volume I of this assessment. A large percentage of sites on the Forest correspond to the Ponderosa Pine Forest or Mixed Conifer ERUs. The next largest number is in Piñon-Juniper Woodland ERU.

Historic properties in the plan area tend to date to prior to A.D. 1600. All of the sites prior to A.D. 1600 are assumed to be Native American, although a significant number may be associated with non-Ancestral Pueblo contexts. The Jemez RD has the greatest number of sites prior to A.D. 1600, and the Pecos/Las Vegas has the greatest number of historic period sites dating to after A.D. 1600, probably owing to the historical development on the east side of the Forest.

The section in this chapter on “Context for historic occupation and use” stated there were few, if any, sites dating to the Paleoindian period on the Forest. However, forest data suggest that around 20 percent of the components on sites are Paleoindian (table 9). For both the Paleoindian and the Archaic periods, the data for the components were derived from the NMCRIS database, which would not necessarily have differentiated between these two time periods for generic lithic scatters. While there are historic properties in the plan area that date to all periods of human occupation, there are portions of the plan area with clusters of properties that correspond to specific time periods and/or with specific ethnic affiliations (table 9). In some cases, these clusters of properties are distributed across the plan area, while others are concentrated on specific districts. Less than 4 percent of the properties in the plan area date to the Archaic era (6500 B.C. to A.D. 600). They are distributed across the plan area, although the highest concentrations are on the Coyote and Española RDs and most likely correspond to areas that are archaeologically known to have been advantageous to Archaic populations. Almost all Archaic sites are found below 8,000 feet in elevation. Of those where the property type is known, the vast majority are chipped stone artifact scatters, the remains of temporary or seasonal encampments. A few of the sites have associated simple features, such as hearths or other thermal features (ash stains, etc.). Of properties where the period of occupation is known, those dating to the Middle and Late Periods occur in equal proportion, while there are few if any known sites that date to the Early Archaic except for the La Bajada type site on the Caja del Rio.

Table 7. Number of historic properties in each district for each ecological response unit (ERU), which is a vegetation classification type

Ecological Response Unit	Coyote	Cuba	Española	Jemez	Pecos/ Las Vegas	Total
Alpine and Tundra	0	0	0	0	0	**0**
Bristlecone Pine	0	0	0	0	2	**2**
Colorado Plateau / Great Basin Grassland	11	1	132	0	138	**282**
Gambel Oak Shrubland	0	0	2	0	0	**2**
Great Plains Grassland (Black Kettle NG)	0	0	3	0	0	**3**
Interior Chaparral	0	0	0	0	0	**0**
Intermountain Salt Scrub	0	0	0	0	0	**0**
Juniper Grass	61	29	514	394	32	**1,030**
Mixed Conifer - Frequent Fire	206	395	117	532	225	**1,475**
Mixed Conifer w/ Aspen	0	1	0	9	0	**10**
Montane / Subalpine Grassland	52	78	26	69	12	**237**
Mountain Mahogany Mixed Shrubland	0	0	0	0	1	**1**
PJ Evergreen Shrub	0	0	0	0	0	**0**
PJ Grass	19	1	298	64	150	**532**
PJ Sagebrush	12	11	345	0	0	**368**
PJ Woodland	287	244	826	631	322	**2,310**
Ponderosa Pine -- Evergreen Oak	0	0	0	0	0	**0**
Ponderosa Pine Forest	726	1,276	389	3,540	194	**6,125**
RMAP Herbaceous	26	36	6	88	6	**162**
RMAP Narrowleaf Cottonwood / Shrub	12	12	37	109	128	**298**
RMAP Ponderosa Pine / Willow	2	0	0	6	1	**9**
RMAP Rio Grande Cottonwood / Shrub	26	0	56	88	11	**181**
RMAP Upper Montane Conifer / Willow		0	1	0	43	**44**
RMAP Willow - Thinleaf Alder	33	21	121	7	24	**206**
Sagebrush Shrubland	165	467	50	0	0	**682**
Semi-Desert Grassland	0	0	0	0	0	**0**
Shortgrass Prairie (Kiowa-Rita Blanca NGs)	0	0	15	0	0	**15**
Sparsely Vegetated	0	0	0	0	0	**0**
Spruce-Fir Forest	43	8	38	2	84	**175**
Total	**1,681**	**2,580**	**2,976**	**5,539**	**1,373**	**14,149**

Note: columns total to greater than the number of total properties on each district and on the forest, because some properties lie in more than one vegetation association.

Table 8. Historic property occupation types by district

Occupation	Coyote	Cuba	Española	Jemez	Pecos/ Las Vegas	Total
Post A.D. 1600						
Features	58	90	108	196	221	673
No Features	10	6	11	14	26	67
Total	68	96	119	210	247	740
Pre A.D. 1600						
Features	579	1,491	1,030	3,401	272	6,773
No Features	611	289	631	375	365	2,271
Total	**1,190**	**1,780**	**1,661**	**3,776**	**637**	**9,044**
Unknown	0	0	0	1	0	1
Total	**1,258**	**1,876**	**1,780**	**3,987**	**884**	**9,785**

Note: Total site counts are slightly higher due to double counting of sites located on shared district boundaries.

Table 9. Cultural affiliations for historic property components, by district

Component Culture	Northern Rio Grande	Time Period	Coyote	Cuba	Española	Jemez	Pecos/ Las Vegas	Total
Present	Recent	Post A.D. 1940	21	21	22	27	50	141
Territorial	Historic	A.D. 1848-1940	33	67	67	164	177	508
Mexican	Historic	A.D. 1821-1848	10	8	15	7	20	60
Spanish	Historic	A.D. 1600-1821	4	0	15	12	0	31
Pueblo V	Proto-historic	Post-A.D. 1600	68	96	119	210	247	740
Pueblo IV	Classic	A.D. 1300-1600	45	422	295	2,461	44	3,267
Pueblo III	Coalition	A.D. 1050-1300	291	647	398	394	9	1,739
Pueblo II	Middle to Late Developmental	A.D. 900-1050	72	254	6	17	3	352
Pueblo I	Early Developmental	A.D. 700-900	3	80	6	6	3	98
BM III	Late Archaic	A.D. 500-700	23	12	12	19	10	76
BM II	Late Archaic	A.D. 0-500	53	24	85	170	18	350
Archaic	Early and Middle Archaic	5000 B.C.-A.D. 0	96	24	188	12	73	393
Paleoindian	Paleoindian	Pre-5000 B.C.	500	95	617	385	287	1,884
Unknown		Unknown	107	222	54	313	190	886
Total			1,326	1,972	1,780	3,987	884	9,949

Table was generated using NMCRIS data, and therefore, temporal categories do not correspond to those discussed in the cultural summary above and in table 3.

Note: Columns total to greater than the number of total properties on each district and on the forest, because some properties feature more than one cultural component.

Because the table was generated using NMCRIS data, the temporal categories do not correspond to those discussed in the cultural summary above and shown in table 3. On the Santa Fe NF, the Archaic period

occupation tends to occur in the early parts of the second millennium and compromises around 8 percent of the total number of components. They occur throughout the plan area, with well-defined concentrations in a few localities. As stated above, Archaic materials tend to be clustered on the Coyote and Española Ranger District's.

Around 4 percent of the properties are indicated to have a Developmental component.

Starting in the Coalition Period, numbers of historic components start to increase and account for around 18 percent of the total number of components and also match the increase in site numbers seen in the discussion on cultural context. By far the largest number of components occurs during the Classic Period (table 9). The large percentage of Classic Period sites, 32 percent, shows the Forest had a dense occupation of Ancestral Pueblo people at that time, which would reinforce the connections modern day Pueblo communities have with these ancestral sites. Although it is not surprising to see the high number of sites for this time period on the Jemez District, it is noteworthy that the number of Classic Period sites on the Española RD is relatively low.

Historic Period sites from the Proto-Historic to the Present total around 15 percent of the total site components on the Forest. Since 1598, when the Spanish entrada occurred, there has been continuous expansion of historic communities around all of the ranger districts on the Forest.

Characteristics of Cultural and Historic Importance

The plan area contains characteristics that are of cultural and historic importance to both Native American and Euro American peoples. Those characteristics of the plan area that are of cultural and historic importance to Native Americans are partially described in the chapter "Areas of Tribal Importance."

Land transfers on the Santa Fe NF have led the Forest to evaluate the effects of these activities on areas with cultural and historical importance to Native Americans and extensive remains associated with ancestral occupation. Inventories to assess areas of cultural and historical importance are made up of a series of resources. One of the most valuable assessments was that conducted by John Peabody Harrington when he completed his inventory of geographic places and names important to the Tewa communities in the Española Basin (1916). In addition, an ethnographic inventory was conducted for development of the Santa Fe Ski Basin at the time that TCPs were first being evaluated on the Forest (Evans et al. 1993). Subsequently, evaluation of TCPs was conducted for a land transfer between the Santa Fe NF, Los Alamos County, San Ildefonso Pueblo and Santa Clara Pueblo (Baldwin and Bremer, 2009). As early as Harrington's work in the early 20th century it was recognized that Native American communities in the vicinity of the Santa Fe NF had a strong tie to their ancestral lands, which in most cases overlap with those of other communities. Important elements of the land include water sources at springs and seeps, running water, arable land for agriculture, plant and animal resources necessary for subsistence and ceremonies, prominent shrine and other ceremonial locations associated with points on the land and other ceremonial aspects. Work by Alfonso Oritz (1965 and 1969) reinforced this concept. He articulated and mapped out the specific Tewa values for the land and its connection to the past and present. This supports an understanding that the remains of ancestral pueblo sites fit into a large landscape perspective on the part of these Native American communities.

Inventory for characteristics of importance to non-Native traditional communities has been limited mainly to the Jemez Mountains on the Coyote, Cuba, Jemez, and Española Ranger District's. These inventories have been associated with the traditional importance and uses of these areas for adjacent Hispanic land grant communities. These inventories were conducted recently to assess the impacts of Forest Service management on characteristics important to land grant and related traditional communities (Anschuetz and Merlan 2007, Anschuetz and Raish 2010, McSweeney and Raish 2012). The places, resources, and

characteristics important to traditional communities are throughout the Jemez Mountains. The most important resource cited by community members is water for irrigation, followed by forage for cattle and other animals, wood for fuel and construction, game for food, and wild plant products for food and for medicinal purposes. Community members also cited solitude, wilderness values, and scenery as critical characteristics, with both visual and physical access to the plan area as critical to community identity. These resources and characteristics are distributed throughout the Jemez Mountains with specific resource locations dictated by elevation and setting.

The Santa Fe NF recognizes the importance of the associations traditional Hispanic and Native American communities have to Forest lands. For Native Americans, the Forest contains ancestral lands, significant ancestral sites, sacred areas, and resource collection areas significant to Pueblo, Navajo, Apache, and Ute communities. Many of these communities are adjacent to or surrounded by Forest lands. These ties date back to “time immemorial” according to oral tradition and to the very earliest period of archaeological dating of sedentary communities along the Rio Grande; A.D. 500 for the Pueblo communities and the 15th to 16th centuries for Navajo, Apache, and Ute and communities. During analysis for Travel Management, 23 known traditional cultural properties were evaluated for effects from the alternatives (Santa Fe NF 2012). The analysis on the use of these properties came from work conducted with traditional communities during previous projects requiring consultation under the requirements of Section 106 of the National Historic Preservation Act. Documentation in the Forest overview (Scheick 1996) and other documents (Harrington 1916) shows a broad pattern of traditional use across the Forest as indicated by a variety of features on the landscape or indigenous identification of landscape features with traditional cultural meaning.

More recent associations, but no less codified in the traditional knowledge of traditional Hispanic communities, are their ties to use of Forest lands known as “common lands” or the *ejidos* of land grants. These lands provided land grant communities access to grazing land, stone resources, wood, game, other Forest products and medicinal plants. Many of these communities formed close ties reflected in the development of social and ceremonial ties to land forms for secular and religious purposes.

Management direction in the current Santa Fe NF Plan specifically recognizes cultural and historic importance through the inclusion of standards and guidelines related to traditional uses of Forest lands by the people of northern New Mexico. Examples of this language include “... enrichment of traditional cultural values…,” the “…identification, protection, and maintenance of the historical, cultural and religious sites found within the Forest…,” and “…understanding the importance of access to those sites for Native American people…” (USDA Forest Service (1987).

Current Condition of Known Cultural and Historic Resources, and Trend Affecting their Condition and Use

The current condition of cultural and historic resources can be characterized by examining the numbers of historic properties that have been placed or have been determined eligible to the NRHP and by examining data and other information on impacts to historic properties and other resources. The fact that a historic property is listed or is eligible to the NRHP reflects that it retains its integrity for the characteristics that make it significant to American history, and thus implies that the property is not in poor condition. Other properties may be found to be not eligible to the NRHP because they are in poor condition, but such a determination may also be made because the property has no intrinsic significant historic value.

Eligibility of Properties to the National Register of Historic Places

There are 21 designated or listed historic properties in the plan area (table 10) and all are listed on the NRHP. No historic properties have been designated National Historic Landmarks for their significance in the history of the United States.

Table 10. National Register eligibility of historic properties by district

National Register Eligibility	Coyote	Cuba	Española	Jemez	Pecos/ Las Vegas	Total
Designated/Listed	2	0	6	11	2	21
Eligible	326	245	230	1,217	180	2,198
Undetermined	144	45	115	147	182	633
Not Eligible	39	35	35	45	77	231
Total Evaluated	**511**	**325**	**386**	**1,420**	**441**	**3,083**
Unevaluated	749	1,551	1,403	2,578	445	6,726
Total	**1,260**	**1,876**	**1,789**	**3,998**	**886**	**9,809**

Note: Total site counts are slightly higher due to double counting of sites located on shared district boundaries.

Of the historic properties recorded in the plan area, around two-thirds have not had formal determinations of National Register eligibility (table 10). The high discrepancy in the number of properties that have been recorded but never evaluated is because, prior to 1995, the Forest Service in the Southwestern Region did not consistently evaluate eligibility for historic properties. Of the properties that have been evaluated, slightly less than one-third has been determined eligible to the NRHP. A very small percentage (2 percent) of the properties was determined not eligible to the NRHP. The remaining evaluated properties did not receive determinations of eligibility either because the recorders of the property felt that more investigation of the property was needed, or because the Forest Service and the New Mexico State Historic Preservation Officer could not agree on the eligibility of the property. For management purposes, the Forest Service treats undetermined and unevaluated properties as if they are eligible until a determination of eligibility can be made for that property.

Condition of Cultural and Historic Resources, and Trends Affecting their Condition and Use

The evaluation of the condition of cultural resources, including historic properties, is problematic. For historic properties, objective criteria such as the evaluation of impacts from natural and human forces can be used to generate statements regarding their condition. However, the nature, intensity, and quality of the evaluation of impacts to properties have changed over the past half-century. From 1977 to 1990, the Forest's own Cultural Resources Automated Information System (CRAIS) forms were used, after which recording was accomplished using a newer version of the state of New Mexico's Laboratory of Anthropology form. All of these forms used different methodologies for assessing site condition. The data from the forms have been normalized in state of New Mexico NMCRIS and Forest Service NRM databases, despite categorical equivalence differences in the level of detail and quality of the data that persist. As such, any determination of the condition of historic properties will necessarily be qualitative and judgmental. For properties and characteristics of importance to traditional communities, their condition is based on traditional communities' perceptions of those conditions, regardless of the objective conditions of those resources and characteristics. This only applies when objective conditions can be measured (for example, the availability of natural resources for collection, or the quality of noise- and view sheds).

Data on current conditions and trends for historic properties can be examined from the past 50 years of recording and monitoring of historic properties (table 11). Overall, water erosion (including sheetwash erosion, drainage formation, and arroyo down-cutting) is the most prevalent impact observed at historic properties. It has been noted at over one-third of all visits. Much of what has been recorded as "unspecified erosion" (this category being a legacy of less precise observation categories on early recording forms) is likely also water erosion. In most cases, water erosion at sites consists of surface removal of loose soils and is usually not severe.

Construction, which also includes land development activities such as mining and logging in addition to road construction and other activities, has been noted during slightly less than one-fifth of all visits. Land development impacts can be slight, but construction activities involving heavy equipment often result in severe impacts to properties.

Bioturbation, which includes impacts from cattle grazing, in addition to damage from rodents, insects, and other wildlife, was noted during about one-eighth of all visits. This seems to indicate that grazing, despite its prevalence on all districts, is not a major impact to historic properties.

Vandalism, a category that includes looting, the defacement of standing structures and other features (such as rock art), arson, and the collection of surface remains such as pottery sherds, arrow and spear points, and bottles; is the least prevalent disturbance category noted during visits, observed just less than 6 percent of the time during recording events. Although the one indicator from the vandalism category is that ranger districts, such as Cuba and Jemez, which have relatively visible architecture and larger habitation sites, experience the most vandalism. The overall low incidence of vandalism is encouraging, given that vandalism impacts can often be severe. There is little significant variability in the prevalence of different categories of impacts to properties between the different ranger districts, except for vandalism (table 11) given the relative number of sites on the districts. Relative to the total number of sites on districts, Cuba and Jemez show a higher number of incidents of vandalism related to the total number of sites on the districts. This may also be related to site visibility, given that Jemez and Cuba have more visible site architecture than other districts.

Trends

There is a rise in impacts to historic properties over time although the causes are not apparent. Sites on all districts on the Santa Fe NF are receiving site-monitoring visits as sites get visited by site stewards or inspected for project activities. However, one disturbing trend seems to be that sites are receiving fewer visits since 2000. Prior to 2000, the increase in impacts over the past 40 years appears to largely be an increase in number of properties being inventoried, and improvements in the quality of observations regarding the condition of these properties. This pattern has improved over the last 10 to 12 years. This may be related to the decrease in projects on the ground as the Forest has moved away from large landscape timber projects. It will be interesting to track in the next decade or so if this will revert to pre-2000 numbers as the Forest embarks on more inventories as part of large landscape-scale ecosystem restoration projects.

The causes of these increased impacts to historic properties over the past decade are unclear. Some of the increase in recorded impacts may be a result of changes in recording techniques and the increased vigilance of recorders in recording impacts over the past decade. The "unspecified erosion" category, used until mid-1993, includes both wind and water erosion, and thus, may undercount overall erosion during these years. Some impacts are also cumulative: erosion (particularly channel cutting), vandalism, and construction impacts may be visible for decades after they have occurred although potentially not inventoried until more recent visits. Regardless, much of the increase in impacts appears to be a consequence of actual change to sites. The increase in erosion impacts is ubiquitous across the plan area,

and may be a consequence of drought conditions within the region and overall patterns of global climate change. These forces would cause a decrease in the prevalence of understory vegetation and increase the erosion impact of severe storms and strong winds. The increase in bioturbation impacts may be related, as grazing-related erosion becomes more severe in drought and climate change conditions. Increased impacts from construction may be a consequence of increasing forest use, an increase in the urban interface, and the development of inholdings within the forest, although this may be negated by changes made as a result of implementation of Travel Management. These urban interface impacts have been noted by the Santa Fe NF site stewards. It is heartening that vandalism has decreased or remained steady on the districts, particularly because the effect of cumulative recording impacts from prior decades can be lead to a bias in the reporting of those impacts in more recent times.

Table 11. Recorded impacts to historic properties 1960 to present, by decade

District	Decade	# of Visits	Wind Erosion	Water Erosion	Unspecified Erosion	Biotur-bation	Vandal-ism	Con-struction	Other
Coyote	2000–Present	543	117	441	0	187	16	258	170
	1990–1999	341	54	115	30	51	31	84	53
	1980–1989	3	0	12	133	6	14	139	227
	1970–1979	153	1	1	20	0	11	15	18
	1960–1969	0	0	0	0	0	0	0	0
	Total	1,040	172	569	183	244	72	496	468
Cuba	2000–Present	93	37	65	0	25	4	52	28
	1990–1999	647	154	332	30	90	123	121	27
	1980–1989	686	2	13	173	8	18	78	91
	1970–1979	528	1	18	110	0	38	10	139
	1960–1969	6	0	0	0	0	1	0	2
	Total	1,960	194	428	313	123	184	261	287
Española	2000–Present	210	48	124	0	62	8	72	31
	1990–1999	979	385	633	20	272	48	153	134
	1980–1989	642	15	70	190	9	22	105	65
	1970–1979	407	15	24	130	0	15	14	69
	1960–1969	13	0	3	1	0	3	2	2
	Total	2,251	463	854	341	343	96	346	301
Jemez	2000–Present	949	130	573	0	329	110	220	167
	1990–1999	2,599	405	941	258	289	273	594	275
	1980–1989	1,846	10	117	453	33	112	439	318
	1970–1979	303	1	12	131	0	25	33	167
	1960–1969	8	0	0	0	0	0	0	8
	Total	5,705	546	1,643	842	651	520	1,286	935
Pecos/ Las Vegas	2000–Present	455	67	270	1	139	26	198	96
	1990–1999	275	32	104	17	75	18	82	16
	1980–1989	181	1	20	27	4	9	36	28
	1970–1979	411	1	5	24	1	0	2	0
	1960–1969	0	0	0	0	0	0	0	0
	Total	1,322	101	399	69	219	53	318	140
Forest	**Total**	**12,278**	**1,476**	**3,893**	**1,748**	**1,580**	**925**	**2,707**	**2,131**

There have been no consistent efforts to record impacts to resources and characteristics important to traditional communities, other than those observed for historic properties (traditional cultural properties). For the general consideration of resources and characteristic important to Native Americans, see the chapter on Areas of Tribal Importance. There has been no assessment of the condition of resources and characteristics important to traditional Hispanic and Anglo-American communities, with the exception of traditional cultural properties. However, the information collected by Raish and McSweeney (2008) has some bearing on current resource conditions and recent trends for traditional Hispanic communities. In particular, there have been declines in the condition of range land and fuel wood resources. The perception is that these resources are currently insufficient to maintain community needs and their availability has been declining over the past 50 years. It is the belief of communities that this decline is not so much due to declining actual availability of the resource itself, but a consequence of increasing access restrictions by the Forest Service.

Contribution of Cultural and Historic Resources to Social, Economic, and Ecological Sustainability

Cultural and historic resources and uses in the plan area are critical to the social, economic, and ecological sustainability of the immediate area, the southwestern region, and the nation. Historic properties within the plan area are a record of historic processes and events important in the identity of local communities, the state of New Mexico, the region, and the nation. Contemporary uses of resources in the plan area by Native American, Hispanic, and Anglo-American traditional communities are critical to maintaining the identity of these communities. Cultural tourism is a significant component of the economy of the plan area. Tourists are attracted by the nature and significance of historic properties, and by the character of traditional communities, a character maintained by resources and uses of the plan area. Historic properties contain a wealth of information for scientific researchers regarding ecological conditions and changes over the past twelve millennia, and human successes and failures in coping with these changes. This information is of value to managers making decisions regarding the contemporary ecological management of the plan area. This information is also of value for educating the public about ecological sustainability.

Historic properties are a major source of information regarding the history of the human occupation and use of the plan area. For the first 11,000 years of human history in the area, the remains found at historic properties are the only source of information, as this is a span of time for which there is little or no information available from written records and from Native American oral history. Scientific researchers, professional organizations, and cooperating groups that have provided input for this assessment have emphasized the value of historic properties in the plan area for providing information about American history (Eiselt 2014, Raish 2014, Liebmann 2014). There are several themes in American history for which historic properties can provide, or have provided, important information:

- Settlement and society during the Archaic era (6500 B.C. to A.D. 500), and the origins of farming in North America (all districts).
- Migration and cultural transformation among Pueblo peoples at the end of the ancestral Pueblo era (A.D. 1100 to 1300) (all districts).
- Pueblo society during the Classic Period (A.D. 1325 to A.D. 1700), and the response by and effects on Pueblo peoples from early Spanish exploration and colonization (Jemez and Española).
- Spanish settlement, land use, and society during the Land Grant period (A.D. 1692 to 1846) (Coyote and Española).

- The economic and social impacts of commercial mining in the late 19th and early 20th centuries (Jemez and Pecos).
- The economic impacts and environmental consequences of commercial logging during the late 19th and early 20th centuries (Coyote, Cuba, Jemez, and Española).

The use of historic properties to generate information about the history of the plan area, the region, and of the Nation is vital to maintaining cultural identity at each of these levels. The importance of history to maintaining social sustainability has been cited by members of Hispanic traditional communities (Raish and McSweeney 2008, McSweeney and Raish 2012). Similarly, scientific researchers and professional organizations cite strong interest among Native American communities in the historical information generated by researchers that study historic properties. Interpreted historic properties also afford an opportunity to educate children and the public at large about the history of the plan area, the region, and the nation.

Hispanic traditional communities have identified the traditional use of the plan area for subsistence economic activities as central to their cultural identity. This includes access to land for grazing, wood for fuel and construction, water for the irrigation of crops, plants used in folk medicine, and areas of traditional religious significance (deBuys 1985, Gonzales 2003, Raish and McSweeney 2008). While there has been little written research, district personnel report that access to resources and characteristics are also important to the maintenance of traditional Anglo-American communities, in particular access to land for grazing, hunting, and recreation.

Cultural and historic resources and uses serve as a driver of economic sustainability in the vicinity of the plan area by fueling cultural tourism. Historic properties are a major attraction for cultural tourism (Lekson 2013). In the plan area, there are few developed historic properties that are interpreted and readily available for visitation by the public. However, back-country visitation by people to remote cultural resources appears to be a frequent activity although it has only been documented anecdotally. Properties associated with 19th and 20th century logging in the Jemez RD may be available for interpretation on the Jemez Mesas. On the Española RD, the Posuouinge Archeological Site features a trail and interpretive placards at the remains of a 14th- and 15th-century Pueblo village of the Rio Grande tradition. The interpretive trail to Tsipin on the Coyote District provides an opportunity to interpret Ancestral Tewa communities to the public. The interpretive trails to Rattlesnake Ridge and Nogales Cliff House on the Cuba RD offer the opportunity to learn about the nature of Gallina cultural development in the area. Although not offered for interpretation by the Forest Service, the thousands of historic properties in the back country are also an attraction for visitors, as has been observed by district personnel and cooperating volunteer groups (Bender et al. 2013, Hayden 2013). Tourists are also attracted to the traditional communities that rely on the resources and uses of the plan area to maintain their traditional identity. Fine art, handicrafts, foods, religious events, festivals and other cultural events, and other products and activities that attract tourists to these communities all rely on cultural resources and uses within the plan area.

Scientific information generated from the study of historic properties can generate, and has generated, a wealth of information germane to the ecological sustainability of the plan area. Places of past human settlement and use contain faunal remains, macrobotanical materials, soils, pollen, and other remains relevant to the reconstruction of patterns of ecological change over the past 12,000 years. These ecological remains have been vital for reconstructing patterns of environmental change within the plan area and the region. Scientific investigation of historic properties can also provide an understanding of how humans have successfully adapted to a changing environment, or when they have failed to do so (Bender et al. 2013, Laumbach 2013). Understanding past patterns of human land use also informs on the forces that have contributed to current ecological conditions, as practices such as farming and logging can

affect the subsequent health of ecosystems for hundreds of years. As such, information about past environmental change and human land use is critical for making decisions about maintaining ecological sustainability in future land management. The interpretation of historic properties also creates opportunities to educate the public about environmental change and human adaptation in the past and ecological sustainability in the future (Bender et al. 2013).

Trends Associated with Cultural Resources

As a result of a lawsuit settlement, there was a significant effort in the late 1980s and early 1990s to nominate historic properties to the National Register. Since then, the Forest has nominated no properties.

As previously stated, there is a rise in impacts to historic properties from a variety of sources.

- The Forest has an active volunteer program with the Santa Fe NF site stewards, but has not had any other volunteer activities, such as Passport in Time, since 2005
- Land grant issues associated with historic cultural landscapes continue to be an issue
- Tribal consultation and working with tribes on managing effects to historic properties are increasing
- Public interest in cultural resources and significant historic properties is increasing
- Priorities and providing support for compliance continue to outpace the active management of cultural resources including documentation of new resources, stabilization of documented resources, and management of historic properties
- As emphasis shifts away from the active management of developed cultural resources, interpreted sites and their infrastructure decline
- Information management issues associated with cultural resources are requiring increasing attention
- The guidance in the1987 plan for management of cultural resources and historic properties derived from the lawsuit settlement and good intentions; however, meeting that guidance in terms of proactive management has declined

Ecosystem Services

Uses and Benefits of Traditional Cultural and Historic Landscapes:

Across northern New Mexico, a unique assemblage of cultural and historic landscapes has taken shape over the past 12,000 years, with various world-renowned indigenous communities adjusting to the complexities of their changing worlds. For the past 400 years, another layer of history was added by historical Spanish immigrants. The features and functions of ecosystems and landscapes with which these communities evolved are considered key to the maintenance of cultural identity and characteristics for a wide variety of peoples, including even more recent immigrants since the American colonization. Traditional uses and connections include a reliance on functioning watersheds that provide clean water, productive soils that support a broad diversity of vegetation (both gathered and cultivated) and wildlife used for food, medicine, clothing and shelter, and fresh air. Social cohesion and spiritual relationships provided by traditional, landscape-focused practices of the pueblo, tribal or land grant communities in the area are notable benefits. A number of stress factors, however, may be affecting the sustainability of these valuable non-material benefits. Changes in land ownership (including historical losses), high severity wildfires leading to degradation of forest health and watershed conditions, changing technologies that bring new impacts to old uses, energy development, population growth and urban pressures, expanding recreation use, and private lands development are all cited. A recent trend toward commercial

uses (as contrasted with subsistence uses) in order to support economically deprived communities has been noted. Long-standing perceptions of cultural landscape losses are considered among the causal factors for persistent drug addiction and poverty concerns in traditional communities. Oral traditions for transmitting key cultural understanding can also put this service at risk.

Potential counterbalancing trends do exist. Many of the peoples in the American Southwest are world-renowned for specific art forms, which are considered aesthetic gifts with their inspiration and source in the distinctive landscapes of the region. The relatively new economic benefit of heritage tourism is on the rise in northern New Mexico. Additionally, the ability of these many cultural traditions and long-standing connections with ecosystem functions offer Forest planning and management a diversity of perspectives to engage in problem-solving in the associated area. Stronger involvement of these communities in planning decisions may help reverse downward trends.

Cultural and Historic Properties and Protection:

The Santa Fe NF has inventoried over 10,000 Traditional Cultural Properties (TCP's) almost entirely within the plan area, and also manages 5 recreation residences as national historic properties. While 21 of the TCP's are designated or listed as eligible for the National Register of Historic Properties, all unevaluated sites must also be managed as eligible. Key benefits from this wealth of sites include education and research to promote understanding of human adaptation over such a long period of time. Interpretive tourism provides new economic benefits from this research. Primary drivers affecting the ongoing availability of these resources include erosion and weathering, grazing, construction and vandalism. While allocated, tribal and pueblo funds for inventory and protection fall far below the need for sustaining this benefit, new opportunities for stakeholder investment are beginning to be realized. Site steward volunteers and organizations are critical to ongoing efforts, and may be able to reduce the existing risk.

Input Received from Public Meetings

This section summarizes input, perspectives, and feedback relevant to this assessment topic and received from the public between April and July 2014. Input was gathered from 14 public meetings as well as forms available at all Santa Fe NF offices and online.

Specialist participants discussed a wide range of concerns regarding cultural and historic uses including decreased funding that limits law enforcement and cultural resource protection at a time when crime is increasing in the forest, growing communities and changing effects on resources, and conflict between use of resources and the changing character of that use (e.g., mechanical cleaning of acequias).

Tribal (pueblo) representatives want to protect ancestral resources. They have concerns about using pueblo resources to monitor the ancestral resources, and are considering partnerships with local communities to protect the resources. Participants referenced the Galisteo Basin Archaeological Sites Protection Act which states that forest resources belong to the people of the nation who speak for the nation when it comes to managing and protecting resources.

There is a general concern about other resources affecting archeological sites and the loss or disappearance of resources. There appears to be an increasing awareness of heritage tourism with an awareness of impact. According to the congressional office, local associations and land grants want to be involved in managing and protecting resources (e.g., San Joaquin de Chama, where agencies work with local organizations).

Participants indicated that there should be an increase in stewardship activities and local communities and groups should be more engaged in resource planning and management. There seems to be a trend toward using resources for traditional uses, leading to overuse. Commercial uses are unregulated and people in economically deprived communities have begun to subsidize their cost of living by marketing resources. So, there is a need for self-policing and managing for competing use.

Chapter 2. Assessing Areas of Tribal Importance

Indian Tribes associated with the plan area

This chapter identifies and evaluates available information on areas of tribal importance relevant to the plan area, including tribal rights, areas of known tribal importance that are in the plan area and are affected by management, and conditions, trends of and potential risks to resources that affect areas of tribal importance and tribal rights.

Tribal involvement, as categorized in the Preamble of the 2012 Planning Rule, specifically outlines the need to ensure that Tribes are given recognition in light of their "special and unique relationship with the Federal Government." In this regard, consideration of traditional ecological knowledge is required by the 2012 Planning Rule.

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, the Navajo Nation, and the Jicarilla Apache Nation. These tribes have all expressed heightened levels of interest in the resources and management of the Forest, and sometimes provide input to the Forest pursuant to Section 106 of the National Historic Preservation Act and the National Environmental Policy Act. 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.

The Santa Fe NF maintains a government-to-government relationship with these sovereign Indian nations and consults with them on policy development, and plans, projects, programs, or activities proposed on the Forest that have a potential to affect tribal interests or natural or cultural resources of importance to the tribes. The Forest Supervisor created a full-time, dedicated tribal relations staff person in 2012. Consequently, tribal consultation and liaison activity has improved significantly on the forest resulting in ongoing and active memoranda of understanding with the Pueblos of Jemez and Tesuque and Ohkay Owingeh tribe (figure 8). A fourth is under discussion with Cochiti Pueblo.

Figure 8. Santa Fe NF Supervisor Maria Garcia and Tesuque Pueblo Governor Mark Mitchell sign Memorandum of Understanding on May 14, 2013

Existing tribal rights

The Federal Government has certain trust responsibilities, and a unique legal relationship with federally recognized Indian tribes, defined by history, treaties, statutes, and court decisions. The span of responsibilities and nature of the relationships can vary between federal agencies. The *Forest Service National Resource Book on American Indian and Alaska Native Relations* (USDA Forest Service (1997)) defines trust responsibility as "the U. S. Government's permanent legal obligation to exercise statutory and other legal authorities to protect tribal lands, assets, resources, and treaty rights, as well as a duty to carry out mandates of Federal laws with respect to American Indian and Alaska Native Tribes." For the Forest Service, trust responsibilities are those duties that "relate to the reserved rights and privileges of Federally Recognized Indian Tribes as found in treaties, executive orders, laws, and court decisions that apply to the national forests and grasslands" (USDA Forest Service (1997): 51-52).

The Forest carries out its trust responsibilities under a variety of authorities. Some of the laws that address the agency's requirement for government-to-government consultation include: the American Indian Religious Freedom Act (AIRFA), the Archaeological Resources Protection Act (ARPA), the National Forest Management Act (NFMA), the Native American Graves Protection and Repatriation Act (NAGPRA), the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA) - Sections 106; 36 CFR Part 800 Protection of Historic Properties, and the Religious Freedom Restoration Act (RFRA). Executive Orders, such as E.O. 13175 Consultation and Coordination with Indian Tribal Governments and E.O. 13007 Indian Sacred Sites, also speak to the agency's responsibilities.

Consultation will be an active, ongoing and integral part of Forest Plan Revision on the Santa Fe NF. In this regard, the Forest will adhere to the following steps as outlined in FSM 1500, Chapter 1560 as amended on July 18, 2012:

1. The agency contacts the Tribal Government, preferably prior to scoping and public involvement, to advise the Tribe of a proposed policy, plan, or project that may affect tribal rights or interests.
2. The Tribe may respond back, that this is not an issue or that this proposal is important and would like to initiate consultation.
3. The Tribe may request that Federal agency technical experts meet with the Tribe's technical representatives (or the Tribe may request an official level meeting).
4. Issues are discussed in order for the agency to understand why the proposal is of concern to the Tribe. This allows the respective staff to brief respective parties and to provide informed opinions and recommendations.
5. Consultation steps are defined and an agreement may be reached between the Tribe and the Forest Service on the process for consultation.
6. The agency makes a decision in consultation with the Tribe.

Other more recent authorities, directives and/or guidance relevant to forest management, collaboration, and consultation include the Tribal Forest Protection Act (2004), the Food Conservation and Energy Act of 2008 (The Farm Bill), Report to the Secretary of Agriculture-USDA Policy and Procedures Review and Recommendations: Indian Sacred Sites (December 2012), Memorandum of Understanding Among the DOD, DOI, USDA, DOE, and ACHP Regarding Interagency Coordination and Collaboration for the

Protection of Indian Sacred Sites (December 2012), and FSH 2409.18-Trees, Portions of Trees, or Forest Products Free of Charge for Indian Tribes for Non-Commercial Traditional and Cultural Purposes.

The U.S. Forest Service Tribal Relations Strategic Plan (2010) outlines three basic goals around Tribal Rights, Partnerships and Program Development:

1. **American Indian and Alaska Native Rights**

   Ensure the agency redeems its trust responsibility and protects American Indian and Alaska Native reserved rights as they pertain to Forest Service programs, projects, and policies.

2. **Partnerships**

   Leverage partnerships to maximize mutual success.

3. **Program Development**

   Promote integration and utility of the Tribal Relations Program throughout the agency.

The strategy targets specific outcomes, and delineates the Tribal Relations Program, mission, goals and objectives. The Region's First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities (December 2003) addresses project-level consultation pursuant to the National Historic Preservation Act (as amended).

Areas of known tribal importance that are in the plan area or affected by management of the plan area

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. Over time, these activities have included, but are not limited to: collection of plants, stone, minerals, pigments, feathers, and soil; catching eagles; hunting game and birds; religious pilgrimages to place offerings; and visiting shrines and springs.

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 NAGPRA, 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 places of importance. 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 TCP.

In addition to specific noted locations, entire mountain ranges are commonly regarded as sacred, 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.

The importance to respect mountain ranges sacred to tribes is complicated by the multiple use to provide recreational opportunities for the public. The Santa Fe Ski Basin and its impact on Tesuque Pueblo is a

prime example. The Santa Fe Ski Company holds a special-use permit from the Forest to operate the Santa Fe Ski Basin. Since the mountaintop is spiritually significant to the Tesuque Pueblo, the tribe (and to a lesser degree Nambe Pueblo) has been steadfastly opposed to any planned expansion of the ski area or its infrastructure. Over the years, this has created a sometimes strained relationship between Tesuque Pueblo and the Forest. In 2013, the tribe and the Forest signed a memorandum of understanding which provides for regular quarterly meetings to discuss concerns and issues related to natural resource management and other forest-related topics. Matters related to the ski basin invariably come up at these meetings. However, the regular face-to-face, leadership-to-leadership format of these meetings has resulted in improved relations and better understanding by Santa Fe NF staff of the deep spiritual bonds the tribes have with these areas on the forest.

Many tribes rely upon the Santa Fe NF for forest products for personal, commercial, and ceremonial use. 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. There is also a heavy reliance on parts of the Santa Fe NF for forest products such as boughs for traditional and cultural purposes.

Conditions and trends of resources that affect areas of tribal importance and tribal rights

Social and economic conditions and trends are influencing tribal use of the Forest and impacting areas of tribal importance. These conditions and trends include: changes in land ownership, high severity wildfires/degradation of forest health and watershed conditions, changing technologies and energy development, population growth, large-scale forest landscape restoration, urban pressures, expanding recreation use, and the development of private lands.

Change in land ownership and access to land and resources

Tribal access and use of the lands and resources managed by the Santa Fe NF have been changed over time. The primary factor is the change in land ownership and jurisdiction. Historically, resources on the land were more widely available to tribes, and they had nearly unfettered access to these lands for grazing sheep, hunting, acquiring construction material, gathering fuel wood, and collecting resources for food, medicine, and ceremony. There were often well-established travel routes between communities, and prescribed routes to specific locations of tribal importance. As the Spanish, Mexicans, and later, the Americans moved into the area, recognition of land ownership became increasingly important. Access to and use of resources continued to change with the establishment of the Santa Fe NF in the early 20th century, and the gradual progression of environmental policy, resulting in the passage of Federal laws and regulations, and greater Federal oversight.

In some cases, access to culturally significant sites has been severely restricted or eliminated altogether in places where the land has transferred into private ownership. While the Forest Service has the ability under a variety of authorities to assure tribes access to sacred sites on NFS land, and to allow tribes to conduct cultural activities in privacy, few tribes have exercised their rights by utilizing provisions of authorities such as the 2008 Farm Bill to request a temporary closure order to conduct traditional activities in privacy on the Forest. There seems to be a widespread lack of awareness about the options available to tribes.

The process of preparing for and travelling to an area to conduct traditional and cultural activities is often as significant as the activity itself. The construction of fences, installation of gates, and checkerboard land ownership patterns have complicated tribes' ability to collect resources and visit areas of traditional cultural and religious significance. Land ownership can affect how tribes approach areas of tribal importance, and there have been conflicts between tribes and land owners and even Forest Service

personnel unfamiliar with tribal rights on NFS land. Ownership and development of private land has led tribes to rely more heavily on national forests, however, in some cases tribes limit where and how they use the Santa Fe NF for traditional, cultural and religious activities, and will opt instead to obtain these resources on their own lands travel to National Forest System lands that are closer to their reservations. When tribes do go to important places on the Santa Fe NF, their methods of travel and their activities often have to be adjusted for factors such as road development, fences, gates, mixed land ownership, and other permitted or recreational uses of the Forest.

The Tesuque, Jemez, and Cochiti Pueblos, among others, have communicated a strong desire to co-manage with the Forest. To bolster their argument, they cite the ongoing co-management arrangement between the Department of the Interior and Cochiti Pueblo for managing Tent Rocks National Monument. The Forest Service does not have the same authority that the Department of Interior has to enter into co-management arrangements. However, other mechanisms within our authorities can be explored such as shared stewardship and partnership agreements.

High Severity Wildfires/Degradation of Forest Health and Watershed Conditions

Tribes that rely upon the Forest for collecting plant resources for personal and/or ceremonial use have noted that some species of plants are more difficult to find than they were in the past. This is due in part to restricted access to areas that were used in the past, and the general degradation of watershed conditions and forest health. Other factors could be due to over collection and climate change.

A number of factors have led to compromised watersheds and forest ecosystems. Broadly speaking, agency fire suppression policies (resulting in forested overgrowth), timber harvesting, logging practices, and localized mining practices have all contributed to the compromised watersheds and forest ecosystems that we are managing today. Much of this occurred during a period in our agency's history when output was a top priority, in response to the social demands of the time. Ground-disturbing permitted activities and dispersed recreation has also contributed to the disturbance and degradation of some plant populations.

In the summer of 2011, the Las Conchas Fire (Figure 9) burned more than 150,000 acres across multiple jurisdictions and caused significant threats to life and property, and large scale high severity effects to forested areas on both tribal and NFS lands. Consequently, a number of tribes that customarily relied on collecting forest products from these now burned areas have been forced to alter their traditional collection activities to other non-burned areas frequented by other tribes. While this has not caused any sort of conflict or disharmony among these tribes, it has disrupted the affected tribe's collection activities.

Figure 9. Smoke plume from the Las Conchas Fire as viewed from Placitas, New Mexico, July 6, 2011. The Las Conchas Fire was the largest fire in the history of New Mexico, burning more than 150,000 acres across multiple land jurisdictions including the Santa Fe NF. Burned areas are impacting tribes' traditional collection activities, and post-fire flooding continues to degrade watersheds that tribes rely upon.

Flooding that has occurred within, and beyond, burn-scarred areas after the Las Conchas Fire has severely impaired watershed conditions on tribal lands. Most notably in the case of Santa Clara Pueblo which has experienced severe impairment of the condition of their upper watershed. The Forest is working closely with Santa Clara Pueblo, both financially through a restoration grant from the Southwest Region's Collaborative Forest Restoration Program and technically through the Tribal Forest Protection Act, to help the tribe with their forest and watershed restoration strategy.

Still, Jemez and Cochiti Pueblos severely criticized methods used to fight the Las Conchas Fire related to unwarranted damage of sacred sites by fire crews unfamiliar with the area and use of retardant and its effect on streams and rivers. In the aftermath of the fire, forest and watershed restoration efforts recommended in the Burned Area Emergency Response Report within the Peralta Canyon near Cochiti Pueblo have helped build greater cooperation and goodwill between the tribe and the Forest.

The after effects of the 2011 Pacheco Fire, which started shortly before Las Conchas, also had severe consequences to Nambe Pueblo's reservoir in terms of sedimentation and debris flow resulting in enormous fish die-off and the subsequent closure of this popular recreation destination and source of revenue for the tribe.

Emerging Tribal Uses on the Santa Fe NF

The construction of transmission lines and the placement of utility corridors have affected areas of tribal importance. Negotiating easements for these corridors and their maintenance by the rural electric cooperatives remains a challenge especially given the fact that recent large-scale high-severity fires have been caused by downed power lines on the Forest.

With a 15-year plan horizon, opportunities abound for collaboration with tribes on landscape restoration projects that cross boundaries. Using authorities as set forth under the Tribal Forest Protection Act (TFPA), the Regional Forester, in January of 2015, approved a TFPA project involving the Jemez Ranger District and the Jemez Pueblo. Discussions with Santa Clara Pueblo are also underway to re-examine their

TFPA request since it pre-dated the Las Conchas Fire and large amounts of these project areas were severely burned.

Jemez Pueblo has been actively exploring plans for developing geothermal and solar energy resources on their lands, with their plans for geothermal having the most implications for the Forest with regard to permitting and transmission.

Recent advancements in the technology for processing small-diameter timber have greatly improved small wood products businesses in the western United States. One example is the recent creation of Walatowa Timber Industries (WTI). WTI is a noteworthy joint venture between a multi-generational, non-Indian logging company with decades of logging experience in northern New Mexico and the Jemez Pueblo (figure 10). This unique partnership holds significant potential to be a major utilization partner with the Forest. WTI recently acquired a Micro-mill small log processor, which is unique turnkey technology that will allow WTI to greatly ramp up production of value added wood products from small-diameter timber coming from NFS lands. In fact, the predicted growth and continued expansion of WTI will greatly compliment the utilization needs of the Forest's Southwest Jemez Mountains Collaborative Forest Landscape Restoration Project.

The need to provide marked and prepped acres for treatment and subsequent utilization (i.e., through previously completed NEPA processes) is a staffing and workload challenge that will impact the Forest's effectiveness in making acres available to WTI or other companies wanting to bid on the Southwest Jemez Mountains Collaborative Forest Landscape Restoration Project.

Figure 10. Micro-mill at Walatowa Timber Industries located on Jemez Pueblo Tribal Lands. This mill is an example of a partnership between a non-Indian logging company and the Jemez Pueblo and emerging tribal uses on the Santa Fe NF.

Population Growth, Urban Pressures, and Expanding Recreation Use

Places of tribal importance have an integral relationship with a tribe's beliefs and traditional cultural practices, and are viewed as critical to the maintenance of a tribe's cultural identity and transmittal of their beliefs and practices. Practitioners sometimes engage in certain traditional activities that can only be conducted in a specific place. Tribes have expressed concern that as development continues in areas of tribal importance, it forces these individuals to alter their cultural activities, and in time, is seen as a

cumulative impact to their cultural activities. Development does not in all cases stop the cultural activities and practices, but downgrades the traditional practices and diminishes their value.

Large and intrusive development has the potential to affect the integrity of a tribe's relationship with an area of traditional and cultural significance and risks the disruption and/or alteration of traditional cultural activities that are critical to the continuity of cultural beliefs and practices of these tribes. In the view of the tribes, impacts to the traditional practitioners' ability to conduct their traditional cultural activities in the area will render the overall effectiveness of medicine and healing ceremonies less effective.

It should also be noted that the agency is proactive in its efforts to draw underserved populations to the outdoors. As dispersed recreation increases on the Forest, conflicts between traditional practitioners and other forest visitors can be expected to increase.

Development of Private Land

There are inholdings of private land within every district of the Forest. In some cases, these properties contain strategic and culturally significant features such as springs. Some of these, lands, once used for ranching, are now being subdivided for sale and development. Development of subdivisions within or adjacent to the Forest creates concerns for neighboring tribal communities.

Input Received at Public Meetings

This section summarizes input, perspectives, and feedback relevant to this assessment topic and received from the public between April and July 2014. Input was gathered from individual meetings held with the Natural Resource staff at 14 separate Pueblos and Navajo Chapter Houses as well as forms available at all Santa Fe NF offices and online.

Many participants expressed value for cultural and historic resources and uses on and off the Forest. Several participants noted that they value the history and archaeology on the forest. Most of the tribes shared a common desire to expand coordination and communication in a government to government relationship with the Forest particularly as it relates to protection of sacred sites, collection of traditional materials for ceremonial purposes and protection of watersheds from high intensity wildfire.

Other topics included:

- Desire for co-management of the Forest
- Employment of tribal members with the Agency
- More mentorship opportunities for tribal youth with Forest Service professionals
- Greater involvement of locally impacted tribes during fire suppression activities
- More opportunities for law enforcement collaboration and coordination
- Unauthorized motorized use by members of the public accessing tribal properties through Forest roads
- Trespass cattle by Forest Service permit holders
- Re-iteration by tribes of their opposition to efforts at the NM Legislature to transfer federal lands to the state
- Cultivate a better understanding by Forest personnel and Law Enforcement Officer's regarding the need for certain tribes to travel farther away from their usual areas to collect forest products for traditional uses since their more frequented areas have been burned by recent wildfires
- The need to provide a sustainable source of material from NFS lands for tribally owned forest products industries

Chapter 3. Assessing Social, Cultural, and Economic Sustainability

Section I: The Social, Cultural, and Economic Context of the Santa Fe National Forest

Introduction

This chapter assesses the social and economic conditions, trends, and risks to social and economic sustainability in the area of influence of the Santa Fe National Forest (NF). Social sustainability refers to the capability of the Santa Fe NF to support the network of relationships, traditions, culture, and activities that connect people to the land and to one another and support vibrant communities. Economic sustainability refers to the capability of the Santa Fe NF to produce goods and services, including contributions to jobs and market and nonmarket benefits. Following the sections covering the social and economic conditions and trends is a section describing how these trends relate to Forest Service management.

This chapter presents socioeconomic and land use information for the Santa Fe NF area of influence (AOI). AOI 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). This information provides context for understanding the setting of the Santa Fe NF, the forest visitors and stakeholders, and the social and economic demands that influence forest management on the Santa Fe NF. Demographic and socioeconomic data reported by areas of influence are consistent with the U.S. Census Bureau county-wide data.

To accurately portray the relationship of current Forest Service management and the community, the AOI must be defined. The directives define the area of influence as "where the management of the plan area substantially affects social, cultural, and economic conditions" (FSH 1909.12, section 13.21). The six counties immediately surrounding the forest—Los Alamos, Mora, Rio Arriba, San Miguel, Sandoval, and Santa Fe counties (figure 11)—comprise the Santa Fe AOI. This geographic analysis area represents a functional economic area where there are activities supported by Forest Service land management, such as timber, range, and recreation.

Most direct market transactions and expenditures associated with uses on the Santa Fe NF occur in these six counties. However, there is 0.2-acre of Santa Fe NF located within Taos County. Because of this negligible amount, Taos County is sometimes included in the AOI's social/economic/demographic information. Portions of the Pecos Wilderness Area are located on both the Santa Fe NF and the Carson National Forest (NF).

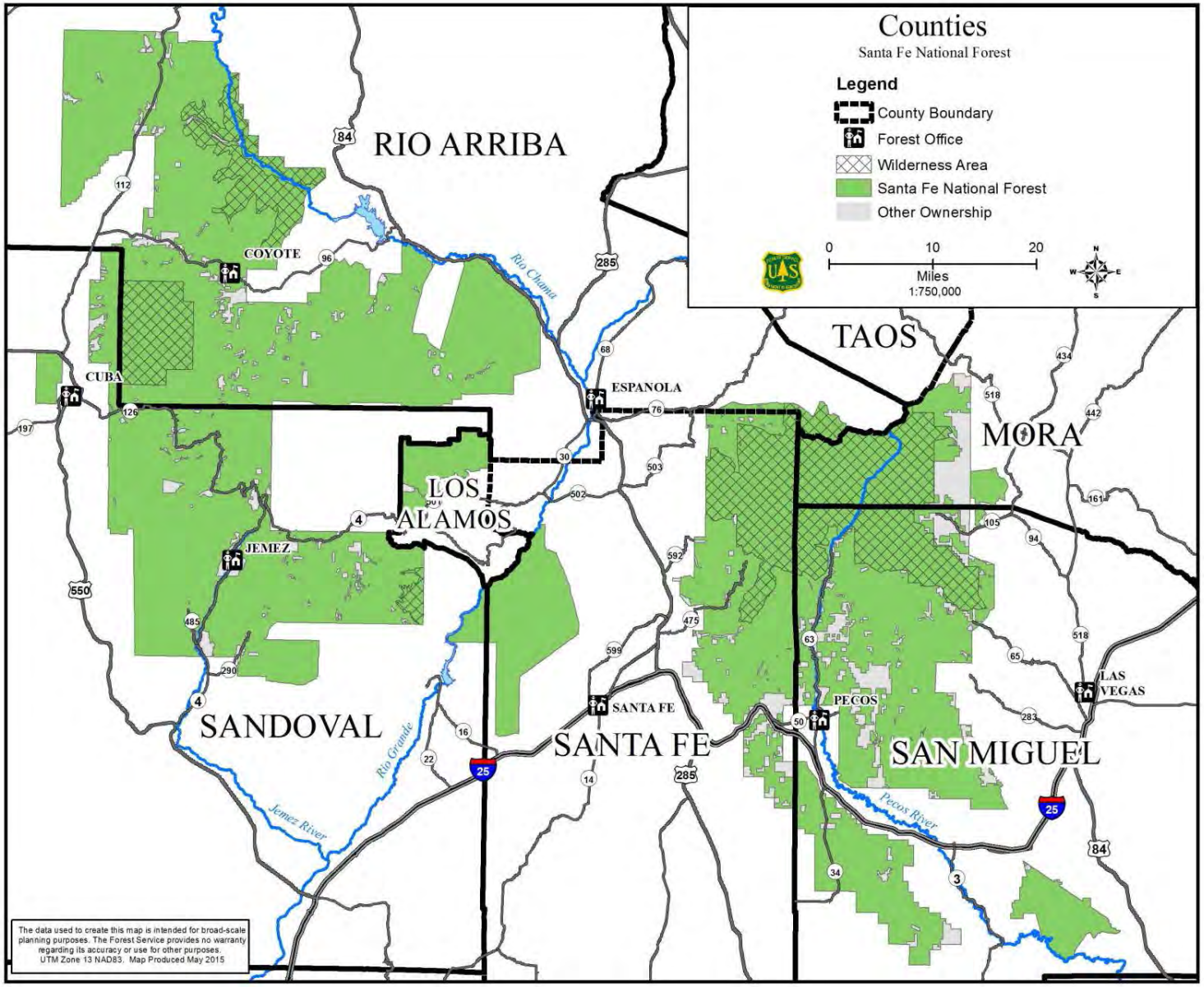


Figure 11. Santa Fe NF with county boundaries

Cultural Context

The Santa Fe NF was established in 1915, when the Forest Service combined the Jemez (established in 1905) and Pecos (established in 1892) National Forest Reserves. The plan area has been under the management of the USDA Forest Service for over a century. Along with the Carson NF, the Santa Fe NF is a defining element of northern New Mexico's cultural context. Native American, Hispanic, and Anglo-American traditional communities have used the plan area for economic, social, and religious purposes for centuries. See chapter 1, Cultural and Historic Resources and Uses, for more detail regarding the cultural and historic resources of the Santa Fe NF.

Cultural and historic resources and uses in the plan area are critical to the social, economic, and ecological sustainability of the plan area, and the southwestern region. Contemporary uses of resources by Native American, Hispanic, and Anglo-American traditional communities are defining elements of these communities (see chapter 1 for more information). Cultural tourism is a significant component of the economy of the plan area. Tourists are attracted by the nature and significance of historic properties, and the character of traditional communities. Historic properties contain a wealth of information for scientific researchers regarding ecological conditions and changes over the past 12 millennia, and human successes and failures in coping with these changes. This information is of value to managers making decisions for the contemporary ecological management of the plan area and for educating the public about ecological sustainability.

General Population Characteristics

Total Population

In 2010, New Mexico was home to more than 2 million people (less than 1 percent of the U.S. population). Compared with other states, New Mexico has a relatively small population, ranking 36 in 2010. In addition, as the 5th largest state, with a land area of 121,697 square miles, New Mexico had a low average population density of 17 people per square mile in 2010. (UNM-Bureau of Business & Economic Research (2013).

The state's population growth rate has been higher than that of the United States since 1980—the New Mexico population grew by 16 percent between 1980 and 1990; 20 percent between 1990 and 2000; and 13 percent between 2000 and 2010. In comparison, the U.S. population grew at 10, 13, and 10 percent during these same periods. University of New Mexico (UNM) Geospatial and Population Studies have projected state population growth rates for the next two decades of 14 and 11 percent, which will result in a population of more than 2.6 million people by 2030 (UNM-BBER 2013). The population growth rate for the region from 1970 to 2012 (figure 12), and more specifically from 2000 to 2012, has varied greatly among counties (figure 13).

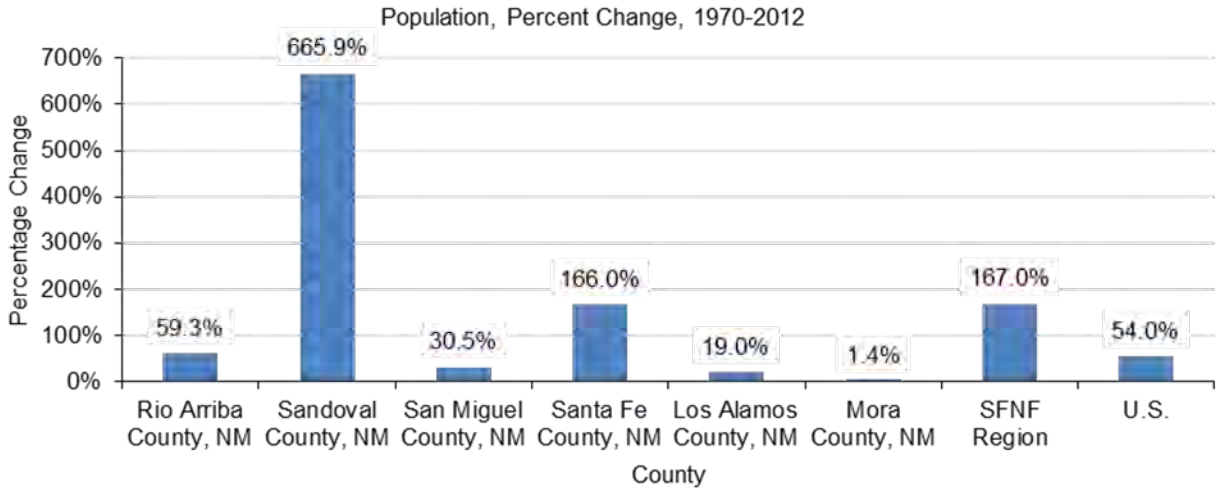


Figure 12. Population change by county from 1970 to 2012

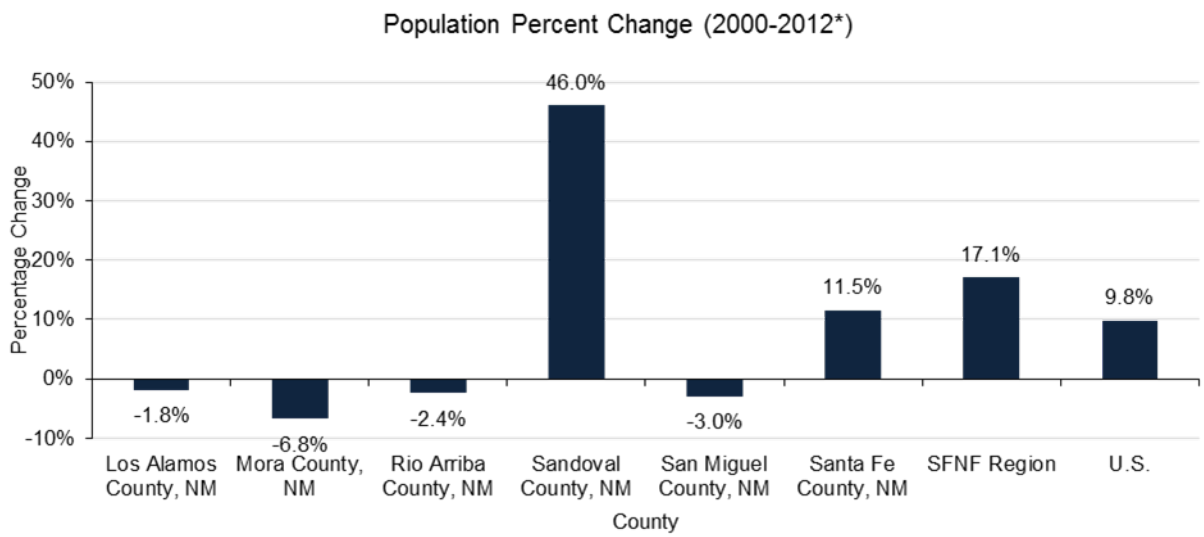
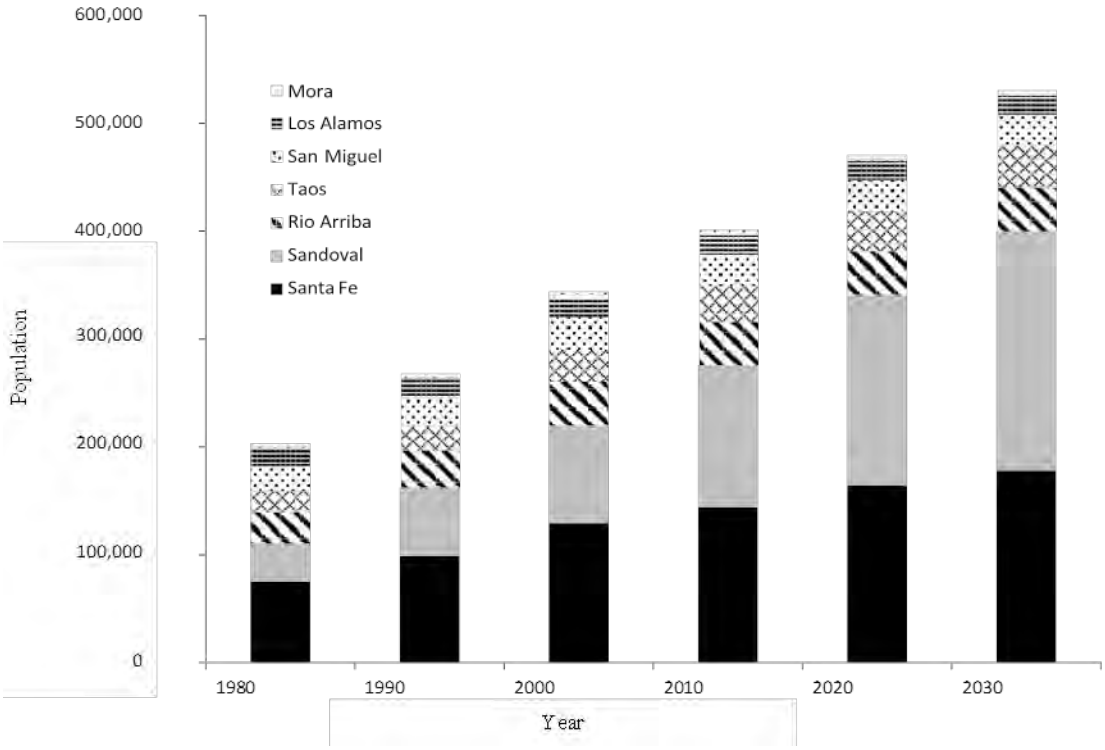


Figure 13. Population growth rates by county within the AOI population, 2000 to 2012

The rate of population growth in the Santa Fe NF's AOI is expected to slow. While the area experienced growth rates ranging from 17 to 32 percent during the last three decades, between 2020 and 2030 the area's population growth rate is expected to average 15 percent. Growth is expected to slow but remain relatively strong in Sandoval County where forecasted growth rates for the next two decades are 34 and 26 percent, respectively. Projected population growth rates for Santa Fe and Taos Counties are fairly similar and average 10 percent. Rio Arriba, San Miguel, Los Alamos, and Mora Counties are, in general, expected to experience population declines between 2020 and 2030.

The relative size of the population of each of the six counties surrounding the Santa Fe NF, along with Taos County, is projected to change through 2030 (figure 14).



Source: U.S. Census Bureau, Decennial Census, 1980, 1990, 2000, and 2010; UNM-BBER, November 2012 population projections.
Figure 14. Historical and projected population of Santa Fe NF counties

Population Density

As noted above, with the fifth largest land area in the country and the 36th largest population, New Mexico's population density is relatively low, at 17 people per square mile. Since at least 1980, the population density in the AOI—20 people per square mile—has been somewhat greater than that of the state as a whole. Population densities within the AOI vary greatly; although Sandoval and Santa Fe Counties have similar populations, Santa Fe County is much more densely populated (76 people per square mile) than Sandoval County (36 people per square mile). With a density of 160 people per square mile, Los Alamos County's population density exceeds that of all other New Mexico counties except Bernalillo County (Albuquerque), which is not part of the AOI. In contrast, Mora County with a population density of 3 people per square mile is one of New Mexico's least densely populated counties. Population projections suggest the more urban areas (Sandoval and Santa Fe Counties) will increase, while the densities of the more rural areas (Rio Arriba, San Miguel, Los Alamos, and Mora Counties) will remain relatively unchanged or may fall slightly (UNM-BBER 2013).

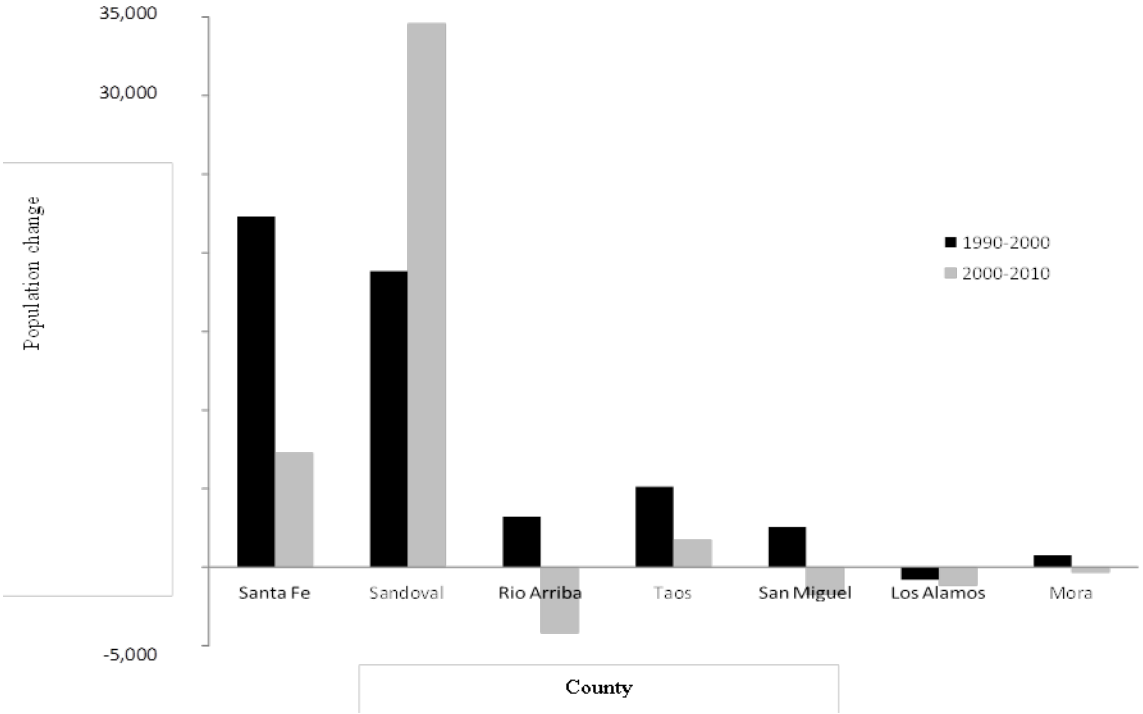
Net Migration

Net migration is a useful indicator of the population dynamics of an area. Are people moving in or leaving or is the population relatively stable? Migration has played a relatively minor role in New Mexico's population growth since 1980. Net in-migration to New Mexico was approximately 150,000 people between 1990 and 2000, and approximately 100,000 people between 2000 and 2010.

Between 1990 and 2000, all counties within the AOI, except Los Alamos, experienced net in-migration, resulting in a rise in the AOIs population of nearly 52,000 people. Los Alamos County experienced net

out-migration during this time, presumably as a result of downsizing at Los Alamos National Laboratory during the mid-1990s. Between 2000 and 2010, the AOI experienced additional net in-migration but at a slower rate. Los Alamos County again experienced net out-migration, as did Rio Arriba, San Miguel, and Mora Counties. The movement out of these counties was likely, at least in part, a result of the Great Recession, as individuals moved to more urban areas with greater economic opportunities (UNM-BBER 2013).

In-migration to Santa Fe County continues but at a slower rate, reflected in the net migration figures for Santa Fe County. The increasing importance of Sandoval County to the area's economy is also reflected in the net migration numbers—34,588 people between 2000 and 2010, 84 percent greater than the 18,832 people between 1990 and 2000. There has been a dramatic regional variation in net migration among counties (figure 15).



Source: U.S. Census Bureau, 1990, 2000 and 2010 censuses, Summary File 1; births and deaths, 2007-2010, New Mexico Dept. of Health, Indicator-Based Information System for Public Health, 1990-2006, New Mexico Dept. of Health, New Mexico Selected Health Statistics Annual Report (selected issues) and unpublished data.

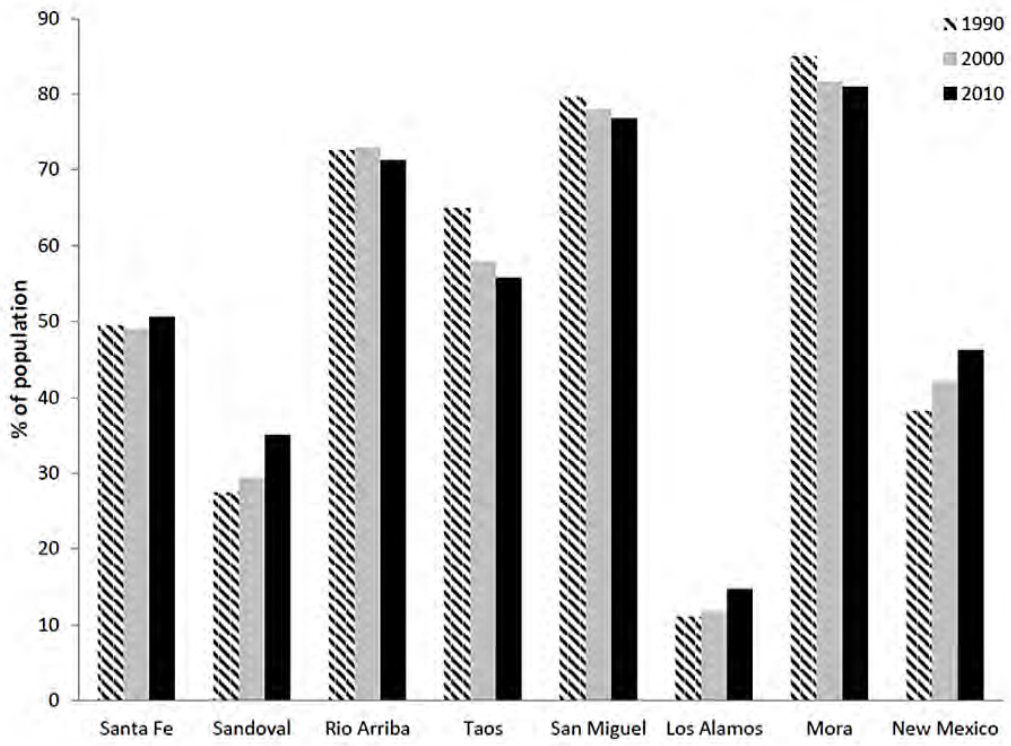
Figure 15. Average net migration by county for two decades. Migration varies greatly among counties within the AOI, with all counties experiencing less migration between 2000 and 2010, except Sandoval County.

Social Characteristics

Ethnic and Racial Composition

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. The portion of the population that self-identified as "White" fell from 76 to 68 percent between 1990 and 2010. This decline has been offset by minimal increases among other racial groups, most notably by those who self-identified as "Other" (UNM-BBER 2013).

Since at least 1990, the AOI's ethnic composition has been relatively stable. In 1990, the state's overall population was more non-Hispanic than the AOI's population, but as the state's population has become more Hispanic, it more closely resembles the ethnic composition of the AOI has become more similar. In 2010, the populations of both the state and the AOI were approximately 50 percent Hispanic and 50 percent non-Hispanic (figure 16).



Source: U.S. Census Bureau, Decennial Census, 1990, 2000 and 2010, Summary File 1.
Note: There has been an increase in the Hispanic and Latino population state-wide, although it has been more stable for the AOI.
Figure 16. Hispanic or Latino population across Santa Fe NF AOI counties and in New Mexico

The ethnic composition of the AOI varies across counties but has also been relatively stable over the past 20 years. American Indians comprise roughly 10 percent of the area's population, but are a larger portion of the population in Rio Arriba County (16 percent in 2010) than other assessment area counties.

Age

The portion of the State's population that is between the ages of 0 and 14 declined between 1990 and 2010 from 25 to 21 percent, while the portion that is age 65 or older increased from 11 to 13 percent. These trends are expected to continue, as BBER projects that by 2030 the population ages 0 through 14 will comprise 20 percent of the population, and individuals age 65 and older will comprise 21 percent of New Mexico's population. Between 1990 and 2010, the portion of New Mexico's population that was of working age, ages 15 through 64, grew from 64 to 66 percent, but is expected to decline to 60 percent of the population by 2030 (UNM-BBER 2013).

Levels of Education

New Mexico's population has become more educated over the past two decades (table 12). The portion of individuals age 25 or older with:

- Less than a 9th grade education decreased from 11 to 8 percent;
- Some high school education but no diploma or GED decreased from 14 to 10 percent;
- An associates or other higher degree increased from 26 to 33 percent. (These values come from the U.S. Census Bureau, 1990 census, Summary File 3 and American Community Survey, 2006 to 2010 5-Year Estimates.)

The population of Santa Fe NF associated counties is better educated than the entire state's population—the portion of the population with an associate's or other advanced degree is higher in the assessment area than in New Mexico—and the gap between the two has grown since at least 1990. There is dramatic variation in education levels across the region, as a result of the educational requirements of employment at the Los Alamos National Laboratory. In 2010, Los Alamos County was the most highly educated county, with more than 70 percent of its population having obtained an associate, undergraduate, graduate, or professional degree (up from 59 percent in 1990). In Los Alamos County, only 11 percent of the population has at most a high school diploma. In Rio Arriba and Mora Counties, both of which are more rural, both economically and culturally, an average of 60 percent of individuals age 25 or older have at most a high school diploma and less than 25 percent have obtained an associate's or other advanced degree, making the populations of Rio Arriba and Mora Counties the area's least well educated.

Table 12. Number and percentage of residents within each county of the AOI 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 yrs or older	26,792	86,170	19,586	102,931	12,725	3,547	251,751	204,336,017
No high school degree	5,802	8,136	3,347	13,686	325	417	31,713	29,179,819
High school graduate	20,990	78,034	16,239	89,245	12,400	3,130	220,038	175,156,198
Associate degree	2,027	8,380	1,192	6,089	857	354	18,899	15,736,009
Bachelor's degree or higher	4,247	24,242	4,171	40,465	8,042	467	81,634	58,205,022
Bachelor's degree	2,448	14,494	2,371	21,567	3,325	133	44,338	36,529,875
Graduate or professional	1,799	9,748	1,800	18,898	4,717	334	37,296	21,675,147
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%

* The data in this table are calculated by American Community Survey using annual surveys conducted during 2008 to 2012 and are representative of average characteristics during this period.

Education levels among people age 25 or older have been improving within counties associated with Santa Fe NF. Educational improvements are consistent with the improvement in educational attainment levels that has occurred across the United States since at least 1940 (UNM-BBER 2013).

Language

Within the AOI, at least six languages in addition to English are used. Spanish is widely spoken throughout the AOI; however, descendants of Spanish pioneers of the 1600s and 1700s speak a distinct dialect unique to the area. In addition, the 20 tribes and pueblos associated with the AOI speak 6 different languages. Language diversity in the AOI is one indicator of the cultural diversity of the communities surrounding the Santa Fe NF (chapter 1).

Individual and Household Economic Characteristics

Income and Income Distribution

In 2012, Los Alamos and Santa Fe counties had per capita income exceeding the national average. Income and income distribution varied widely by county in 2012 (table 13).

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.

Table 13. Average household income statistics (in 2012 dollars and percentages) for counties in the AOI and the United States 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
Per Capita Income (2012 $s)	$20,253	$26,848	$18,576	$32,530	$50,740	$22,561	na	$28,051
Median Household Income^ (2012 $s)	$40,791	$58,116	$30,499	$53,642	$106,426	$40,000	na	$53,046
Total Households	14,959	46,795	11,730	60,954	7,498	1,700	143,636	115,226,802
Less than $10,000	1,639 11.0%	2,720 5.8%	1,943 16.6%	4,916 8.1%	96 1.3%	249 14.6%	11,563 8.1%	8,272,970 7.2%
$10,000 to $14,999	1,276 8.5%	2,186 4.7%	1,110 9.5%	3,022 5.0%	61 0.8%	212 12.5%	7,867 5.5%	6,260,673 5.4%
$15,000 to $24,999	1,606 10.7%	4,226 9.0%	2,075 17.7%	6,573 10.8%	321 4.3%	154 9.1%	14,955 10.4%	12,309,201 10.7%
$25,000 to $34,999	1,847 12.3%	3,777 8.1%	1,266 10.8%	6,017 9.9%	408 5.4%	164 9.6%	13,479 9.4%	11,939,777 10.4%
$35,000 to $49,999	2,479 16.6%	7,029 15.0%	1,720 14.7%	8,277 13.6%	685 9.1%	412 24.2%	20,602 14.3%	15,779,346 13.7%
$50,000 to $74,999	2,800 18.7%	9,544 20.4%	1,761 15.0%	11,019 18.1%	973 13.0%	177 10.4%	26,274 18.3%	20,929,952 18.2%
$75,000 to $99,999	1,341 9.0%	6,355 13.6%	904 7.7%	7,492 12.3%	910 12.1%	104 6.1%	17,106 11.9%	14,110,448 12.2%
$100,000 to $149,999	1,360 9.1%	6,757 14.4%	630 5.4%	7,512 12.3%	1,794 23.9%	186 10.9%	18,239 12.7%	14,768,587 12.8%
$150,000 to $199,999	471 3.1%	2,372 5.1%	238 2.0%	2,761 4.5%	1,171 15.6%	42 2.5%	7,055 4.9%	5,510,639 4.8%
$200,000 or more	140 0.9%	1,829 3.9%	83 0.7%	3,365 5.5%	1,079 14.4%	0 0.0%	6,496 4.5%	5,345,209 4.6%
Gini Coefficient^	0.43	0.43	0.49	0.49	0.37	0.46	na	0.47

* Data in this table are calculated by American Community Survey using annual surveys conducted during 2008 to 2012 and are representative of average characteristics during this period.

^ Median Household Income and Gini Coefficient are not available for metro/non-metro or regional aggregations.

Economic Characteristics

Unemployment, Employment, and Economic Sectors

During the 2001 recession, job growth in the state of New Mexico remained strong, and did not experience a decline. Between 2000 and 2008, much of the growth in New Mexico nonfarm employment occurred in health and social assistance, local government, professional and business services, and construction. In 2008 to 2009 the economy crashed, resulting in what is now referred to as the Great Recession (UNM-BBER 2013).

On a seasonally adjusted basis, New Mexico lost more than 57,000 jobs from the peak to the trough of the Great Recession. Between 2008 and 2009, New Mexico lost more than 34,000 jobs with nearly 10,000 in the construction industry. Other sectors that experienced significant job loss were: manufacturing,

administrative and waste services, retail trade, and mining. However, the health care and social assistance industries remained strong, as did Federal and local government employment sectors. These two sectors added nearly 5,500 jobs to the state's economy. Because of the overall declining economy, revenues began to decline at all levels of government and the strength previously seen in local governments disappeared, but the strength in Federal government jobs remained in 2009 to 2010 (UNM-BBER 2013).

Although New Mexico was slower to enter into the recession than the Nation, it has also been slower to recover. For example, whereas the U.S. employment level reached its trough in February 2010, New Mexico reached its trough nearly a year later, in January 2011. Sectors in New Mexico that continue to struggle to recover include: construction, manufacturing, professional and technical services, and government. On the other hand, the mining industry has been growing, due in part to high oil and other commodity prices, as have the health care and social assistance and accommodation and food industries.

Although, in general, the Great Recession caused declines in employment levels between 2000 and 2010 throughout the state, some exceptions exist. The importance of local government as a source of wage and salary employment (WSE) grew in almost all cases, with only Mora County as an exception. In addition to growth in local governments, a number of industries grew within specific counties. For example, the health care and social assistance industry grew by nearly 70 percent in Santa Fe County, and a number of industries had sizeable growth in Sandoval County where the wholesale trade, health care and social assistance, and accommodation and food services industries grew by approximately 450,100, and 85 percent, respectively. Although the data indicate tremendous growth in the professional and technical services industry within Los Alamos County between 2000 and 2010, the change is due to a change in the management and operating contractor; before 2006, Los Alamos National Laboratory workers were employees of the State of California and covered under California unemployment insurance laws, and thus, were not included in Los Alamos covered wage and salary employment counts (UNM-BBER 2013).

Unemployment

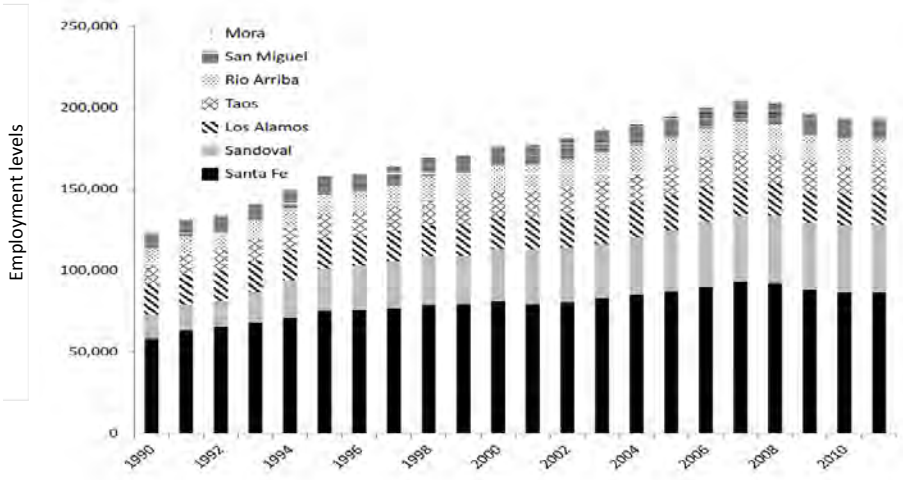
Prior to this century, the unemployment rate in New Mexico typically exceeded that of the Nation. Between 2002 and 2006, New Mexico's unemployment rate was considerably below that of the United States. The gap between the New Mexico and U.S. unemployment rates grew during the Great Recession, as the U.S. unemployment rate rose more than did the New Mexico rate. The gap was greatest in 2009, when New Mexico's unemployment rate was 6.8 percent, while the U.S. unemployment rate was 9.3 percent. In 2011, the United States had an unemployment rate of 8.9 percent, while New Mexico had a rate of 7.4 percent (UNM-BBER 2013).

Since at least 1990, the unemployment rate in the AOI has been higher than that of New Mexico as a whole. Employment growth has exceeded population growth for the past two decades, so unemployment rates have declined relatively consistently. The difference was greatest in 1992, when the AOI had an unemployment rate of 11.7 percent—a rate 4.2 percentage points higher than New Mexico's 7.5 percent unemployment rate. After 1992, the gap narrowed, and in 2010, it was only 0.5 percentage points.

Mora County has consistently had the area's highest unemployment rates. In 1991, Mora County had an unemployment rate of 25.2 percent, which dropped to a low of 7.3 percent in 2007, but subsequently rose to 14.7 percent in 2010, as a result of the Great Recession. At the other extreme, Los Alamos County has consistently had the area's lowest unemployment rate, ranging from a low of 1.2 percent in 1993 to a high of 3.3 percent in 2010. As the national economy continues to slowly recover, unemployment rates should gradually decline.

Employment

The effects of the Great Recession are evident in the decline of employment levels in 2008 (figure 17). The fall in employment was most pronounced in Rio Arriba County, where more than 2,000 jobs (13 percent of all jobs) were lost between 2008 and 2011. In contrast, Los Alamos and Mora Counties experienced small amounts of job growth during the Great Recession: 214 jobs were created in Los Alamos and 41 jobs were created in Mora County between 2008 and 2011. This period of job growth for these counties is paralleled by reductions in poverty rates for both counties (see section on Income and Income Distribution earlier in this chapter).

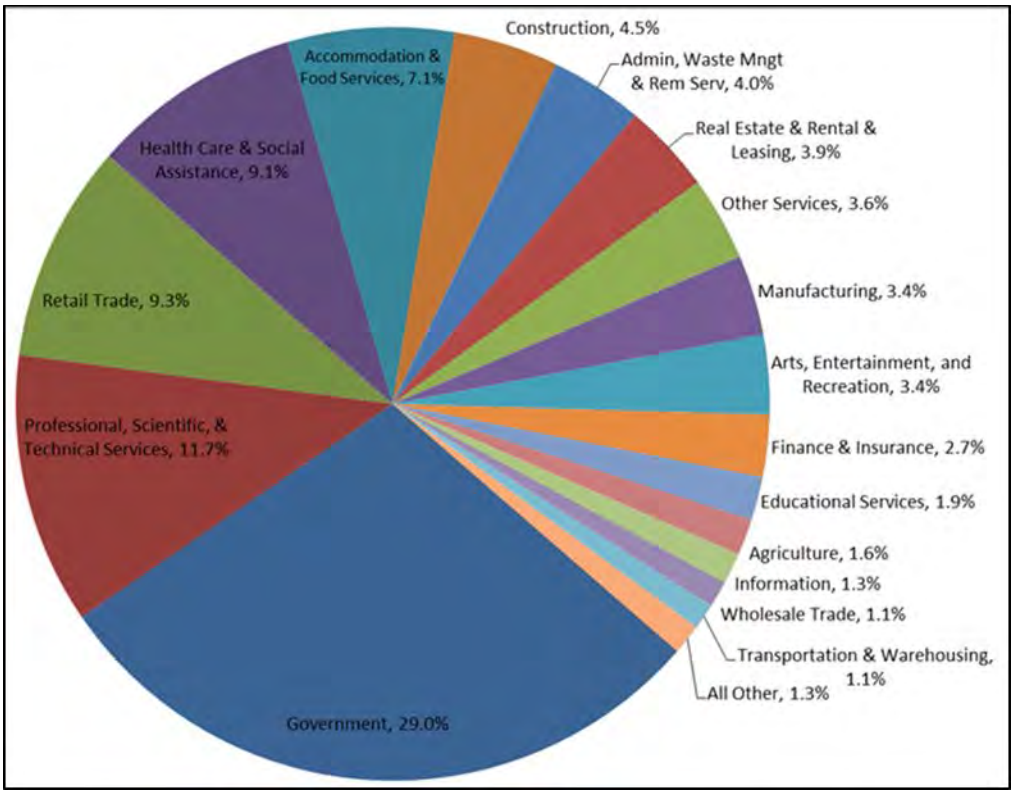


Source: U.S. Dept. of Commerce, Bureau of Economic Analysis, Table CA Total full-time and part-time employment. November 26, 2012.

Figure 17. Total employment in Santa Fe NF counties, 1990 to 2011

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. In 1990, employment within Los Alamos County was the second largest source of employment, representing 15 percent of area employment. Today, Los Alamos County provides 10 percent of all area employment, and Sandoval County has become the area's second largest source of employment, representing 21 percent of all employment.

In the six-county analysis area, government; professional, scientific & technical services; and retail trade are the top three contributing industry sectors for employment (IMPLAN 2011) (figure 18). Contributions from the Santa Fe NF represent only a portion of the economic activity reflected in industry sectors seen in the figures below.



Note: In the six-county analysis area, the top three contributing industry sectors for employment are: (1) government; (2) professional, scientific & technical services; and (3) retail trade.

Figure 18. Employment distribution in the analysis area (IMPLAN 2011)[1]

One-quarter of those employed in the assessment area in 2010 were proprietors. Proprietary employment consists of sole proprietorships and general partners, and in contrast to wage and salary employment, captures those who are self-employed. While Los Alamos County has an especially low level of proprietary employment (only 10 percent), proprietary employment is more common in Rio Arriba, Taos, and in particular, Mora County, where self-employment accounted for 32, 35, and nearly 60 percent of 2010 total employment, respectively. The especially high level of proprietary employment in Mora County makes sense for a highly rural area where employment opportunities are limited. Farm proprietary employment accounts for roughly 25 percent of total employment in Mora County, but only 6 and 2 percent of total employment in the AOI and New Mexico, respectively.

With Los Alamos National Laboratory in Los Alamos County accounts for the professional, scientific, and technical services industry is the assessment area's largest source of employment outside of government (table 14). Other industries that provide large portions of the area's total employment include retail trade, health care & social assistance, and accommodation & food services. Together, these four industries provide more than half of all employment in the assessment area.

Not surprisingly, Santa Fe County has far more state government employees than other area counties. In 2010, nearly 10,000 state employees worked in Santa Fe County, approximately 2,000 worked in San Miguel County, and fewer than 1,000 worked in each of the five other area counties. Whereas, the 10,000 state employees in Santa Fe County represent 11 percent of total employment in Santa Fe County, the 2,000 state government employees in San Miguel County represent a sizeable 20 percent of total

[1] The following sectors not shown in Figure 18 because their proportions of total employment are less than 1 percent: management of companies and enterprises, utilities, and mining (captured in the All Other category)

employment in San Miguel County. Major state government employers in San Miguel County include New Mexico Highlands University and the New Mexico Behavioral Health Institute.

Santa Fe County serves as an important center for the arts and cultural industries, and provides a multitude of recreational opportunities (table 14). Tourism is an important source of economic activity and the accommodation and food services industry represents a significant portion of total covered WSE in both Santa Fe and Taos Counties (13 and 19 percent, respectively, in 2010). 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 (table 14). In 1990 and 2000, the manufacturing industry accounted for more than one-quarter of all WSE in Sandoval County, but approximately only 6 percent of WSE in New Mexico. Reductions in force at Intel resulted in a smaller manufacturing industry in 2010, employing 2,353 fewer people than it had in 2000, and representing only 14 percent of Sandoval County's WSE.

Table 14. Numbers and percentages of people employed by Industry for all counties in the AOI, the Santa Fe NF region, and the entire U.S in 2012*

	Los Alamos County, NM	Mora County, NM	Rio Arriba County, NM	Sandoval County, NM	San Miguel County, NM	Santa Fe County, NM	Santa Fe NF Region	United States
Civilian employed population over 16 years	9,119	1,960	16,346	57,776	10,831	70,063	166,095	141,996,548
Agriculture, forestry, fishing & hunting, mining	66 (0.7%)	192 (9.8%)	437 (2.7%)	838 (1.5%)	402 (3.7%)	940 (1.3%)	2,875 (1.7%)	2,699,250 (1.9%)
Construction	225 (2.5%)	288 (14.7%)	1,476 (9.0%)	3,922 (6.8%)	644 (5.9%)	5,057 (7.2%)	11,612 (7.0%)	9,221,878 (6.5%)
Manufacturing	167 (1.8%)	15 (0.8%)	308 (1.9%)	5,739 (9.9%)	193 (1.8%)	1,821 (2.6%)	8,243 (5.0%)	15,079,996 (10.6%)
Wholesale trade	35 (0.4%)	25 (1.3%)	135 (0.8%)	1,348 (2.3%)	110 (1.0%)	938 (1.3%)	2,591 (1.6%)	4,018,762 (2.8%)
Retail trade	516 (5.7%)	200 (10.2%)	1,325 (8.1%)	7,213 (12.5%)	1,298 (12.0%)	7,926 (11.3%)	18,478 (11.1%)	16,422,596 (11.6%)
Transportation, warehousing, and utilities	137 (1.5%)	74 (3.8%)	868 (5.3%)	2,386 (4.1%)	699 (6.5%)	1,938 (2.8%)	6,102 (3.7%)	7,096,633 (5.0%)
Information	123 (1.3%)	0 (0.0%)	122 (0.7%)	1,070 (1.9%)	282 (2.6%)	1,357 (1.9%)	2,954 (1.8%)	3,139,327 (2.2%)
Finance and insurance, and real estate	361 (4.0%)	24 (1.2%)	473 (2.9%)	3,351 (5.8%)	454 (4.2%)	3,792 (5.4%)	8,455 (5.1%)	9,574,851 (6.7%)
Prof., scientific, mgmt., admin., & waste mgmt.	4,907 (53.8%)	105 (5.4%)	2,377 (14.5%)	6,234 (10.8%)	981 (9.1%)	11,270 (16.1%)	25,874 (15.6%)	15,141,136 (10.7%)
Education, health care, & social assistance	1,558 (17.1%)	892 (45.5%)	3,735 (22.8%)	12,628 (21.9%)	3,380 (31.2%)	14,196 (20.3%)	36,389 (21.9%)	32,513,621 (22.9%)
Arts, entertain., rec., accommodation, & food	446 (4.9%)	22 (1.1%)	2,257 (13.8%)	5,933 (10.3%)	588 (5.4%)	9,841 (14.0%)	19,087 (11.5%)	13,039,332 (9.2%)
Other services, except public administration	187 (2.1%)	28 (1.4%)	619 (3.8%)	2,355 (4.1%)	276 (2.5%)	4,083 (5.8%)	7,548 (4.5%)	7,027,803 (4.9%)
Public administration	391 (4.3%)	95 (4.8%)	2,214 (13.5%)	4,759 (8.2%)	1,524 (14.1%)	6,904 (9.9%)	15,887 (9.6%)	7,021,363 (4.9%)

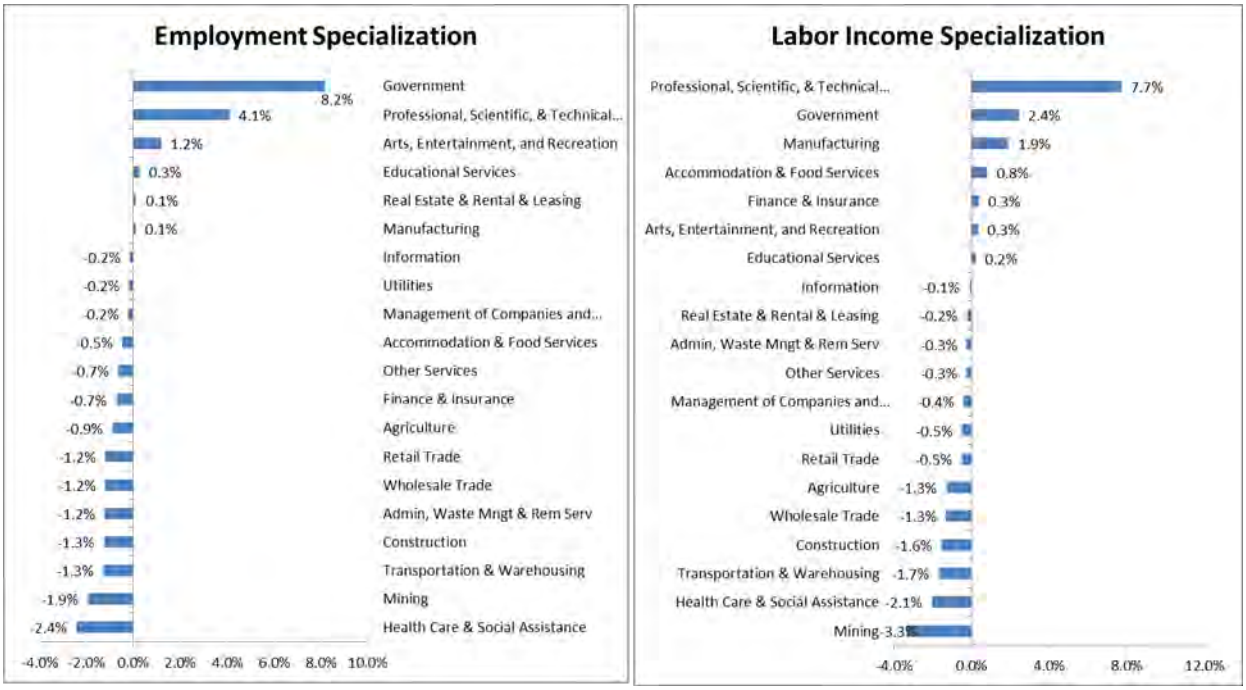
Data Sources: U.S. Department of Commerce. 2013. Census Bureau, American Community Survey Office, Washington, D.C.

See Section 3 of this section, “Contributions to the Area from Forest Service Management,” for more information on employment.

Employment Specialization

Identification of employment specialization for the analysis area provides a frame of reference for the contribution analysis. Specialization is the ratio of the percent employment or labor income in each industry in the region of interest (six-county analysis area) to the percent of employment in that industry for a larger reference region (the state of New Mexico). For a given industry, when the percent employment in the analysis region is greater than in the reference region, local employment specialization exists in that industry (USDA Forest Service 1998).

Using this criterion applied with 2011 data, the analysis area can be characterized as most specialized (relative to the state of New Mexico) in the government; professional, scientific & technical services and arts, entertainment, and recreation sectors. Shares of total employment in these sectors are, respectively, 8.2, 4.1, and 1.2 percent greater than shares in the state (figure 19).

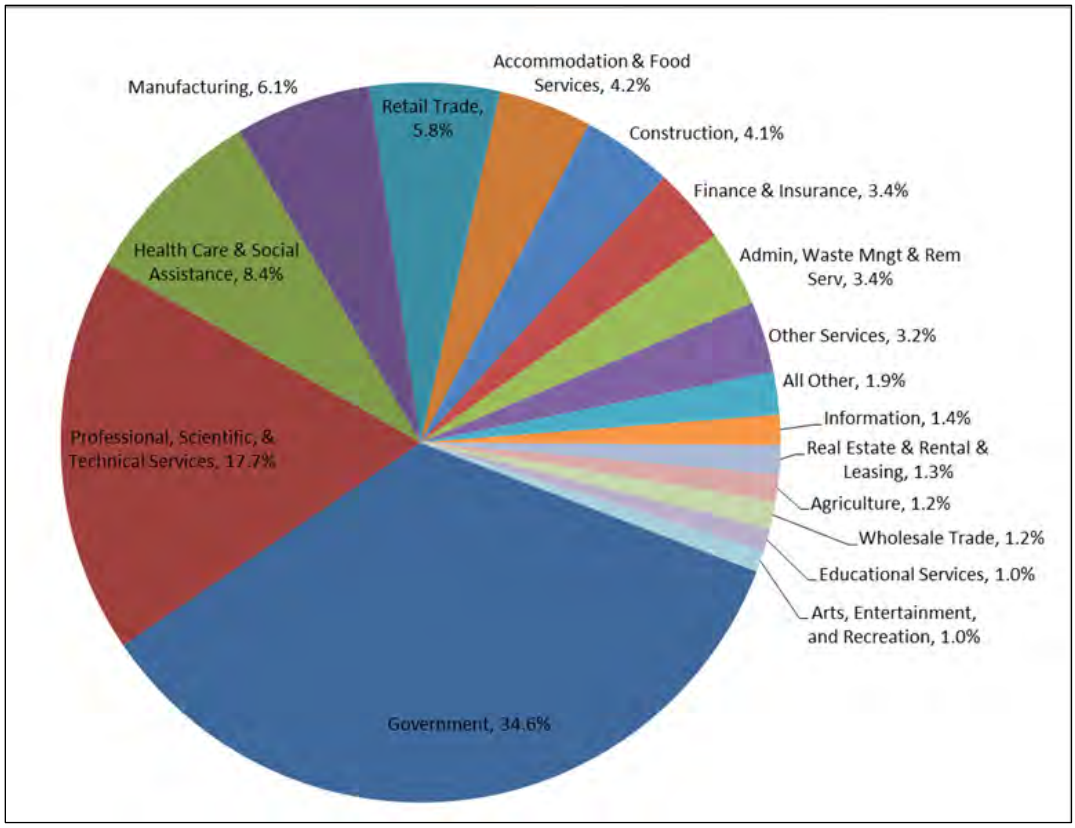


Note: Percentages greater than zero indicate local employment specialization for the six county analysis area.

Figure 19. Analysis area employment and labor income specialization (IMPLAN 2011)

Labor Income

Labor income trends provide insight to the area economy and its connection to the lands administered by the Forest Service. The government; professional, scientific, and technical services; and health care and social assistance sectors were the largest components of labor income in 2011 for the analysis area (figure 19). Contributions from the Forest Service represent only a portion of the economic activity reflected in industry sectors.



Note: In the six-county analysis area, the government; professional, scientific & technical services; and health care and social assistance sectors were the largest components of labor income in 2011.

Figure 20. Labor income distribution in the analysis area (IMPLAN 2011)[2]

The AOI can be characterized as most specialized (relative to the state of New Mexico) in regard to labor income in the professional, scientific, and technical services; government; and manufacturing sectors. Shares of total labor income in these sectors are, respectively, 7.7, 2.4, and 1.9 percent greater than shares in the state (figure 20). Labor income specialization differs from employment specialization because it considers the share of wages versus the number of jobs. For example, using data from 2011 in the analysis area and inflating to 2014 dollars, the average labor income per job is $78,753 in the professional, scientific, and technical services sector and $61,728 per job in the government sector. In other words, 10 jobs in the professional, scientific, and technical services sector account for the same labor income as approximately 13 jobs in the government sector. Jobs attributed to Forest Service activities often have lower labor income than non-Forest Service-related jobs (e.g., grazing jobs versus health care jobs). Therefore, Forest Service-related jobs will likely contribute less to labor income specialization and more to employment specialization in the analysis area. As a percent of total employment in all sectors, the government sector in the analysis area has 8.2 percent more employment than in the state of New Mexico. As a percent of total labor income in all sectors, the professional, scientific, and technical services sector in the analysis area has 7.7 percent more labor income than in the state of New Mexico.

[2] The sectors not shown in Figure 20 due to proportions of labor income less than 1 percent are management of companies and enterprises, utilities, mining, and transportation and warehousing (captured in All Other category).

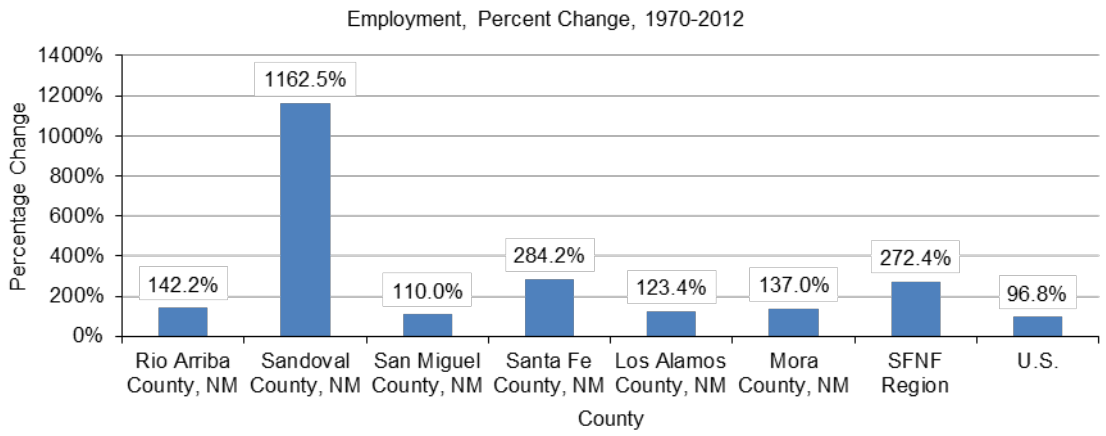


Figure 21. Employment change by county from 1970 to 2012

Land Ownership:

With a mix of land ownership, often across landscapes that share basic similarities, there is the potential for a mix of management priorities and actions. Federal and State land managers, private land owners, and others are constrained in different ways by laws and regulations that dictate how different lands can be managed. This can lead to adjacency challenges and opportunities.

In addition, where a large portion of land is owned and managed by Federal agencies, local governments may rely heavily on Payments in Lieu of Taxes (PILT) and revenue-sharing payments (e.g., Forest Service Secure Rural Schools and Community Self-Determination Act or BLM Taylor Grazing Act payments).

Decisions made by public land managers may influence the economy at the local level, particularly if public lands represent a large portion of the land base. Agency management actions that affect water quality, access to recreation, scenery (as well as other quality of life amenities), and the extent and type of resource extraction are particularly important in areas where public agencies manage much of the land.

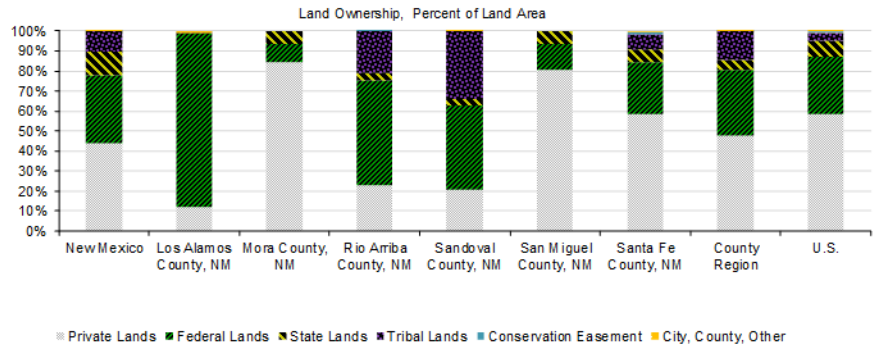
The following is a breakdown of land ownership in the AOI (figure 22):

- Los Alamos County has the largest share of Federal public lands (86.5 percent), and Mora County has the smallest (9.1 percent).
- Mora County has the largest share of state public lands (6.5 percent), and Sandoval County has the smallest (3 percent).
- Mora County has the largest share of private lands (84.3 percent), and Los Alamos County has the smallest (12.3 percent).

Land Ownership (Acres)

	New Mexico	Los Alamos County, NM	Mora County, NM	Rio Arriba County, NM	Sandoval County, NM	San Miguel County, NM	Santa Fe County, NM	County Region	U.S.
Total Area	77,761,778	69,924	1,237,507	3,771,215	2,377,832	3,030,790	1,211,550	11,698,818	2,286,279,509
Private Lands	34,284,805	8,627	1,043,498	868,199	490,583	2,447,765	716,910	5,575,582	1,341,224,948
Conservation Easement	52,433	na	na	2,329	327	na	11,410	14,066	14,841,267
Federal Lands	26,229,956	60,455	113,195	1,975,760	1,003,512	395,057	315,868	3,863,847	658,155,051
Forest Service	9,298,320	29,416	105,188	1,405,432	471,439	333,999	239,646	2,585,120	193,059,372
BLM	13,428,855	na	7,287	567,829	503,455	45,770	70,075	1,194,416	253,918,202
National Park Service	382,714	6,663	720	na	26,391	5,850	1,512	41,136	78,818,664
Military	2,535,996	46	na	2,369	2,190	na	2,754	7,359	25,028,820
Other Federal	584,071	24,330	na	130	37	9,438	1,881	35,816	107,329,993
State Lands	9,121,709	na	80,815	140,174	71,962	187,967	75,889	556,807	192,517,204
State Trust Lands*	8,871,722	na	72,795	85,682	68,933	183,734	75,542	486,686	42,498,598
Other State	249,987	na	8,020	54,492	3,029	4,233	347	70,121	150,018,606
Tribal Lands	8,058,994	76	na	787,082	809,747	na	94,775	1,691,680	90,323,859
City, County, Other	66,318	767	na	na	2,029	na	8,107	10,903	4,058,428
Percent of Total									
Private Lands	44.1%	12.3%	84.3%	23.0%	20.6%	80.8%	59.2%	47.7%	58.7%
Conservation Easement	0.1%	na	na	0.1%	0.0%	na	0.9%	0.1%	0.6%
Federal Lands	33.7%	86.5%	9.1%	52.4%	42.2%	13.0%	26.1%	33.0%	28.8%
Forest Service	12.0%	42.1%	8.5%	37.3%	19.8%	11.0%	19.8%	22.1%	8.4%
BLM	17.3%	na	0.6%	15.1%	21.2%	1.5%	5.8%	10.2%	11.1%
National Park Service	0.5%	9.5%	0.1%	na	1.1%	0.2%	0.1%	0.4%	3.4%
Military	3.3%	0.1%	na	0.1%	0.1%	na	0.2%	0.1%	1.1%
Other Federal	0.8%	34.8%	na	0.0%	0.0%	0.3%	0.2%	0.3%	4.7%
State Lands	11.7%	na	6.5%	3.7%	3.0%	6.2%	6.3%	4.8%	8.4%
State Trust Lands*	11.4%	na	5.9%	2.3%	2.9%	6.1%	6.2%	4.2%	1.9%
Other State	0.3%	na	0.6%	1.4%	0.1%	0.1%	0.0%	0.6%	6.6%
Tribal Lands	10.4%	0.1%	na	20.9%	34.1%	na	7.8%	14.5%	4.0%
City, County, Other	0.1%	1.1%	na	na	0.1%	na	0.7%	0.1%	0.2%

* Most state trust lands are held in trust for designated beneficiaries, principally public schools. Managers typically lease and sell these lands for a diverse range of uses to generate revenues for the beneficiaries.



Data Sources: U.S. Geological Survey, Gap Analysis Program. 2012. Protected Areas Database of the United States (PADUS) version 1.3

Note: Santa Fe NF land is a component of the Federal lands category.

Figure 22. Distribution of land ownership for each county within the Santa Fe NF AOI

Trends in Land Use Conversion

In the past decade, despite the downturn in the housing market, the conversion of open space and agricultural land to residential development has continued to occur at a rapid pace in many parts of the United States. The popularity of exurban[3] lot sizes in much of the country has exacerbated this trend (low density development results in a larger area of land converted to residential development).

This pattern of development reflects a number of factors, including demographic trends, the increasingly unstable nature of economic activity, the availability and price of land, and preferences for homes on larger lots. These factors can place new demands on public land managers as development increasingly

[3] A region or settlement that lies outside a city and usually beyond its suburbs and that often is inhabited chiefly by well-to-do families (Merriam-Webster online dictionary 2014).

pushes up against public land boundaries. For example, human-wildlife conflicts and wildfire threats may become more serious issues for public land managers where development occurs adjacent to public lands. In addition, there may be new demands for recreation opportunities and concern about the commodity use of the landscape.

Wildland-urban Interface (WUI):

Wildfire directly impacts safety, private and public costs, and landscape health. Today, the rising expense of wildland firefighting on both public and private lands costs the Federal Government more than $3 billion per year. A principal reason for the escalating cost of wildland firefighting is the growing number of homes built in the WUI. This report defines WUI as private lands that are within 500 meters of public forestlands. The focus is on adjacency to public forests since roughly 70 percent of western forests are publicly owned, and since wildfire is a natural disturbance in these forests, creating a potential risk to adjacent private lands. WUI areas with homes are the square miles of private forest lands within 500 meters of public forestlands that are occupied by homes. WUI areas without homes are the square miles of private forestlands within 500 meters of public forest lands that have the potential to be developed.

San Miguel County has the largest WUI area in the AOI with 68 square miles. Los Alamos County has the smallest WUI area in the AOI with 0 square miles (figure 23). There are 219 square miles of WUI within the entire AOI. Los Alamos County has the largest percent of the WUI with homes (69.5 percent), and Mora County has the smallest percent (2.6 percent).

Many studies point to the expanding pattern of residential development adjacent to public lands as a significant factor contributing to the rising costs of forest and other wildland fires. The costs of fire suppression will continue to grow if residential development trends continue (EPS-HDT 2014).

Fire plays an important part in most wildland ecosystems. However, many years of fire suppression, much of it undertaken to protect private property, has resulted in fuel buildup, which in turn increases the probability of a large, expensive fire. Warmer temperatures, less snowpack, and drier forests also result in longer and more intense fire seasons across the West. Other factors, such as bug infestations, can exacerbate fire intensities (EPS-HDT 2014).

Section II: Social and Economic Influences on the Plan Area

This section describes the types of social, economic, and cultural dynamics that affect the plan area.

Demands for and Interests in Specific Uses, Resources, and Services

Many local, minority, low income, and/or tribal stakeholders have traditionally used the Santa Fe NF for gathering firewood, hunting, livestock grazing, and herb and piñon nut gathering. Demand for these uses is expected to continue, but they are constantly affected by changing demographics. For example, subsistence activities such as firewood gathering and hunting tend to decrease as income levels rise or age and physical ability changes. Because newcomers to an area may not share those traditional ties to the Forest due to differing demographic characteristics as discussed earlier in this chapter, it can be expected that other recreational use pressures will increase proportionately with the arrival and use of the Santa Fe NF by individuals with differing demographics.

The areas discussed below were chosen based on the demand for the activity and the level of impact the activity has on the management of the Santa Fe NF. While every activity that takes place on the Santa Fe NF could be discussed, only a few are discussed here in the interest of brevity.

Recreation:

Relationships between demographic and economic characteristics and recreation demand are complex. At the most basic level, as an area's population increases, use of the forest does too. Education also tends to increase some recreation participation rates. Higher education levels are 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)

Various research efforts provide evidence that outdoor recreation participation rates are positively correlated with income. According to research, nearly 50 percent of the 2011 participants had incomes of $75,000 or more. Improved economic conditions may cause communities to be less reliant on the forest for subsistence activities (e.g., herb gathering and hunting) and household cash income (e.g., from the sale of firewood, piñon nuts, or Christmas trees). However, agriculture and natural resources may be an important component of the way of life in rural areas. Therefore, even as reliance on forest products becomes less imperative, the forest may continue to be an important source of subsistence and cash income for individuals and families. (UNM-BBER 2013)

Ethnicity and race have also been found to affect participation rates. African-Americans, Hispanics, and Asians are far less likely than whites to participate in many forms of recreation, although exceptions do exist. For example, when socioeconomic factors and availability of recreation options are controlled for, Hispanics are more likely than whites to participate in hiking. In addition, non-Hispanic American Indians are more likely than whites to participate in remote recreation activities such as hunting, fishing, wildlife viewing, and equestrian activities. Increased minority populations have been found to diminish hunting participation rates, as have increased population densities. Whether visits are multi-day or day-use only is influenced in part by race and ethnicity. Latinos are more likely than others to primarily use sites for day-use purposes. (UNM-BBER 2013)

An older population will place different recreational demands on the Forest. One study found that people over the age of 55 tend to have much lower participation rates in almost all forms of recreation than younger individuals with the exception of bird viewing and photography. (UNM-BBER 2013)

As discussed in the recreation chapter, recreation is one of the biggest demands on the forest (see chapter 5 for more detail). Some of the most notable recreation activities discussed in the recreation section are:

- Motorized trail use
- Nature viewing/study
- Camping (dispersed and developed)
- Trails
- Driving for pleasure
- Cross-country and downhill skiing
- Wildlife viewing
- Mountain biking
- Hiking/walking

Grazing:

In northern New Mexico, grazing is very much a traditional way of life and not merely a vocation. The tradition of ranching has a very long history in the area. In a report titled, “Social Cultural Economic Aspects of Ranching” by Carol Raish (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 in the early 17th 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/or received them from their fathers or grandfathers (McSweeney and Raish 2012).

The grazing report contains details on the current number of permits, acres, and conditions of the Range program on the Santa Fe NF (see chapter 4).

Hunting:

There are two primary types of hunters in northern New Mexico: subsistence hunters who hunt for food and sport hunters who hunt for recreation. Culturally, hunting is an important activity for the people of northern New Mexico. Early inhabitants hunted and lived off the land. Now their descendants, who make up the majority of the population in rural areas and small towns in northern New Mexico, 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.

Recently, sport hunting has emerged as a recreational activity, which can involve larger groups, OHVs, and hunting camps. Sport hunting can be very social and many hunters return to the Forest annually for this activity. The growth of sport hunting has given rise to a community of commercial outfitters and guides. The Santa Fe NF is known for its trophy animals, including elk, mule deer, bear, cougar, and bighorn sheep, which attracts hunters from all over the world.

Hunting on the Santa Fe NF is managed exclusively by the New Mexico Department of Game and Fish (NMDGF). Licenses to hunt elk, mule deer, bear, turkey, and bighorn sheep are only available by the New Mexico lottery system. The number of permits issued for Hunt Units that are located on the Santa Fe NF varies by species (table 15) and the number of permits can change every few years based on population data. A total of 68 gaming units cover the entire state, and 5 are located on the Santa Fe NF (New Mexico Department of Game and Fish 2014). New Mexico’s hunt draw system is based on a quota to allocate big game hunting opportunities among residents (78 percent of licenses) and non-residents using outfitters (12 percent of licenses) and not using outfitters (10 percent of licenses).

Table 15. Number of hunting licenses issued for various game species by the New Mexico Department of Game and Fish for Hunt Units on the Santa Fe NF*

Species	Number of Licenses
Deer	1,553
Elk	3,454
Pronghorn Antelope	9
Cougars	85
Bears	246

* The New Mexico Department of Game and Fish Hunt Units are not aligned with the Santa Fe NF boundaries, so the numbers are not an exact representation of hunting on the Santa Fe NF, but serve as a good approximation.

The New Mexico Department of Game and Fish (NMDGF) also manages fishing on the Santa Fe NF. Unlike with game species, fishing is not managed and tracked by Game Management Units, and thus, tracking where and how anglers fish specifically for the Santa Fe NF is more difficult. However, NMDGF has completed an Angler Satisfaction Survey, which captures a lot of data on how anglers fish statewide.

According to the Angler Satisfactory Survey conducted in 2012, regarding their species preference, anglers were asked if they preferred to fish for cold water species like trout or salmon or warm water species like bass or walleye. The majority of anglers (61.4 percent) reported that they preferred to fish for cold water species. In contrast, only 22.2 percent of anglers indicated that they preferred to fish for warm water species. Approximately, 13.1 percent of anglers stated that they liked to fish for both. Only cold water fish species are found on the Santa Fe NF (NMDGF 2012).

The number one cold water species preferred by anglers who were surveyed was rainbow trout. Nearly three-quarters (71.3 percent) of anglers who indicated that they preferred fishing for cold water species or both cold and warm water species provided this response. A slightly higher percentage of anglers reported that they prefer to choose their fishing location based on where fish like rainbow trout have been recently stocked rather than where they would expect to find wild fish like brown trout or cutthroat trout—40.6 percent compared to 34.9 percent, respectively. This is consistent with rainbow trout being the top preference amongst anglers who prefer to fish for cold water fish or both cold and warm water species. (NMDGF 2012).

Nearly half (47.8 percent) of the anglers indicated that they preferred to release most of the fish they catch. Slightly more than one-third (39.6 percent) of the anglers stated that they preferred to keep most of the fish they catch. Nearly half (48.7 percent) the anglers indicated that they choose their fishing location based on where they will catch lots of fish. About the same percentage of anglers expressed a preference for fishing in lakes and reservoirs as they did a preference for fishing in streams—42.2 percent as compared to 41.5 percent, respectively. Approximately, 15.2 percent of anglers indicated that they liked to fish in both streams and lakes and reservoirs. (NMDGF 2012).

Popular known fishing sites associated with the Santa Fe NF include:

- Cowles Ponds – One pond for children and one pond for everyone else. Both ponds are accessible for people with disabilities.
- Pecos River and tributaries to Pecos River – Stream fishing opportunities using artificial lures, bait, and artificial flies. Some stretches of rivers/streams have special regulations such as quality waters. Refer to Game and Fish rules and regulations as these may change on an annual basis.
- Gallinas River – Stream fishing opportunities using artificial lures, bait, and artificial flies. Some stretches of rivers/streams have special regulations such as quality waters. Refer to Game and Fish rules and regulations as these may change on an annual basis.
- San Gregorio Lake – Lake is owned by Forest Service. Fishing opportunities using artificial lures, bait and artificial flies. Some stretches of rivers/streams (entering/exiting San Gregorio) have special regulations such as quality waters. Refer to Game and Fish rules and regulations as these may change on an annual basis.
- Fenton Lake – Owned by New Mexico Game and Fish, but is adjacent to the Santa Fe NF lands where people camp. Fishing opportunities using artificial lures, bait, and artificial flies. Some stretches of rivers/streams (entering/exiting San Gregorio) have special regulations such as quality waters. Refer to Game and Fish rules and regulations as these may change on an annual basis.

- Española – Stream/river fishing opportunities using artificial lures, bait and artificial flies. Some stretches of rivers/streams have special regulations such as quality waters. Refer to Game and Fish rules and regulations as these may change on an annual basis.

Seasonal and Recreation Homes:

Another major influence on the Santa Fe NF plan area is the increasing number of seasonal and recreational homes in most areas in the Santa Fe NF AOI. This has become a complicating factor related to fire management in the Forest, as an increasing number of people live at the Santa Fe NF's edges—the wildland-urban interface (WUI). Many urban subdivisions are being developed near forested areas for aesthetic and economic values (UNM-BBER 2013). This translates into public demands for the Santa Fe NF to increase its efforts to address fuels and fire management and wildfire suppression in these interface areas.

The number of vacant seasonal and recreational homes in the assessment area consistently increased between 1990, 2000, and 2010, although the increase in the latter decade was slower. During both decades the percentage increase within the assessment area was nearly double the increase within the state (98 and 33 percent in the assessment area, compared with 46 and 14 percent in New Mexico). The slower increase between 2000 and 2010 is likely a result of the Great Recession. Only two counties experienced more rapid growth in vacant homes between 2000 and 2010 than between 1990 and 2000—Rio Arriba and Los Alamos Counties.[4] As economic constraints imparted by the Great Recession ease, the number of vacant seasonal and recreational homes may increase more rapidly, particularly in the more tourism-focused counties of Taos and Santa Fe (UNM-BBER 2013).

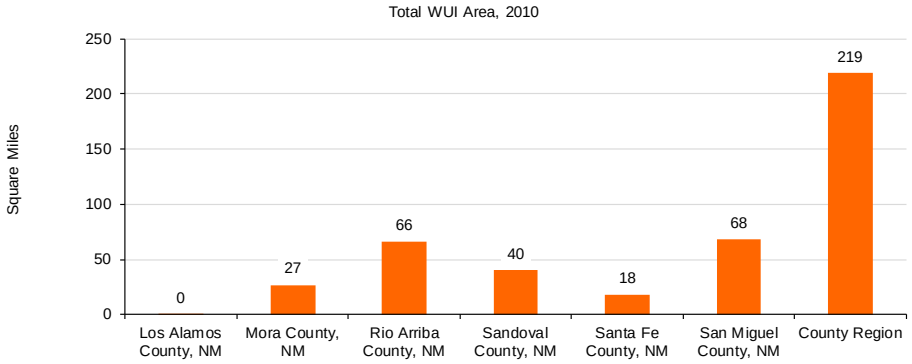
Portions of the assessment area's vacant seasonal and recreational homes located within various counties have shifted over time. San Miguel and Taos Counties both contained 23 percent of the assessment area's seasonal and recreational homes in 1990, while Santa Fe County contained 16 percent. By 2010, Santa Fe County had come to contain 30 percent of the area's homes, while the portion in San Miguel had fallen to 14 percent, and the portion in Taos County had become 25 percent (after first rising to 31 percent in 2000). On the other hand, the portions within Sandoval, Rio Arriba, Los Alamos, and Mora Counties have remained relatively constant over time. (UNM-BBER 2013)

Because the Pecos/Las Vegas Ranger District (RD) is associated with both Santa Fe and Taos Counties, it contains more vacant seasonal and recreational homes than any other Santa Fe NF ranger district. In 1990, the Pecos/Las Vegas RD contained 4,062 such homes. By 2010, the number had grown by 172 percent to 11,084 homes. In 2010, the Española RD had the second greatest number of homes (7,863 seasonal and recreational homes). All other ranger districts contained between 3,200 and 3,500 homes. (UNM-BBER 2013).

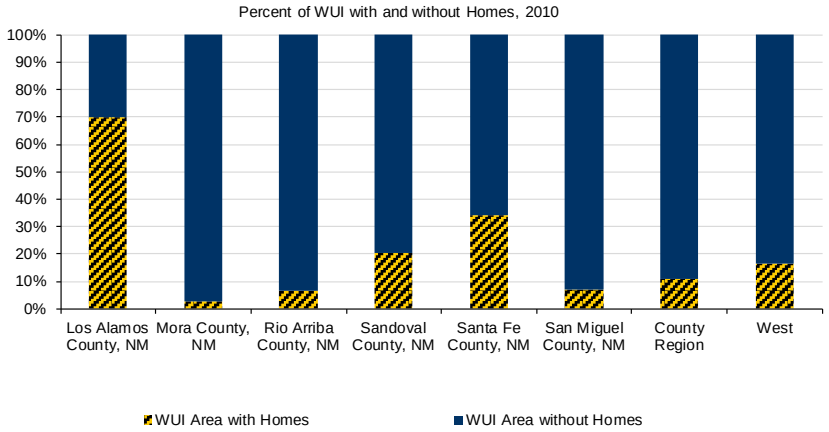
[4] In Rio Arriba County, the number of such homes increased from 658 to 1,042 between 1990 and 2000 (a 58 percent increase) and to 1,709 in 2010 (a 64 percent increase). In Los Alamos County, with only 0.3 square miles of WUI (which is rounded to 0 in Figure 23), the number fell by 18 homes (23 percent) between 1990 and 2000, but rose by 186 homes (262 percent) between 2000 and 2010.

Wildland-Urban Interface (Square Miles), 2010

	Los Alamos County, NM	Mora County, NM	Rio Arriba County, NM	Sandoval County, NM	Santa Fe County, NM	San Miguel County, NM	County Region	West
Total WUI Area	0	27	66	40	18	68	219	23,596
WUI Area with Homes	0	1	4	8	6	5	24	3,837
WUI Area without Homes	0	26	62	32	12	63	195	19,759
Percent of Total								
WUI Area with Homes	69.5%	2.6%	6.6%	20.2%	33.9%	7.0%	11.0%	16.3%
WUI Area without Homes	30.0%	97.4%	93.4%	79.8%	66.1%	93.0%	89.0%	83.7%



- In 2010, Los Alamos County, NM had the largest percent of the WUI with homes (69.5%), and Mora County, NM had the smallest (2.6%).



Data Sources: Gude, P.H., Rasker, R., and van den Noort, J. 2008. Potential for Future Development on Fire-Prone Lands. Journal of Forestry 106(4):198-205; U.S. Department of Commerce. 2011. TIGER/Line 2010 Census Blocks and 2010 Summary File 1, Washington, D.C.

Figure 23. Distribution of wildland-urban interface (WUI) across counties in the Santa Fe NF AOI including (a) total square miles by county and (b) distribution of WUI acres with and without homes

Section III: How the Plan Area Influences Key Social, Cultural, and Economic Conditions

In the same way the social, cultural, and economic conditions within the plan area influence the Santa Fe NF, the Forest influences the social, cultural, and economic conditions in the plan area, as well as the broader landscape. Management of the Santa Fe NF has a more measurable impact on these conditions in recent years because of changing conditions due to urbanization, land use conversion, and climate change.

Key Social and Cultural Conditions Influenced by Plan Area Management

In recent years, the Forest Service and the public have placed a higher priority on making sure that NFS land management takes into account the needs of nearby communities, regional residents, and national residents. As awareness and commitment to this wide range of stakeholders grows, so does the need for forest managers and planners to understand the dynamic linkages between the forest, surrounding communities, and stakeholders including the national public.

In 2005, a survey designed to identify the public's values, attitudes, and beliefs toward the Santa Fe NF was conducted by Adams-Russell Consulting. Data collection for the report *Values, Attitudes, and Beliefs toward National Forest System Lands: The Santa Fe National Forest*[5] was accomplished through interviews with the public and agency personnel at each ranger district. The report identified issues for forest plan revision from agency and public perspectives that were categorized into three groups: the planning environment, resource and multiple-use, and assessments of needs for change and desired conditions. Three factors emerged as affecting the planning environment: the social setting, attitudes, values, and beliefs about Santa Fe NF management, assessments of Forest Service policies and procedures, and sidebar issues. (Russel and Adams-Russel 2005)

Themes regarding the benefits and values of Santa Fe NF resources included aesthetic benefits; biodiversity as an asset of forest resources; the benefits of cultural and subsistence uses of forest lands and resources; the economic benefits to communities of the Santa Fe NF; concerns about noxious weeds; the value of roads and trails; timber as a forest resource and liability; the value of the forest watersheds in water production and maintaining water quality; wildlife habitat; and wilderness and roadless areas. The themes about multiple-use include assessments of the viability of multiple-use; user types and land ethics; access and fees for access; cultural uses of forest resources; recreation; off-road vehicle use; the transition from traditional uses such as timber and grazing to primarily recreational uses; and, the costs and benefits of timber and grazing uses. (Russel and Adams-Russel 2005).

Issues identified in the planning environment include a desire for more flexibility in forest planning and decision making; an emphasis on using monitoring and data in a transparent decision-making process; developing partnerships with interested parties to respond to the perceived limitations of the agency to meet the demands of forest management; and a focus on collaboration in future planning and decision making activities. Resource issues include recognition of the need for adaptable fire management plans; emphasizing forest health as the cornerstone for future management; developing alternative approaches to using herbicides or other chemical approaches to responding to noxious weed problems; maximizing management practices that respond to the needs for water supply and quality; attending to wildlife habitat issues, especially those concerning threatened or endangered species; and assessing the costs and benefits of expansion of wilderness and roadless areas. Themes regarding needs for change in multiple-use activities include access issues, including rights-of-way to ensure access to forest resources; attention to custom and culture in decision making; consideration of the social and economic benefits and tradeoffs of the commercial use of forest resources; responding to a perceived decline in land ethics that results in problem behaviors; law enforcement needs; and, the benefits and trade-offs of timber harvesting and grazing on the Santa Fe NF (Russel and Adams-Russel 2005).

[5] This study was conducted using a focus group method. Approximately people comprised the total for the discussion groups, representing local and state government, grazing associations, environmental groups, ranching interests, recreation users, off-highway vehicle users, utility and mining interests, outfitters and guides, economic and community development interests, and conservation groups. The targeted sampling of this study was not intended to result in participants who are representative of their communities and the Santa Fe NF is aware of this in using this study for the assessment report.

Key social and cultural conditions experienced locally related to management of the Santa Fe NF's resources, goods, and services are the subject of stakeholder comments the Santa Fe sometimes receives related to planning and project activity. Increasingly, stakeholders are concerned about impacts of climate change and urbanization and what the Santa Fe NF can do to foster resiliency to these impacts upon the Forest. Stakeholders are also concerned about impacts of adaptive management on the Santa Fe NF upon local and regional social and cultural conditions. Concerns are expressed about impacts of management upon historical cultural uses of the Forest, such as gathering nuts, berries, or firewood, or impacts to sacred or cultural sites, or ways of life (e.g., ranching, hunting) or impacts to recreation opportunities or scenery (Russel and Adams-Russel 2005).

Climate change, increasing populations in the AOI, increasing use of the Forest, and a myriad of competing stakeholder preferences and demands all interact and influence the way the Santa Fe NF is managed. Forest Service management responses to these influences have long-term impacts on many of the social and cultural services provided by the Forest and received by the public and affects social and cultural conditions and quality of life in the Santa Fe NF AOI at varying levels, such as:

- The condition of wildlife habitats and forest and range conditions that affect aesthetics, hunting, and innate and spiritual values
- The viability of the ranching way of life
- The length of seasons for recreation activities by users
- The quality of recreational experiences while accommodating larger numbers of users
- Increased risks of uncharacteristic wildfire and threats to property and safety local and regional air quality and viewscapes
- Changes in sense-of-place felt by users within the plan area
- Changes in opportunities for pursuing traditional uses such as gathering fruits, nuts, firewood
- Capacity of the Santa Fe NF to provide water for human use (i.e., Santa Fe Municipal Watershed)
- The social and/or cultural or spiritual enjoyment of the Forest in the face of increasing energy development and corridor proposals to satisfy energy demand

Collaborative Forest Landscape Restoration – Southwest Jemez Mountains Collaborative Forest Landscape Restoration Project

In 2009, Congress authorized the Collaborative Forest Landscape Restoration Program, which encouraged collaborative, science-based ecosystem restoration of forest landscapes. This is a competitive program that awards funding to the top proposals nationwide. The program provided a perfect opportunity for the Santa Fe NF and the key partners in the restoration group—Valles Caldera National Preserve, Jemez Pueblo, The Nature Conservancy, New Mexico Forest and Watershed Restoration Institute—to develop a proposal and move forward on restoring the Southwest Jemez Mountains area. Over 40 agencies and groups met and developed the Southwest Jemez Mountains Collaborative Forest Landscape Restoration Strategy ((USDA Forest Service and Valles Caldera National Preserve 2010) and "Out of Whack" reports. The group proposed to treat over 210,000 acres across multiple ownerships and integrate treatments for riparian and forest ecosystems, wildlife habitat, and cultural resources.

The Secretary of Agriculture selected the Southwest Jemez Mountains Landscape Restoration proposal in the first round of funding awarded in 2010. Since then, the partners have purchased monitoring equipment and started "shovel-ready" projects already analyzed under NEPA requirements.

The Southwest Jemez Mountains Collaborative Forest Landscape Restoration Program is a prime example of how management of the Santa Fe NF influences the social, cultural, and economic conditions in the surrounding area.

The Santa Fe NF proposes to conduct treatments that would restore the structure and function of forests and watersheds across approximately 110,000 acres of the Jemez RD. This work would be done over 8 to 10 years or until objectives are met. The purpose of the project is to restore ecosystem structure and function and increase resilience to undesirable, large-scale disturbances such as high-severity wildfire, climate change, or insect outbreaks in the Southwest Jemez Mountains. The primary purposes of this project, as identified in the draft environmental impact statement, are:

- Restore the structure, function, and resilience of ponderosa pine and dry mixed conifer forests, which would also reduce the potential for uncharacteristically severe and intense wildfires while promoting low-intensity, frequent surface fires that were common across this landscape.
- Improve the function of riparian ecosystems and streams, and improve fish and wildlife habitat, vegetative diversity, and water quality.
- Provide for the sustainability of archaeological sites, TCPs, sacred sites, and forest resources and areas associated with traditional practices.
- Offset treatment costs and provide economic opportunity through wood product removal.

Key Economic Conditions

The economic analysis addresses the use of goods and services from NFS lands on the Santa Fe NF. These lands contribute a wide range of economic values to people. Market goods such as minerals, timber, livestock, and recreation opportunities generate employment and income, as well as payments to local communities and revenue for the U.S. Treasury. Non-market goods such as existence values of cutthroat trout or unique ecosystems and habitats generate value everyone reaps, but do not necessarily pay for. Other forest benefits such as outdoor recreation and scenery are valued by the people who use them, but only a portion of this value is represented in market purchases. The analysis considers only the market transactions that result from activities on the Santa Fe NF. Numerous non-market social and economic values are associated with the Forest. The value of ecosystem services, such as, clean air and water, are not captured in the economic contribution analysis. Therefore, this analysis should not be conflated with a representation of the total economic value of the Forest.

The economic role of the Santa Fe NF in the analysis area was modeled with IMPLAN Professional 3.0 software using 2011 data. IMPLAN is an input-output model, which estimates the economic outcomes of activities, projects, and policies on a region. Input-output analysis represents linkages between sectors in an economy. For example, forest visitors spend money on accommodation and food (a direct effect). Accommodation and food service businesses buy supplies from other businesses (an indirect effect). The employees of these firms spend their earnings on a variety of goods and services (an induced effect). These transactions result in direct, indirect, and induced effects in the analysis area economy, respectively. This method is discussed further below.

Contributions to the Area from Forest Service Management[6]

Forest Service-administered lands in the analysis area contribute to the livelihoods of area residents through subsistence uses as well as through market-based economic production and income generation. Subsistence uses on public lands provide products of value to households at no or low cost (permit fees)

[6] See Appendix A for the information and modeling used for this section of the analysis.

such as fuelwood, wood posts, and livestock grazing. Additional products with subsistence value may include fish, game, plants, berries, and seeds (figure 18 and figure 19) include these products in the agriculture sector (NAICS code for Agriculture, Forestry, Fishing, and Hunting)). Use of these products (e.g., piñon nuts, firewood, cattle) is often part of traditions that sustain local culture. Contributions for these uses are captured in the agriculture sector (table 16).

The contribution of activities on the Santa Fe NF to the AOI's employment and labor income is widely divergent by sector (table 16).

Market transactions attributable to activities on the Santa Fe NF support an estimated 1,029 jobs and $39 million in labor income in the analysis area economy. Activities on the Santa Fe NF are responsible for a small amount of employment and labor income, less than 1 percent of both in the six-county area. The Santa Fe NF contributes the most employment to the (1) government, (2) accommodation and food services, and (3) agriculture (NAICS code for Agriculture, Forestry, Fishing, and Hunting) sectors. The Santa Fe NF contributes the most labor income to the (1) government, (2) accommodation and food services, and (3) retail trade sectors. The agriculture sector is the most reliant on Forest Service activities as a percent of total jobs in the analysis area (approximately 5 percent of agriculture jobs in the analysis area are attributable to the Santa Fe NF and about 1 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. While these contributions by industry appear small, the labor income and employment generated from activities on NFS land in the analysis area may be more important to smaller communities within the analysis area. Thus, individual counties and communities may be more susceptible to changes within the analysis area, given their specialization in sectors connected to the Forest Service.

The discrepancy between the relative contribution of the Forest to employment and labor income (0.53 percent of analysis area employment versus 0.40 percent of analysis area labor income) indicates that jobs related to Forest activities pay less than jobs not related to Forest activities. The high concentration of Forest-related jobs in the retail trade, accommodation and food services, and agriculture sectors is consistent with the discrepancy. Many jobs in these industries use low-skilled and/or part-time labor.

Table 17 displays the economic contribution of Santa Fe NF activities by program area. These numbers differ from those in table 16 because jobs in the Forest Service program areas below can fall into multiple sectors listed in table 17. For example, the grazing program contributes about 154 jobs to the local area economy; however, these jobs could be in the retail trade, real estate, and finance sectors since grazing employs a diversity of expertise. In other words, table 16 details how the jobs are distributed amongst industry sectors, whereas table 17 details how the Forest Service program areas contribute jobs to the area. The Santa Fe recreation visitation is estimated to contribute 384 jobs to the area, but these jobs can fall under a variety of industry sectors, as displayed in table 16 (such as Retail Trade, Real Estate, Accommodations, Arts, etc.).

Table 16. Current contribution of the Santa Fe NF to the AOI economy in number of jobs and dollars, and by different sectors

Sector	Employment[a] (number of jobs) Analysis Area Totals	Employment[a] (number of jobs) Forest Service-Related	Labor Income[b] (thousands of 2014 Dollars) Analysis Area Totals	Labor Income[b] (thousands of 2014 Dollars) Forest Service-Related
Agriculture	3,019	139	$122,690	$1,156
Mining	1,499	8	$39,451	$196
Utilities	454	1	$36,984	$131
Construction	8,701	7	$405,590	$320
Manufacturing	6,659	9	$610,165	$375
Wholesale Trade	2,218	12	$119,501	$666
Transportation and Warehousing	2,098	10	$83,990	$484
Retail Trade	18,072	124	$580,450	$3,892
Information	2,555	5	$134,689	$236
Finance and Insurance	5,149	13	$339,754	$824
Real Estate, Rental, and Leasing	7,500	27	$128,555	$411
Professional, Scientific, and Technical Services	22,537	34	$1,766,508	$1,869
Management of Companies	568	1	$31,746	$46
Administrative, Waste Management, and Remediation Services	7,663	13	$339,482	$524
Educational Services	3,589	6	$102,036	$170
Health Care and Social Assistance	17,559	36	$832,814	$1,845
Arts, Entertainment, and Recreation	6,575	83	$95,993	$1,552
Accommodation and Food Services	13,804	200	$418,079	$5,786
Other Services	6,966	15	$316,466	$697
Government	56,125	287	$3,448,124	$18,314
Total	193,311	1,029	$9,953,067	$39,495
Forest Service as Percent of Total		0.53%		0.40%

[a] Employment: jobs in IMPLAN are the annual averages of monthly jobs in each industry. Thus, one job lasting 12 months is equivalent to two jobs lasting six months each, or three jobs lasting four months each. A job can be either full-time or part-time - the job estimates are not full-time equivalents (FTEs).

[b] Labor income: includes employee compensation and proprietors' income - the wages, salaries, and benefits paid to employees and self-employed individuals.

Recreation and Forest Service expenditures contribute the most to employment in the analysis area economy, each supporting more than 300 jobs on an average annual basis. To illustrate the importance of downhill skiing in the analysis area, of the 384 jobs on the Santa Fe NF attributable to recreation, 86 jobs are from downhill skiing (22 percent). Downhill skiing provides approximately $350,000 more in labor income compared to grazing, despite providing about half of the employment. This indicates that jobs related to downhill skiing activities on the Santa Fe NF are more likely to provide higher wages than jobs related to grazing activities on the Forest.

Table 17. Current economic contribution of the Santa Fe NF activities by program area*

Program Area	Employment	Labor Income (Thousands of 2014 Dollars)
Recreation	384	$11,916
Downhill Skiing (included in Recreation)	86	$2,396
Wildlife	24	$806
Grazing	154	$2,032
Timber	13	$487
Minerals	14	$471
Payments to Counties	50	$2,712
Forest Service Expenditures	389	$21,112
Total	1,029	$39,534

*Program areas listed here may cross into multiple sectors of table 16.

Recreation activities on the Santa Fe NF contribute the most to employment within the analysis area (384 jobs) (table 17). The top six activities that Santa Fe NF visitors are participating in as their main activity help explain the importance of specific recreation amenities on the Forest (table 18). However, these data cannot be used to extrapolate the jobs attributed to each activity or break out the 384 jobs listed above among the six activities. Data on this level are not available. Although hiking/walking is the most popular activity on the Santa Fe NF, many of these visitors may be day users and therefore, are not contributing as much expenditures to the local economy as campers.

Table 18. The top six activities that were the main activity for recreation visitors on the Santa Fe NF

Activity	Was Main Activity (%)
Hiking / Walking	31
Viewing Natural Features	18
Fishing	7
Viewing Wildlife	6
Relaxing	6
Driving for Pleasure	5

* Camping is only reported by 2.5 percent of visitors as their main activity, and therefore is not reflected.

Another way to demonstrate the economic contributions from the Santa Fe NF is money spent by visitors on area goods and services (table 19). Spending associated with Santa Fe NF visits are mostly for fuel, lodging, and restaurants ($17.7 million, $12 million, and $10.6 million, respectively). While the labor income contribution from recreation on the Santa Fe NF (table 17) is about $12 million, this figure does not fully capture how goods and services are traded in markets. The total spending shows that Santa Fe NF visitors annually spend approximately $65 million in the local area (table 19). Of the $65 million spent on recreation-related activities, only about $12 million contributed to the area's labor income. The remaining $52 million is generally for the cost of the goods, transportation, rent, and other non-salary business expenses. For example, of the $17.7 million spent on fuel, only a small percentage contributed to labor income, while the majority of the spending went toward the cost of the raw material (to pay the supplier for the gas). It is also important to note that 62 percent of visitor spending was associated with non-local visits.

Table 19. Annual total spending in 2014 by Santa Fe NF visitors in various categories, categorized by local and non-local visits (USDA Forest Service 2009)

Spending Category	Total Spending Associated with Non-local Visits ($1,000s)[a]	Total Spending Associated with Both Local and Non-local Visits ($1,000s)
Lodging	10,938	12,053
Restaurant	7,096	10,613
Groceries	5,553	9,897
Gas and Oil	8,462	17,724
Other Transportation	299	392
Activities[b]	2,300	3,665
Admissions/Fees	2,489	4,529
Souvenirs/Other[c]	3,200	6,204
Total	40,336	65,079

[a] A National Forest Visit is defined as the entry of one person upon a national forest to participate in recreation activities for an unspecified period of time. A National Forest Visit can be composed of multiple Site Visits. "Non-local" visits are those where the individual(s) traveled greater than approximately 50 miles from home to the site visited. Dollars include spending on the forest and within 50 miles of the forest boundary.

[b] The Activities category includes spending on guide fees and equipment rental.

[c] The Souvenir/other category includes spending on sporting goods.

Average Santa Fe NF visitor spending per group and per trip, but excluding downhill skiing, shows that overnight, off Forest, non-local visitors spend the most, more than double what the overnight, off Forest, local visitors spend ($604 and $250, respectively) (table 20). Typically, visitors spend the most on overnight, off Forest and the least on day trips. However, for the local segments, visitors spend more money on groceries when they stay overnight on rather than off Forest. This could be an example where the Forest amenities (such as camping) encourage people to spend money locally on groceries for Forest-related activities (such as campfires and cooking).

Table 20. Average spending in 2014 in dollars per group per trip and by category for different types of Santa Fe NF visitors (USDA Forest Service 2009)

Spending Category	Non-Local Segments[a] Day[b]	Non-Local Segments[a] Overnight on NF[c]	Non-Local Segments[a] Overnight off NF[d]	Local Segments Day[b]	Local Segments Overnight on NF[c]	Local Segments Overnight off NF[d]
Lodging	0	75	210	0	36	63
Restaurant	16	28	118	6	7	36
Groceries	9	60	74	7	72	59
Gas and Oil	31	71	97	17	51	54
Other Transportation	1	2	5	0	1	1
Activities	5	8	30	1	3	6
Admissions/Fees	5	10	21	2	5	8
Souvenirs/Other	7	23	49	6	16	22
Total	75	277	604	39	191	250

[a] "Non-local" trips are those where the individual(s) traveled greater than approximately 50 miles from home to the site visited.

[b] "Day" trips do not involve an overnight stay outside the home,

[c] "Overnight on-forest" trips are those with an overnight stay outside the home on National Forest System (NFS) land

[d] "Overnight off-forest" trips are those with an overnight stay outside the home off NFS land.

Grazing also plays an important role in the local area economy. The Santa Fe NF grazing program contributes approximately 154 jobs and $2 million in labor income to the analysis area. These jobs and income are not only from direct grazing activities such as ranching, but also include indirect and induced effects as explained above. When a rancher purchases machinery or veterinary services, these impacts are also included. In addition, when ranchers spend earned income in the local economy on food, this is accounted for in the induced effects. The impacts on grazing from Forest Service activities is based upon a 5-year average of about 84,000 authorized animal unit months) (table 17), which are believed to more closely reflect actual use than permitted animal unit months.

Although mineral extraction occurs on the Forest, the quantities of stone, sand, and gravel removed are insufficient to result in measureable 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 on the Forest occur outside the region. However, of the 14 jobs in the Minerals program area, 13 are attributable to oil and gas activities on the Santa Fe NF. The majority of oil and gas production in the six-county analysis area is in Rio Arriba County. Appendix A provides more information on oil and gas production on the Santa Fe NF.

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 April 2015, 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:

4. **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.
5. **Title II:** Counties may reserve a portion of the payments to fund certain land management projects that benefit Federal lands.
6. **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. 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 to each county from 2010 to 2012 have been consistent (table 21). These payments are made annually for tax-exempt lands administered by all agencies of the Interior Department, the Forest Service, Federal water projects, and some military installations (Department of the Interior 2010, 2011, 2012).

Table 21. Payments in lieu of taxes and secure rural school payments for each county within the AOI from 2010 to 2012

County and Year	Secure Rural Schools[a]	Payments in Lieu of Taxes[b]	Santa Fe NF % of land
Los Alamos			
2010	$10,746.71	$64,813.18	79%
2011	$9,430.99	$65,135.50	79%
2012	$9,393.16	$66,669.68	79%
Mora			
2010	$200,007.73	$67,614.06	73%
2011	$160,587.73	$78,625.38	73%
2012	$125,791.03	$121,720.93	73%
Rio Arriba			
2010	$899,087.62	$389,475.58	26%
2011	$777,511.25	$402,694.24	26%
2012	$725,540.20	$475,381.66	26%
San Miguel			
2010	$492,833.74	$513,568.30	85%
2011	$408,437.64	$546,982.65	85%
2012	$400,766.71	$620,636.85	85%
Sandoval			
2010	$416,336.32	$711,818.56	34%
2011	$364,521.96	$719,152.02	34%
2012	$355,639.37	$747,177.20	34%
Santa Fe			
2010	$150,150.65	$491,709.28	74%
2011	$150,620.00	$496,396.44	74%
2012	$149,164.54	$512,072.25	74%

[a] Data from U.S. Forest Service SRS Payment and Receipts (ASR 18-1 Secure Rural Schools Act Titles I, II, and III). Payments are apportioned among counties by acres of Proclaimed National Forest within the county.

[b] 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 by the acres managed by the Santa Fe NF for each county (as determined by U.S. Forest Service land area reports), then reduced to reflect only the Santa Fe NF/acres contribution.

Input Received from Public Meetings

This section summarizes input, perspectives, and feedback relevant to this assessment topic and received from the public between April and July 2014. Input was gathered from 14 public meetings as well as forms available at all Santa Fe NF offices and online.

Economics

Participants in our meetings shared the value of the Santa Fe NF in providing for livelihoods and driving local economies. Tourism was a key theme in Santa Fe and Los Alamos, and is important for many other communities as well. Recreating in the Forest brings in tourism dollars. The Santa Fe NF can also be seen as part of the City of Santa Fe's efforts to turn around the tourism and business demographic, with more of a shift toward younger visitors. Tourism provides funding and jobs. The Forest is also a vital source of livelihood for ranchers and farmers—providing space for grazing and water for irrigation, for instance. Participants see logging as far less central to local economies than it was before, as timber sales and jobs in logging are down. Another change observed is that tourism dollars are increasingly stressed due to fires. Droughts have impacted irrigated pastures.

Social, Cultural

The long and rich history of the area provides for a multitude of social and cultural factors in and around the Santa Fe NF. See Traditional Uses.

On a broader and more historical level, several participants remarked on the "blending of culture, language, and communities" over time.

In Las Vegas, participants discussed the importance of sustainability of the forest over time, preservation for the use and enjoyment of future generations.

Traditional Uses

Many individuals and families depend on the Santa Fe NF: for sustenance as well as for cultural, social, and historic needs and ties. People view the Forest as their community. The community is not next to the Forest: the forest is a *part* of it.

Some individuals spoke about how they rely on the Santa Fe NF for wood—for fuel to heat their homes and for landscaping. Their communities gather herbs from the Forest. Their water, and the quality of their water, depends on the Forest too. Acequias provide communities with water, and the maintenance and repair of acequias is vital for these communities. People frequently highlighted livestock grazing and the ability to run cattle as critical values of the forest. Along these lines, access is important, access to get to a sick animal and avoid loss of livestock, for instance. Livelihoods and local communities depend on the Santa Fe NF and its resources.

Family traditions and values are dependent on the forest for some participants, too. In Mora, one participant gave an account of her first job cutting Christmas trees with her father. This experience was a lesson in economics and resource stewardship along the way. These experiences influence the rest of a person's life: their values, world view, even career choice. Acequias not only provide water in acequia cultures, but also provide the basis of local governance structure. Many of these families have deep historical ties, and come from families that have lived in the area for generations, from being from a cattle-raising family that has been in the area since 1938 to a family with a three-generation logging business. The Forest is also important for traditional communities' recreation.

Participants from families or communities that use the Forest for traditional uses expressed concerns about changes they have seen. The sustainability of these communities and their way of life overall came into question. People are leaving rural communities for the cities.

One attendee in Pecos expressed the perspective that “regulations overseeing some traditional use seem to be more strict.” Another attendee in Abiquiu is concerned that the “agency is removing native people off the forest.” Several participants have observed a decline in native people’s ability to access resources, such as restrictions on gathering firewood. Subsistence users used to be the main users of the forest. Concerns were expressed about reductions in grazing permits over time, and also the allotment system not always being fair and supporting the community. It is difficult to repair and maintain acequias – they have to cut through a lot of red tape to get into the forest. Wilderness has negatively impacted acequia management. One participant also observed that climate change and the over-harvesting of herbs has impacted heirs on his land grant.

As discussed in the Social, Cultural, and Economic Concerns section, some participants have perceived an increased conflict around traditional uses. Many participants are concerned about the perceived negative impacts of grazing on streams, forest health, and safety on trails and that there is “lots of destruction due to ranch leases on forest land.” Concerns were also expressed about fence disrepair. Other participants have observed that there are too many elk, and they are taking over the grazing. One participant talked about wealthy individuals from outside the community buying property and having less tolerance of a stray cow—yet they are often unwilling to fence their property. A participant in Albuquerque told the story about how four elders in his community died after the Las Conchas Fire because they internalized responsibility. According to the participant, traditional historic communities have an environmental ethic and are stewards of the land.

Input from Technical Meeting on Traditional Uses

Tribal, ranching, and land owner participants expressed appreciation about being involved in forest planning. All participants are concerned about continuing their traditional uses of forest lands and they want the Santa Fe NF to consider their needs along with those off the Forest. They want to be involved and have input in the planning process.

Conclusion

Population in the AOI overall has grown and is expected to continue to grow steadily over the next 10 years; however, the populations in Rio Arriba, San Miguel, Los Alamos, and Mora counties are expected to decline. The ethnic composition of the AOI is expected to remain the same, with an approximate 50 percent Hispanic and 50 percent non-Hispanic population. Unemployment in the AOI has been higher than the national average since 1990, but the unemployment rate is expected to decline within the AOI as the national economy recovers. In the six-county analysis area, government; professional, scientific & technical services; and retail trade are the top three contributing industry sectors for employment.

Despite many social and demographic changes in the counties closest to the Santa Fe NF, continued clear stewardship ties and strongly-held cultural and natural resource dependencies bring many voices to the management planning arena. More details regarding the relationships between and among social, cultural and economic trends and the natural ecosystems underlying the important resources and benefits provided by the Forest will be presented in the following chapters under Ecosystem Services headings.

Chapter 4. Extractive Multiple Uses and Their Contributions to Local, Regional, and National Economies

Extractive forest-products industries have long-standing and often key roles in the social life and economies of rural communities surrounding national forests. Wood products harvesting and livestock grazing still provide lifeways and income important to many. National Forests were created to develop tools and techniques to better continue such uses in a sustainable manner, so that these activities could continue into the future and do so compatibly with maintaining other multiple uses on National Forests, such as wildlife habitat, functioning watersheds and recreation. This chapter will review the current status, trends and potential risks to and opportunities for the continued provision of forest products, range and grazing, water, fish and wildlife, and related services from the Santa Fe National Forest.

Timber

Wood products harvesting is closely associated with national forests in the public mind, and the Santa Fe NF has been an oasis of woody materials for a geographic area widely covered in grass- and shrublands. Wood from the Forest has long provided heat, building materials, and fencing materials to area residents and during times of strong commercial timber production, to markets much farther away as well. As conditions change, the services and products have evolved as well. Along with new potential wood products markets, harvesting wood may now offer value as an ecological service that provides economic benefits in a variety of savings for area communities. This section of the chapter will offer an overview of demand and discuss current production relative to capacity and trends. It will conclude by outlining the various contributions that wood products and harvesting provide to ecological, social and economic sustainability, as well as any potential risks to sustainability that are indicated by current trends.

Projections of Demand for Goods and Services

Current condition of forests in the plan area:

Managers use the relationship between disturbance processes (management-created or naturally-occurring), the responses of organisms to these processes, and current conditions to evaluate the potential for proposed management actions to meet ecological sustainability goals. Volume I describes all of these in detail; a summary of those findings is provided here, with a focus on the prevalent vegetation types that produce the bulk of wood products. The first paragraph covers four woodland types that contribute most of the smaller diameter wood products, such as latillas, although they also provide forage. Following that are the vegetation types most commonly associated with larger diameter trees.

Juniper Grass (5.8% of the Forest) is in many locations severely departed from historic conditions due to the effects of long-term fire suppression. Herbaceous understory plants for Pinyon-Juniper-Grass, at 2.6% of the Forest, has the lowest departure from similarity to site potential of all ERUs analyzed, although increased small-tree densities are severely departed due to fire suppression. Pinyon-Juniper-Sage (1.8%) is the most departed ERU in terms of vegetative ground cover; over 35 percent departed from historical conditions where it occurs. The patch size has also been greatly reduced from 50 to 200 acre averages down to 16 acres. Pinyon-Juniper Woodland (13.8%) is slightly departed in the context landscape and plan scales. A slight shift toward early seral states has occurred in this type, likely due to chaining and road development, but trends show an expected improvement.

Spruce Fir Forest (14.9% of Forest) and Mixed Conifer with Aspen (2.4%) are in the best shape of all vegetation types found on the Santa Fe NF, with a close approximation of historic fire regimes. Drought often interacts with other disturbance agents, such as wildfire, increasing the probability of landscape-scale crown fires and contributing to insect outbreaks. At the context scale aspen mortality has been widespread, thought to be related to drought, fire cessation, and chronic defoliation by western tent caterpillar and large aspen tortrix over the last decade. Modeling shows decreases in seral state departure and only moderate vulnerability to climate change.

In Mixed Conifer – Frequent Fire type (25.6% of Forest), fire exclusion and past management activities including selective logging, fragmentation (e.g., construction of roads) and intensive grazing in this type have contributed to higher stand densities and altered species composition. Frequently treated for resiliency, the modelled improvement in seral state departure over 100 years is 10%, and a large proportion of the ERU (38%) shows low climate change vulnerability. Ponderosa Pine (24% of Forest) has also been altered by the exclusion of fire, currently averaging over 200 years between cycles; the confluence of livestock grazing, fire management, and one or more regeneration pulses of ponderosa pine are driving the high seral state departures (97% current, trending to 89% with 100-year model) in this vegetation type. This report will outline potential opportunities for wood products harvesting to contribute to positive changes in conditions across a number of vegetation types.

Current levels of timber harvest and production

Nationwide, the Forest Service sells timber for a variety of reasons, most commonly to support local mills and communities that were, in some cases, built around a specific forest's timber supply and to modify forest structure or composition to meet a variety of management goals (Gorte 2004). Timber sales on NFS land have been steadily decreasing since the late 1980s, when total production reached 11 billion board feet annually (General Accounting Office 1999). In contrast, just over 2 billion board feet were harvested during fiscal year (FY) 2004, at a total value of approximately $218 million; an additional $3.17 million in special forest products, including Christmas trees, fuel wood, piñon nuts, and other materials were harvested that year (Valles Caldera National Preserve 2004).

This pattern is mirrored by the Santa Fe NF. Total timber volume sold on the Forest peaked in the late 1970s and early 1980s at approximately 50 million board feet (MMBF) (figure 24). Volumes sold declined in the mid to late 1980s to approximately 25 MMBF and bottomed out in 1996 due to a six-month court injunction affecting all timber cutting within the Southwestern Region, including the Santa Fe NF. Output during the last decade has been relatively stable at approximately 12 MMBF per year.

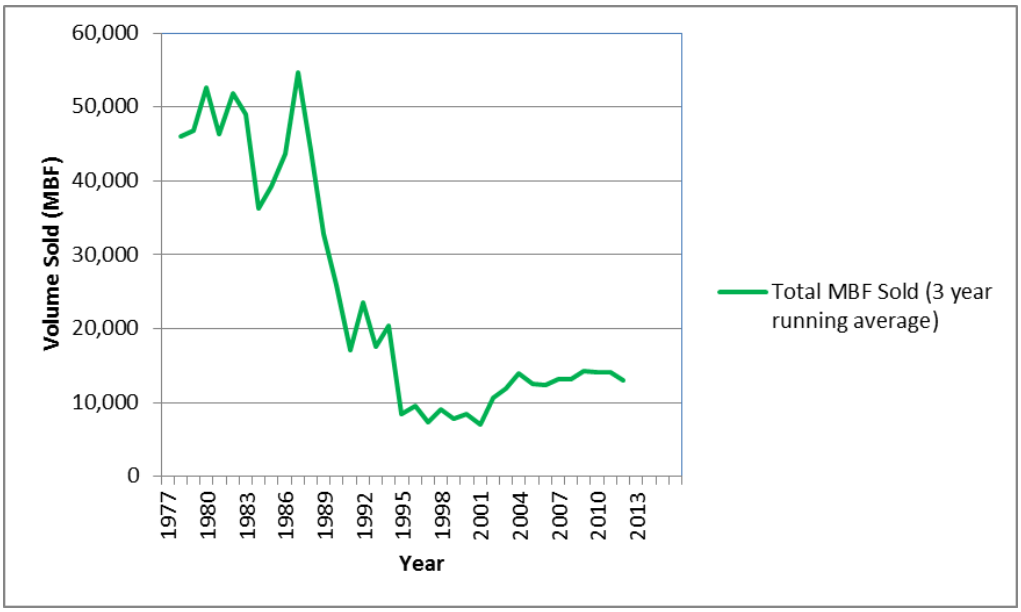


Figure 24. Three-year running average of total volume of timber sold (Thousand board feet) on the Santa Fe NF between 1977 and 2013

On the Forest, as total timber volumes declined, the mix of products sold and removed has also changed drastically since the late 1970s. During the late 1970s and 1980s, the large majority of the total volume removed was in the form of sawlogs (logs cut into boards for lumber). From the mid-1990s up to today, the majority of material cut on the Santa Fe NF is in the form of fuelwood and miscellaneous products such as posts and poles, vigas, and latillas.

Within the broader landscape, forest products generated from private lands have been equally volatile. Much of the private land is either marginal for producing timber (sawlogs) or has been cut over in the past, leaving them not well suited to be harvested for sawlogs. Some logging has occurred on private land on the east side of the Forest, north of Las Vegas, New Mexico, and areas north and west of Cuba, New Mexico. Some of the larger inholdings on the Forest including the Bar-X-Bar on the Pecos/Las Vegas RD and the Valles Caldera National Preserve (formerly the Baca Ranch) were extensively harvested. Harvests on the Baca Ranch averaged nearly 1,000 acres per year from 1936 to 1972 and then fell to only 2,700 acres between 1980 and 2000. In the absence of larger mills for sawlogs, much of the material harvested annually is in the form of Fuelwood and other forest products. They have and continue to be produced from the broader landscape area with outputs varying based upon yearly demand, primarily affected by the price of home heating fuels.

In addition to sawlogs, the Forest has provided other forest products including fuelwood and small forest products (figure 25).

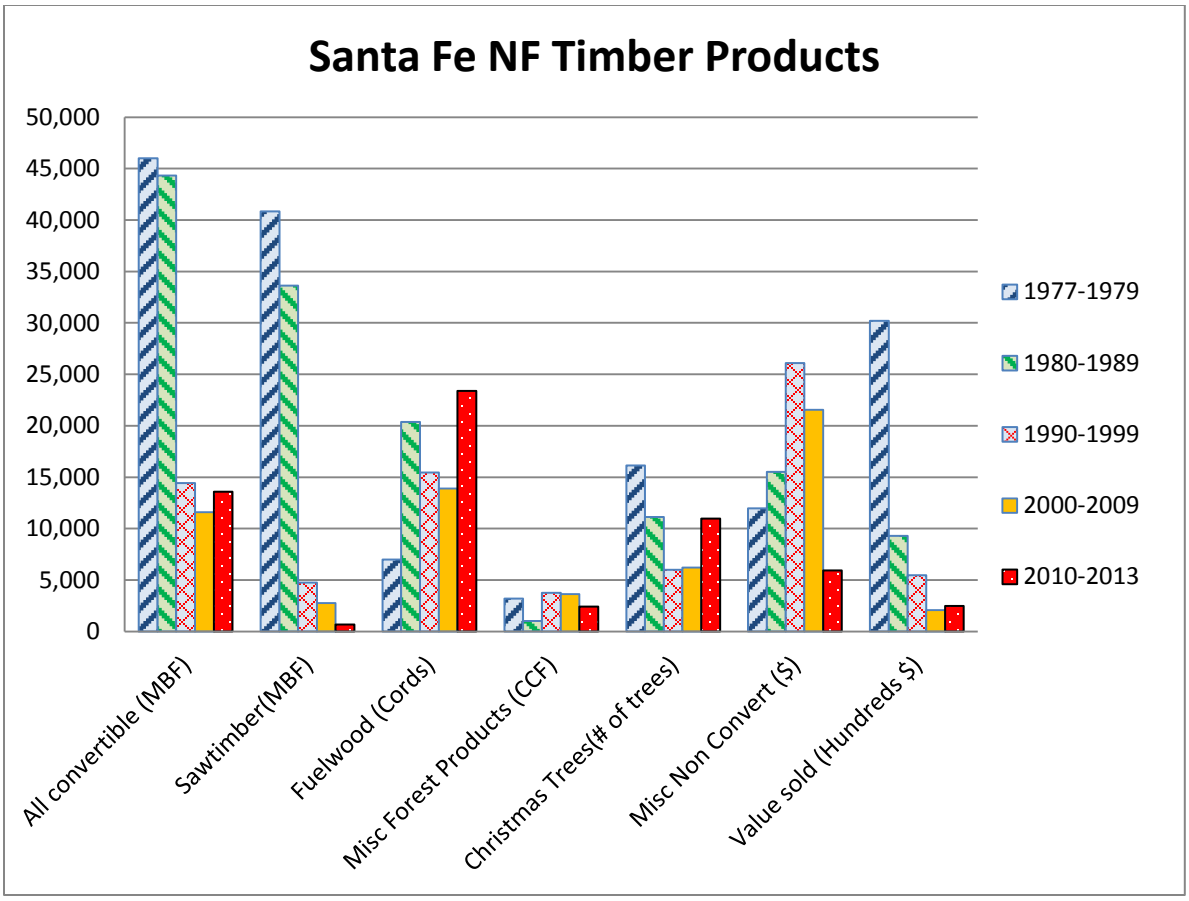


Figure 25. Amount and type of timber products sold on the Santa Fe NF from 1977 to 2013

Demand for fuelwood was relatively stable until 2008, in spite of an increase in the population of the towns and cities near the Santa Fe NF. In the last 5 years, annual fuelwood demand has increased to approximately 11,000 MMBF or 22,000 cords. This is likely because of the 2008 recession and increases in home heating fuel costs.

Miscellaneous forest products include; vigas and poles, latillas, posts, and coyote fencing. Miscellaneous non-convertible products on the forest are predominantly Christmas trees and wildings (tree transplants). These small aspen, piñon, and ponderosa pine trees were dug up on the forest to be sold as landscape trees. Demand for miscellaneous products and transplants peaked in the 1990s and declined when the housing market in Santa Fe and Albuquerque flattened in the late 2000s.

Ability of timber harvest to affect forest resistance and resilience to stressors such as fire, insects, and disease

Human activities have dramatically affected and changed forest and woodland ecosystems directly and indirectly. In response to these altered environments, the extent and activity of insects and diseases change. In turn, the way we perceive the effects of insects and diseases on the landscape has also changed. Today's pine and mixed conifer forests are at greater densities and therefore more susceptible to bark beetle outbreaks and more vulnerable to the spread of dwarf mistletoes. While mistletoe distribution has likely remained relatively static, harvest activities have probably decreased the abundance of large infected trees in many areas. In some cases, historical harvesting activities that left mistletoe-infected seed trees likely increased infestation levels in regenerating stands, as the effects of insects and diseases are often closely interconnected. While one agent may be identified as a mortality agent, multiple factors

often contributed to the tree's death. For example, trees most susceptible to attack by bark beetles often are stressed by pre-existing conditions, including overcrowding, dwarf mistletoe infection, root disease, and drought periods. Past harvesting preferences that reduced the pine component of mixed conifer stands have shifted forest composition to greater dominance by shade tolerant species favored by western spruce budworm, Douglas-fir tussock moth, and root disease. Outbreaks of western spruce budworm, in particular, are probably more extensive in the mixed conifer simply because there is a greater abundance of host trees.

Climate change is already modifying ecosystems (Walther et al. 2002) and it is expected to substantially change insect and disease and fire regimes. The rising temperatures and reduced snowpack conditions observed in the western U.S. (Knowles et al. 2006) are already putting additional stress upon southwestern forests with high tree densities. These stresses will add to the probability of increased bark beetle activity and could exacerbate the effects of root and other diseases. Stress in general predisposes trees to various insects and diseases, but not all agents will respond in a similar way.

Ability of timber harvest to maintain or restore key ecosystem characteristics identified in the assessment of ecological sustainability (sec. 13).

These concerns are commonly addressed by thinning forests, as tree density is the major factor that a forester can manipulate (Daniel et al. 1979). Timber harvesting improves site conditions by reducing competitive pressure between trees, removing less vigorous individuals, thereby reallocating growth potential to the residual trees as a result of increased soil water availability, allowing them to better withstand drought and insect attack. Furthermore, lower stand densities also retard the spread of dwarf mistletoe and high-severity wildfire.

Thinning allows for the manipulation of species composition and residual stand structure, such that appropriate characteristics can be attained or retained in order to promote desirable ecological processes (e.g., disturbances) and function (e.g., food webs and wildlife habitat). For example, thinning tactics can prescribe removal of weak, diseased, and dying individuals, or species and individuals with characteristics that are more susceptible to drought, fire, and/or insect mortality. Wildfire hazard can be addressed through thinning, by removing ladder fuels (smaller trees in the understory and mid-canopy that can carry a surface fire into the forest canopy) and decreasing canopy bulk density or the volume of canopy fuels. Canopy bulk density is the primary controlling factor of crown fire (Graham et al. 1999). The removal of trees through the process of harvesting not only changes the stand density and fuel structure, but also improves wildlife habitat, and provides resistance and resilience to the potentially negative effects of system drivers and stressors; understory vegetation is able to develop with the removal of overstory species that would compete for sunlight and nutrients. With well-developed understories, frequent-fire ecosystems have the horizontal fuel continuity necessary to carry low severity fire and promote nutrient cycling, drive plant succession, and contribute to biological diversity.

While timber management has the potential to improve forest resistance and resilience to stressors, timber management is a relatively slow process. It takes two to five years from the beginning of planning to implementation, so it does not respond quickly to rising threats. This works better as a long-term approach to achieving desired conditions. (For more information, please see Chapter 1, Volume I of this assessment.)

Current capacity and trend for logging and restoration services

Key trends that drive supply and demand

Demand for timber and other forest products have been and will be directly related to a viable forest products industry. During the 1990s, when most of the larger mills in the area closed, the reliability of the supply of timber from the Forest was often cited as the reason. Once there were fewer mills, the cost of hauling logs and smaller log size became an issue affecting potential bidders. Future opportunities for industry expansion will be affected by the ability to use small-diameter material, energy costs, transportation costs, treatment subsidy, and if emerging markets in bio-energy and bio-fuels become viable.

Small products demand has also been affected by the housing market. Demand for vigas, latillas, cedar posts and fencing declined with the reduction in new housing starts. However, demand for small products on the Santa Fe NF was not as affected by the appearance in the 1990s of “big box” home improvement stores, as it was to the local mills providing dimension lumber (2x4s). This is likely due to the unique nature of products cut and sold from the Forest.

Current and future demands for forest products include a variety of factors that can influence the types of products available on the Santa Fe NF and how they change over time. The list below describes some of the specific relationships between those products and demands.

- **Fuelwood demand:** Personal use and commercial fuelwood demand from the Forest is most affected by the cost of fuels used for heating homes (propane, natural gas, electricity) (Stoddard, Weaver et al. 1979). Other factors include the weather during the fall firewood gathering season, the cost of gas and diesel (as a cost of transporting personal use firewood), and the availability of off-forest firewood from other sources, such as thinning and land clearing on private land or removing beetle-killed trees from bark beetle infestations in the early 2000s.
- **Public perception and opinion:** Global economy, demand for locally produced products, demand for green products, need for timber harvest being driven by a restoration need rather than economic need.
- **Restoration Need:** There is a need on the forest for restoration on a large scale. Nearly all restoration whether it is for watershed health, threatened and endangered species habitats, or resilience will include tree removal for density control.
- **Past and future catastrophic events:** Large-scale events such as the Las Conchas, Cerro Grande, and Viveash Fires and the widespread bark beetle mortality in the 2000s cost millions of dollars and influenced public opinion for years following these events. The cost of suppression of the Las Conchas Fire topped $48 million and estimates of the total costs including the resource rehabilitation within the fire and all other direct and indirect costs may be as high as $1.4 billion (“The Full Cost of New Mexico Wildfires” by Impact Datasource for NM Economic Development Dept., 2013).
- **Demand for ecosystem services:** The Santa Fe NF provides a number of ecosystem services. The Forest’s watersheds capture, store, and release drinking water and water for agriculture. Wildlife, recreation and clean air are other services. Protecting these services from large-scale disturbance will involve removal of forest products as a byproduct of restoration. Both the existing Water Source Protection Fund in the Santa Fe Watershed and the Rio Grande Water Fund currently being developed recognize that some of the cost of providing and protecting these ecosystem services could be borne by the consumers.
- **Climate change:** Climate change has the potential to affect the need for timber sales in two ways. First, the need for forests that are resilient and adaptable to changing climate norms is cited as a need

for restoration. Nearly all restoration prescriptions on the forest will require extensive timber removal. Second, carbon sequestration and carbon budgeting are becoming the linchpin for addressing the causes of climate change. Forests have the opportunity to sequester more carbon through active management and replace fossil fuels with a renewable (and carbon neutral) source of energy. On the supply side, the forest's ability to provide sawlogs and roundwood has been affected most by flat or reduced annual funding, increased cost of treatments and the forest's capacity to plan (National Environmental Policy Act) and prepare areas for harvest. Based upon forest-level growth projections and Forest Inventory and Analysis (FIA) data (USDA, 2014), current harvest levels are a mere fraction of annual growth. There is a nearly unlimited supply of smaller material due to the lack of recent harvest and a restoration backlog. Projects like Southwest Jemez, and the infrastructure it is hoped they will generate, are hoped to address some of the restoration backlog. However, the combination of low value material and the high per acre cost of treatments may continue to limit the amount of material offered, cut, and sold from the Santa Fe NF as well as the surrounding forested areas.

Contribution of timber to ecological, social, and economic sustainability

Over the last 20 to 30 years, New Mexico's timber economy has declined steadily, both in harvest volume and processing capacity. However, as of 2002, it still provided significant economic value, with $47.7 million in sales of finished wood products and mill residues from a harvest of 74.4 MBF (Morgan, Dillon et al. 2006). The timber harvest contribution within the plan area holds to the same pattern. At current harvest levels, the sale and processing of forest products provides limited contribution to the economic stability of northern New Mexico. However, the New Mexico Natural Resource Assessment (EMNRD Forestry Division 2010) indicates that much of the plan area has high or high/medium potential for economic potential.

Timber harvest has the potential to contribute to ecological, social, and economic sustainability in a number of ways. They include:

- Reduced fire suppression costs. It is estimated that in the Southwest: $238 to $601 per acre could be saved through treatments to avoid future cost of fire suppression (Snider et al. 2006).
- Reduced smoke emission. Through harvest and use of forest products, smoke emissions from wildfires and prescribed burns can be reduced in duration and intensity.
- Increased recreation stability. Forest management activities can improve the stability of recreational opportunities by creating resilience to large scale catastrophic events. Forest closures are often implemented during and following wildfires. This has led to temporary and sometimes permanent disruption of the recreational opportunities provided by the Forest. Through forest management the scenic quality and water resources can be protected and enhanced and continue to provide a landscape for which the forests recreational visitors select the forest for their recreational pursuits. As described in other sections of this report, these forest recreational opportunities support the local economies.
- Carbon emission reduction, CO_2 offsets, and carbon sequestration. The Forest has great potential to provide biomass through the harvest of small-diameter logs generated as a byproduct of restoration and fuels treatments. Ryan et al. (2010) found that forest management can increase carbon sequestration and reduce large losses of carbon storage in a wildfire.
- Local job creation and industry expansion. As discussed previously, the Forest has the potential to provide a large quantity of logs and biomass to the local industry.
- Habitat improvement. Timber harvest has great potential as a tool for wildlife habitat improvement. Habitats for threatened and endangered species, game species habitats, and wildlife for viewing and

other enjoyment can be developed, maintained, or improved through forest management on the Forest.

However, in New Mexico as well as many other areas, the potential for timber harvest is hampered by inconsistent supply, difficulty obtaining environmental permits for wood-to-energy facilities, and the economics of electricity generation (Evans 2008). As for New Mexico's inventory statistics, O'Brien (2003) estimated the total biomass in live trees to be 296 million tons and the total volume of wood in live trees of diameter 5 inches and larger to be 16 billion cubic feet. However, given the age and general nature of her report, it is clear that we would still need a more comprehensive woody biomass supply analysis to appropriately size the industrial demand to match the appropriate supply to realize this sector's full economic and social potential. (See Volume I for information on the input received at public meetings for this resource.)

Ecosystem Services

On the Forest, as elsewhere across the West, timber volumes declined drastically since the late 1970s, and the mix of wood products sold and removed from the SFNF has also changed. During the late 1970s and 1980s, the majority removed was sawlogs. Private lands in neighboring counties too were cut over during that time period, transport costs increased, and mills closed. Today, fuelwood and miscellaneous products such as posts and poles, vigas and latillas, Christmas trees and transplant stock form the backbone of the existing markets for the Santa Fe NF. Wood-product harvesting for ecological restoration purposes from fire mitigation to carbon sequestration can also have measurable economic value. Off-forest influences affecting harvesting include population growth along forest boundaries, coupled with changed expectations from those new residents; deteriorating road conditions; housing market volatility across the 6-county area; and difficulty securing appropriate wood-to-energy permits. These economic factors have created high per-acre costs for wood product removal relative to potential income. As noted in Volume I, climate change and extreme wildfires have affected underlying ecosystem functions that support the growth of wood products as well.

Nonetheless, a backlog of supply, especially for emerging higher economic potential markets, presently exceeds demand. While Forest Service planning capacity remains limited, many watershed and habitat restoration projects across the forest will be based on controlling the density of small diameter woody growth. Fire suppression costs can also be reduced at the same time, and smoke emissions from any on-forest fires would decrease with less woody fuel. Recreation opportunities would be more sustainable, with less fire-caused interruptions and facility destruction. By releasing remaining vegetation, carbon sequestration could increase as larger trees store more than dense stands of small trees. A greater variety of habitats are also provided when the forest is able to stage different vegetation treatments across the landscape.

Range and Grazing

Volume I of this Assessment provides information on different habitat types and water types that form the basis for healthy rangelands. A brief summary of current conditions for three common vegetation types that contribute to the rangeland resource begins the section. Following that, a synopsis of the human benefits derived from those ecosystems and the management efforts that oversee this use are provided. As part of the agency's mission, the Santa Fe NF authorizes grazing by domestic livestock under a permit system, administering this use to be compatible with other multiple-use objectives and to provide desired benefits to communities. Where other uses, such as recreation or wildlife habitat, can be provided at the same time, livestock may mingle with backpackers, and mule deer may drink from stock water tanks. Some uses cannot be provided in the same place or time, and a Forest Plan can allocate certain acres with an emphasis on different types of use, such as mining.

The land that comprises the Santa Fe NF has been grazed much longer than the Forest, as an administrative entity, has existed. The Santa Fe NF and surrounding lands have been grazed by domestic livestock since the Spanish first settled the area around 1600. Initially, cattle, sheep, swine, and goats grazed across the landscape. The amounts and types of livestock grazing on federally administered lands has changed over time, and currently the Santa Fe NF is grazed primarily by domestic cattle, with some incidental grazing by horses used to work the cattle.

Because settlers have utilized these lands for so long, raising livestock has become a very important part of the culture of the communities surrounding the forest. Many of the Forest's permittees and their families have grazed these lands for generations and for many permittees, grazing the Forest is important not only as a source of income, but as a part of their cultural identity.

Current Condition of Rangeland Ecosystems

The loss of sagebrush ecosystems is well-documented in western North America, with off-forest threats including urban and suburban development, agricultural conversion and altered fire regimes. Heavy ungulate use (livestock, native wildlife) of native arid grasslands, coupled with drought, can lead to the loss of native grasses, the introduction of invasive exotic grasses and other weedy species, the destruction of cryptogamic crusts, sagebrush disease, altered grassland structure, and contribute to the conversion of grasslands to shrub-dominated desert scrub or pinyon-juniper. The biggest alteration to contemporary Sage Shrubland (2%) landscapes is the significant encroachment of trees into this vegetation type, with drought and sagebrush disease, along with heavy ungulate grazing, thought to be driving this change. While seral state conditions are predicted to worsen, this type has the lowest climate change vulnerability on the Forest. About 2.5% of the Forest is considered Colorado Plateau/Great Basin Grassland, where the historic average fire return interval was 10–35 years and at the plan scale is now over 1,000 years. Vegetative basal area where this type occurs is moderately departed at the plan scale but is edging toward high departure. Montane Subalpine Grasslands, covering 1% of the Forest, show seral state departure at the context scale is high at 71%. Fire return intervals on the Forest are significantly shorter, and closer to reference, than at the context scale (261 yrs. and 852 yrs., respectively). Modeling shows expected trends for reduced grassland productivity and continued woody-species encroachment into the future. Woodland vegetation types, which also provide forage, are summarized in the timber section above.

Riparian Systems

Because water availability is so variable in the Southwest, shifts in the balance between erosion, runoff, sedimentation, and vegetation resistance are discrete and episodic. It is also important to note the significant role that Forest riparian areas play, both on-Forest and in the greater landscape of the contextual scale. An estimated 80 percent of all vertebrate species in New Mexico use riparian areas for at

least half their life cycles, and more than half of these are totally dependent on riparian areas. Because forage in these areas can regrow during a grazing season, these limited areas have also been important to livestock utilizing the Forest.

The herbaceous vegetation type is most vulnerable, with 73% departure from site potential. Narrowleaf Cottonwood-Shrub (NCSH) and Rio Grande Cottonwood-Shrub (RGCS) are listed at 56% departure from potential, and Mixed Cottonwood/Willow Group (MCWG) at 54% departure.

Because the condition of riparian ERUs is so dependent on and responsive to physical setting (hydrology, bank structure, etc.), status and trend of individual riparian ERUs are best assessed in a spatially explicit context. Floods are the most important disturbance type in many riparian ecosystems, with road densities, recreation, grazing, invasive species and logging all contributing to current changes. Diversion of water for irrigation and storage and construction of flood control structures have changed the hydrologic cycles on perennial and intermittent streams. Demand for water, fertile land, and forage for livestock in the West has already affected many aquatic, riparian, and wetland areas; and pressures will likely increase with time, threatening the integrity and long-term viability of these vital ecosystems and the biota they support.

Current Level of Grazing Activity

At the present time, 237 grazing permits are authorized on the Santa Fe NF, with 45 multiple-permittee allotments, and a total of 101,661 Animal Unit Months (AUMs). An AUM is calculated based on approximately 800 pounds of air-dried forage, the amount used by a cow/calf pair in a month of grazing. Conversion formulas are used for other livestock categories. Throughout the forest, the number of grazing permits, grazing allotments, and maximum permitted forage consumption (in AUMs) has remained relatively stable over time. The exception to this stability comes from the near record-breaking droughts experienced from 2002 to 2012. In 2002, precipitation was 54% below the 30-year average. Then, from 2003 to 2012 precipitation was 11% below normal based on the 30-year average for the precipitation year[7]. During the 2002 drought, the Santa Fe National Forest implemented significant reductions in authorized use requiring permittees to remove livestock from allotments on the Forest. Throughout the drought period, authorized livestock use has averaged about 77 percent of past permitted use (USDA Forest Service 2014) (USDA NRCS).

Currently, climate data suggests we may be beginning to recover from the drought, and incremental restocking will be used to insure that grazing at higher levels can resume while allowing for vegetative communities to recover from the drought.

Current Grazing Management

Livestock management on the Santa Fe NF has used an adaptive management strategy that allows stocking levels and timing to change in response to variability in forage production, water availability, and precipitation patterns. Adaptive Management flexibility better mimics natural processes and decreases the potential for undesired impacts on other resources. This adaptive management strategy is codified as policy in the Forest Service Handbook on Grazing Permit Administration, Rangeland Management Decision making (USDA Forest Service 2013). The handbook describes adaptive management as the following:

[7] Precipitation years are measured from October 1 through September 30

± INFRA is the Database that the USFS uses to record and track resource data. In the case of the Range Program, it is used to track permitted numbers, monitoring data, range improvements and condition, and the billing for the program.

"Adaptive management is a formal, systematic, and rigorous approach to learning from the outcomes of management actions, accommodating change and improving management. It involves synthesizing existing knowledge, exploring alternative actions and making explicit forecasts about their outcomes. Management actions and monitoring programs are carefully designed to generate reliable feedback and clarify the reasons underlying outcomes. Actions and objectives are then adjusted based on this feedback and improved understanding. In addition, decisions, actions and outcomes are carefully documented and communicated to others (Nyberg 1999)."

To help support and shape our management decisions and as part of adaptive management, monitoring is essential to range management.

Monitoring should answer the question "Is acceptable progress being made towards attainment of resource management objectives and thus desired conditions?" If the answer to this question is "yes" current management may continue. If the answer to this question is "no", various adaptive management adjustments may be initiated as long as they remain within the range of actions analyzed and disclosed as part of the project's NEPA compliant environmental documentation. When monitoring indicates the need for adaptive management adjustments, those adjustments can be implemented without revisiting the authorized decision. Nonetheless, periodic review of environmental documents is conducted in light of changing conditions to determine the degree to which resource management objectives are being met, or if management adjustments are needed that require further analysis and documentation in accordance with NEPA.

Current Range Condition

Range condition or status is a comparison of the current condition to the desired condition, or description of the social, economic and ecological attributes that characterize or exemplify the desired outcome of land management (USDA Forest Service 2013). Desired conditions are broadly defined in the Santa Fe NF Plan (USDA Forest Service 1987) and more specifically in the environmental analysis conducted for each allotment. Rangeland is considered to be in "satisfactory rangeland status or condition" when the existing vegetation community is similar to the desired condition or the short-term objectives are being achieved to move the rangeland toward the desired condition. "Unsatisfactory condition" is when the existing vegetation community is not similar to the desired condition and short-term objectives are not being achieved to move the rangeland toward the desired condition (USDA Forest Service 1997).

In addition to determining the range condition or status the current vegetative community may also be compared to the potential natural community (PNC). PNC is defined as the potential vegetation given the natural range in disturbance without human intervention.

Over the past 10 years monitoring data indicates that the vast majority of range condition is of mid to high similarity to PNC throughout most of the inventoried area, or in other words satisfactory condition. Because the current range condition is satisfactory or consistent with the desired condition identified within the NEPA decision, we believe that livestock grazing is ecologically sustainable at current levels. In areas that have been identified as low similarity to PNC, the Forest Service works with permittees to implement changes as part of an adaptive management decision. These management changes include such items as rest, improving or adding infrastructure, and changing the time of use.

Further discussion of the condition and trends of ecological response units (ERUs) in which rangelands occur on the Santa Fe NF can be found in the vegetation chapter of Volume I of this Assessment Report.

Potential Future Issues:

Future issues that have the potential to affect livestock grazing on the Santa Fe National Forest include the listing of threatened and endangered species, extended drought, fires, encroachment of trees on meadows and the introduction of invasive weeds.

The listing and designation of critical habitat for the New Mexico meadow jumping mouse (NNMJM), an endangered species, on the Santa Fe National Forest could potentially have a large impact on grazing. As a riparian obligate species, the NMMJM impacts grazing in riparian areas, which are a source of livestock forage. NMMJM also impacts the use of riparian areas for cattle movement and the areas where cattle can be watered. In three of the seven Allotments that contain NMMJM habitat, analysis and planning for new grazing management strategies have been initiated. Management for NMMJM and its habitat has the potential to restrict livestock grazing. The NMMJM is just one species that has been recently listed, and being a riparian obligate species, may be heavily impacted by drought.

Drought is normal and reoccurring in the arid Southwest. Currently, the Forest has had ten consecutive years of drought with some of the warmest and driest periods on record. While the current drought may be ending, it is almost certain there will be another drought in the next 10 years. During these times of drought, it is important to be adaptive and maintain communication with permittees and other agencies. For this reason, the Santa Fe and Carson NF's have been holding Climate Summits and when possible, will continue to hold them.

Drought weakens the resiliency of most ecosystems. This can lead to the introduction of invasive species, which is another potential future stressor for grazing management on the Santa Fe NF. Domestic livestock grazing has not been found to be a major contributor to the spread of invasive plants within range allotments at this time (Eaton, J., L. Atencio, and M. Lujan 2014, personal communication). Overall trends indicate that human activity along roads and trails and in recreation areas is a major transportation vector.

Contribution of Plan Area Grazing to Social and Economic Sustainability

Ranching and livestock grazing are traditional cultural values in the rural communities adjacent to the Santa Fe National Forest. McSweeney and Raish (2012) summarized livestock grazing of Northern New Mexico in the following: "Retaining the livestock operation for family and future generations is a goal common to the permittees." There is a long history of ranching and farming in the area prior to the establishment of National Forest Lands, and this leads to a strong tradition and cultural value to grazing for local ranchers.

Ranchers value ranching so much that even when it is not economically viable to rely on their grazing operation, they work other jobs as a means of supplementing their income (McSweeney and Raish 2012). A working ranch lifestyle, even in limited scale, carries tangible family and cultural benefits; Santa Fe NF permits are typically small, with herd size ranging from 1 to 374, and an average herd size per permit of only 39. Some families have made conscious employment choices in order to remain in the local community. In spite of the difficulties, they expressed hope for the future of the ranch, the land, and the family.

While the cultural value of livestock grazing is very important to local farmers and rancher, this is not the only value associated with livestock grazing. There is economic benefit to be had from cattle grazing. For example, the United States 2012 Census of Agriculture reports the following: in Rio Arriba, Sandoval, Santa Fe, Mora, and San Miguel Counties, value of sales from cattle and calves account for more than 43 million dollars in income. (USDA 2012).

Approximate values for cattle originating from Forest Lands are difficult to determine, however, it is significant. Santa Fe NF lands represent 14% of the total combined land area of these counties (USDA FS, 2014. Santa Fe National Forest Corporate layer database) In addition to the income made from cattle grazing, most permittees consider their ranching and livestock operations as an investment or a form of savings. “While the ranch may produce little or even a negative operating income, the assets have a high value which is expected to increase. Most northern ranchers own their homes, land and cattle, and these constitute a significant investment and form of savings, which often has a very high value” (McSweeney and Raish 2012). The Santa Fe NF grazing program contributes approximately 154 jobs and $2 million in labor income to the analysis area.

While there are strong cultural ties, and economic benefit to be had from cattle grazing in the areas adjacent to the Santa Fe National forest, due to the history of land ownership in the region (i.e. the Land Grant System set up by the Spanish settlers), many ranching operations rely on public lands for livestock grazing (McSweeney and Raish 2012). Many of these operations may not be viable if unable to use public lands.

State, County, and Tribal Plans Relevant to the Santa Fe NF Plan Area

State and County

When assessing livestock grazing on the Santa Fe NF, it is important to consider State and county government and tribal plans and be aware of potential conflicts among these plans or of opportunities to work toward common objectives. Below are brief summaries of other plans addressing livestock grazing on Federal rangeland in the Forest’s area of influence.

Following is a county by county assessment of the counties within the Forest area of influence that were analyzed in the New Mexico Statewide Natural Resources Assessment and Strategy and Response Plans.

San Miguel County encompasses the majority of the Pecos/Las Vegas RD. San Miguel Counties Comprehensive Plan (San Miguel County 2004), states that a specific goal is to preserve and protect ranching lands from development that is detrimental to existing land use. San Miguel County further promotes livestock ranching as a traditional economic activity in most areas of the County.

Rio Arriba County encompasses segments of the Cuba and Española RDs and a majority of the Coyote RD.

Santa Fe, Mora, and Sandoval Counties also encompass areas of the Santa Fe National Forest; however, these counties do not have land use plans pertinent to grazing use on Forest lands.

Tribal Lands

The Forest has a close working relationship with Pueblos and Tribes adjoining the Forest. Santa Clara, Nambe, Santo Domingo, San Ildefonso, Cochiti, Jemez, Pojoaque, and Zia Pueblos and the Jicarilla Apache Nation all share common boundaries with the Santa Fe NF; however, a number of pueblos that do not directly adjoin the Forest, still share strong cultural and aboriginal ties to Forest lands.

Nambe Pueblo is the only pueblo that retains a current Term Grazing Permit on the Forest; however, to date, there is one other pending application from a different pueblo. The Forest specifically consults with the pueblos regarding their concerns on any proposed action regarding range management occurring on the Forest.

Summary

Livestock grazing has important economic and cultural value to communities surrounding the Santa Fe National Forest. Many livestock operations rely heavily on the use of public lands to remain viable. At the same time, livestock management on the Santa Fe National Forest has used an adaptive management strategy that allows stocking levels to change in response to variability in forage production, water availability, and precipitation patterns. To do so, rangeland management specialists working for the forest must have a sound relationship with permitees. Adaptive Management is important because it better mimics natural processes and decreases the potential for undesired impacts on other resources. Currently, the majority of the range condition is in satisfactory range management status. However, there are a number of issues with the potential to strongly effect grazing management in the future including the listing of endangered species, drought, and the spread and introduction of invasive species.

Ecosystem Services

Across northern New Mexico, livestock grazing has long provided many benefits to area communities. Originally a source of subsistence, providing primarily meat and hides, responsibilities for livestock became ingrained in tradition and passing along these responsibilities a source of social cohesion. Because of shifting conditions, grazing practices also provided opportunity for social adaptation and learning, which continues to this day. In recent centuries, commercial economic opportunities began to be realized as transportation became more widely available. Livestock are often an economic investment and savings, with high asset value.

The Santa Fe and Carson National Forests attended a meeting with the Northern New Mexico Stockman's Association (NNMSA) in August, 2015. Members of NNMSA emphasized the importance of the grazing program to their community and the cultural history of Northern New Mexico. In addition, NNMSA emphasized the importance of a sustainable grazing program for future generations. Rural communities continue to be dependent upon ranching for their economic, social and cultural sustainment.

Range monitoring across the Santa Fe NF show that allotments are primarily being managed with a mid- to high-similarity to Potential Natural Community indicators. Adaptive management appears to effectively be mitigating negative trends in those areas having a temporarily low similarity. Many stressors may, however, affect the long-term ability of national forests to sustain productivity of rangelands. Volume I discusses indicators of risk to the underlying soils, water and vegetation systems. Influences beyond the Forest include fractured ownership of private lands and legal uncertainties about land titles, as well as Fish and Wildlife Service listing of the NM Meadow Jumping Mouse as an endangered species, necessitating strict protections for its riparian habitat. Human vectors have introduced invasive species that out-compete nutritious forage. In the past 30 years, an average 11% decline in precipitation has necessitated adaptive management in numbers and timing of livestock. Long-term climate change models show that these risks share feedback loops and are likely to continue.

Water

This section provides an overview of the water resources on the Santa Fe NF. Condition and trends are briefly covered; topics include climate change and watershed services, population and water use in New Mexico, the New Mexico State Water Plan – 2013 Review, and a brief summary of the watershed conditions and impaired waters on the Santa Fe NF. The important regulatory and supporting ecosystem services provided by watersheds are discussed in detail in Volume I; this volume focuses on the various provisioning and cultural ecosystem services that water also offers, which are summarized at the conclusion of the section.

Water Resources of the Santa Fe NF

In order to appreciate the importance of water and the role it plays in providing social, economic and ecological benefits, the occurrence and general condition of the water resources across the Santa Fe NF must be understood. The Santa Fe NF lies in north-central New Mexico with portions of the forest covering six counties). The Santa Fe NF is approximately 2,627 square miles in size.

Hydrologic unit codes (HUC) are discussed in Water-Supply Paper 2294 (USGS 1987). As described and modified based on information in this paper, hydrologic units are arranged or nested within each other, from the largest geographic area 'region' to the smallest geographic area 'sub-watersheds.' Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to twelve digits based on the six levels of classification.

There are six different levels within the HUC numbering system with their own meaning and geographic area (table 22). For the purposes of Forest Plan Revision, the 4th through 6th level HUCs will be used, namely the sub-basin, watershed, and sub-watershed levels.

Table 22. Hydrologic unit codes explained

HUC	Level	Hydrologic Unit	Example (HUC number, name of Hydrologic Unit)
02	1	Region	13 is the Rio Grande region.
04	2	Sub-region	1302 is the Rio Grande-Elephant Butte sub-region.
06	3	Basin	130201 is the Upper Rio Grande basin.
08	4	Sub-basin	13020102 is the Rio Chama sub-basin.
10	5	Watershed	1302010210 is the Abiquiu Reservoir watershed.
12	6	Sub-watershed	130201021003 is the Rio Puerco-Abiquiu Reservoir sub-watershed.

The Santa Fe NF lies within eight sub-basins. They are the Rio Chama, Upper Rio Grande, Rio Grande – Santa Fe, Jemez, Rio Puerco, Mora, Pecos Headwaters, and Blanco Canyon. The majority of the Santa Fe NF is tributary to the Rio Grande. In addition to the main stem of the Rio Grande, the Rio Chama, Jemez River and Pecos River are major tributaries arising on or flowing through the Santa Fe NF. However, this is not to say that all of the other tributaries originating on the Santa Fe NF are not of equal importance, because they are. For example, the Gallinas River and the Rio La Casa (tributary to the Mora River) are important to the towns of Las Vegas and Mora, respectively. There are eight sub-basins with a certain percentage of NFS lands contained within each sub-basin (table 23 and figure 26).

Table 23. Sub-basins (HUC8) and percent of Santa Fe NF NFS lands contained within sub-basins

HUC8 Number	HUC8 Name	HUC8 (Square Miles)	NFS Lands within HUC8 (Square Miles)	% of NFS Lands within HUC8
11080004	Mora	1,457	115	7.9%
13020101	Upper Rio Grande	3,254	237	7.3%
13020102	Rio Chama	3,158	742	23.5%
13020201	Rio Grande-Santa Fe	1,872	335	17.9%
13020202	Jemez	1,039	416	40.0%
13020204	Rio Puerco	2,112	99	4.7%
13060001	Pecos Headwaters	3,481	665	19.1%
14080103	Blanco Canyon	1,714	17	1.0%
	Total	18,086	2,626	

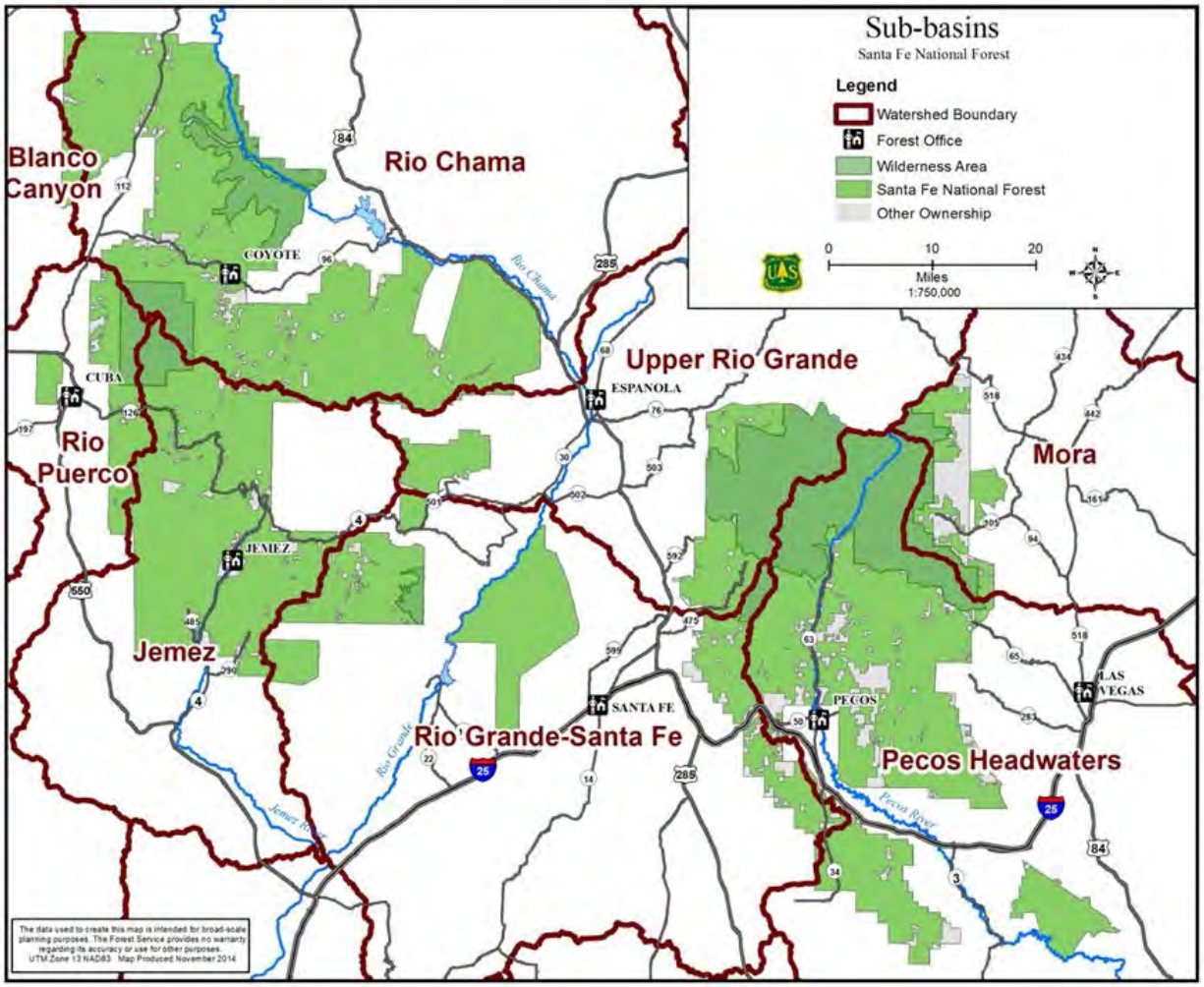


Figure 26. Sub-basins covering the Santa Fe NF

As stated previously, the Rio Chama, Rio Grande (both Upper and Santa Fe), Jemez and Pecos Headwaters sub-basins all contribute flow to the main stem of the Rio Grande. In fact, approximately 91 percent of the Santa Fe NF is tributary to the Rio Grande.

From a scale perspective, the total area of the eight sub-basins listed in table 23 account for approximately 15 percent of the land area of the State of New Mexico. For comparison, the Santa Fe NF comprises 2.2 percent of the land area of the State of New Mexico.

Groundwater, streams, lakes, ponds, playas, springs, wetlands, and riparian corridors comprise the majority of the water resources on the Santa Fe NF. Using the geographic information system (GIS) files maintained by the Forest, most of these features were quantified. There are approximately 1,180 miles of perennial streams and 5,070 miles of intermittent and ephemeral streams. Water bodies (lakes, ponds, playa, etc.) cover nearly 1,000 acres. Over 200 springs and seeps, 7,000 plus acres of wetlands, and approximately 51,000 acres of riparian corridors exist on the Santa Fe NF ().

It should be noted that approximately 270 miles of streams and 1,810 acres of wetlands have been classified as outstanding national resource waters on the Forest. On December 15, 2010, the New Mexico Environment Department's (NMED) Water Quality Control Commission approved the statewide designation of wilderness waters. These waters include perennial rivers and streams, lakes, and wetlands within the wilderness areas of the Santa Fe NF (NMED 2014).

Provisioning Services

Provisioning services include products obtained from ecosystems. Recall that some principal watershed services from forests include freshwater supply for domestic, agricultural, commercial, industrial, and other uses. The following paragraphs explore some of the provisioning services in and adjacent to the Santa Fe NF: water rights and uses, water supply, and known infrastructure and water-related uses.

Water Rights and Uses

Chapter 5 of the State Water Plan 2013 Review (OSE and ISC 2013) presents a good summary of water rights adjudications. As stated in the Overview, "Water rights adjudications are comprehensive court proceedings required by state law to determine all rights to the use of the state's waters in a particular stream system. Each water right adjudication produces a single court decree that judicially determines the elements of all water rights, for both surface and groundwater, in the stream system. Adjudication decrees facilitate the State Engineer's ability to actively manage the state's waters to protect senior water rights and ensure that New Mexico meets its interstate stream obligations. The adjudication of water rights also provides certainty for water right owners and promotes the state's ability to maintain administrative authority over its waters. Twelve adjudications are currently pending in New Mexico courts, involving water rights within the Rio Grande, Pecos, Upper Colorado River, and Lower Colorado River drainages."

Because water is needed for survival, consumption by society is a top priority for this commodity. A water right or permit (of some kind) enables an individual to use an allocated amount of water for a beneficial use (domestic, agricultural, commercial, etc.). According to the Office of the State Engineer's (OSE) database, over 60,000 water rights point locations were identified in the six counties covering the Santa Fe NF. Within the Santa Fe NF boundary, nearly 3,850 water rights exist, and many are adjacent to the Santa Fe NF boundary (figure 27). These rights are primarily used for livestock and domestic purposes (i.e., private inholdings, campgrounds and other administrative sites). Of these, 32.4 percent are held in ownership by the United States of America, and 67.6 percent are privately held. As population continues to increase, the demand for water will too.

The occurrence/density of water rights and uses is significantly higher on non-public land. Thus, one of the many benefits of public lands is the conservation of water.

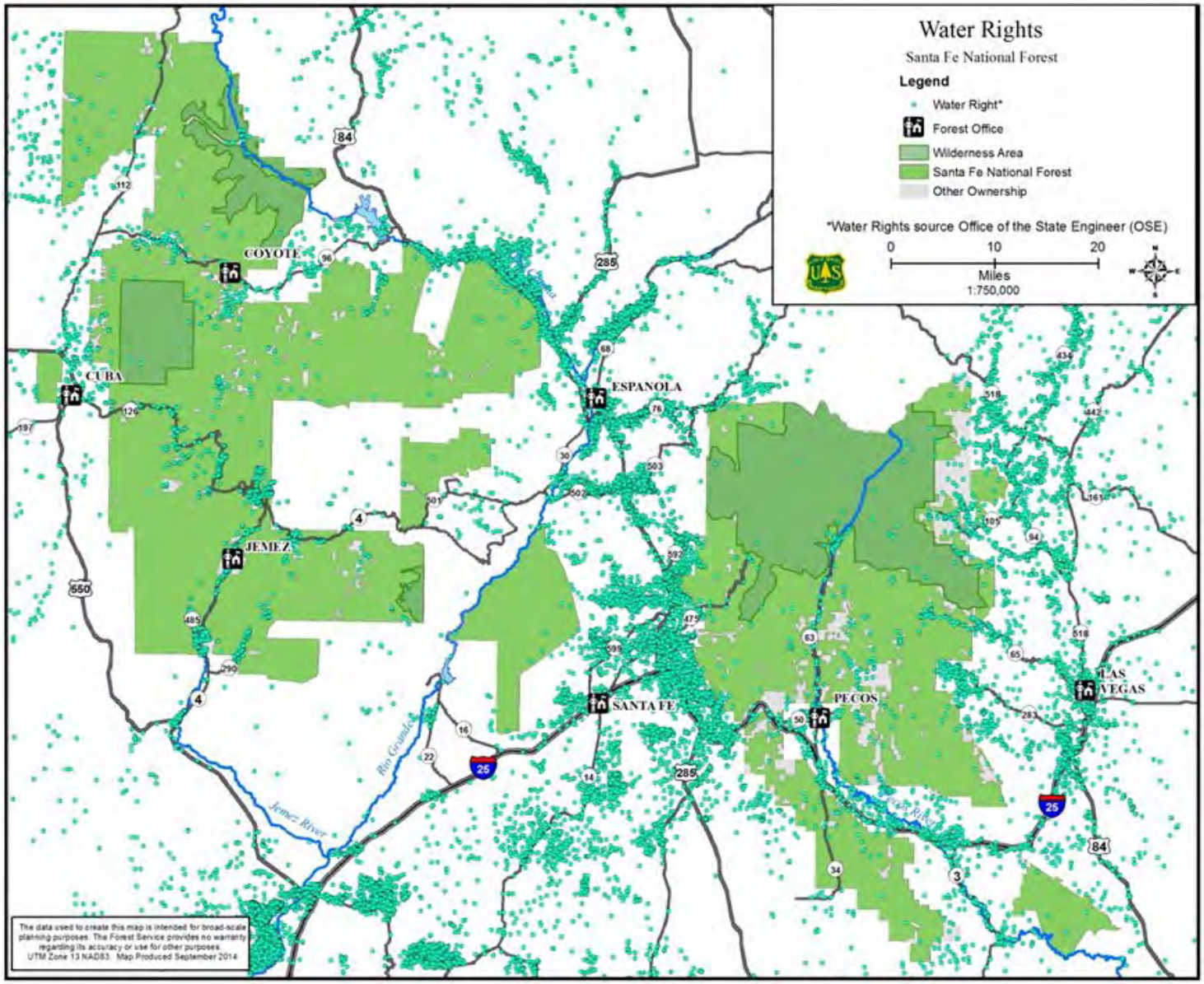


Figure 27. Water rights on and adjacent to the Santa Fe NF

Agriculture along the Rio Grande has occurred for many centuries, so not surprisingly acequias (ditches) have been around before the Santa Fe NF was established. According to the OSE database, approximately 100 miles of acequias exist within the boundary of the Santa Fe NF. Approximately, 20 percent of these ditch miles occur on public land with the balance occurring on private land.

Water Supply

Several sub-watersheds have been designated as municipal watersheds or major drinking water watersheds, and portions of these sub-watersheds lie within the Santa Fe NF boundary. Under the current forest plan, the Headwaters Santa Fe River sub-watershed and the Gallinas River sub-watershed have been designated as municipal watersheds for the towns of Santa Fe and Las Vegas, respectively. Thirty-seven sub-watersheds on the Santa Fe NF have been identified as major drinking water watersheds by the New Mexico Environment Department (NMED) (figure 28).

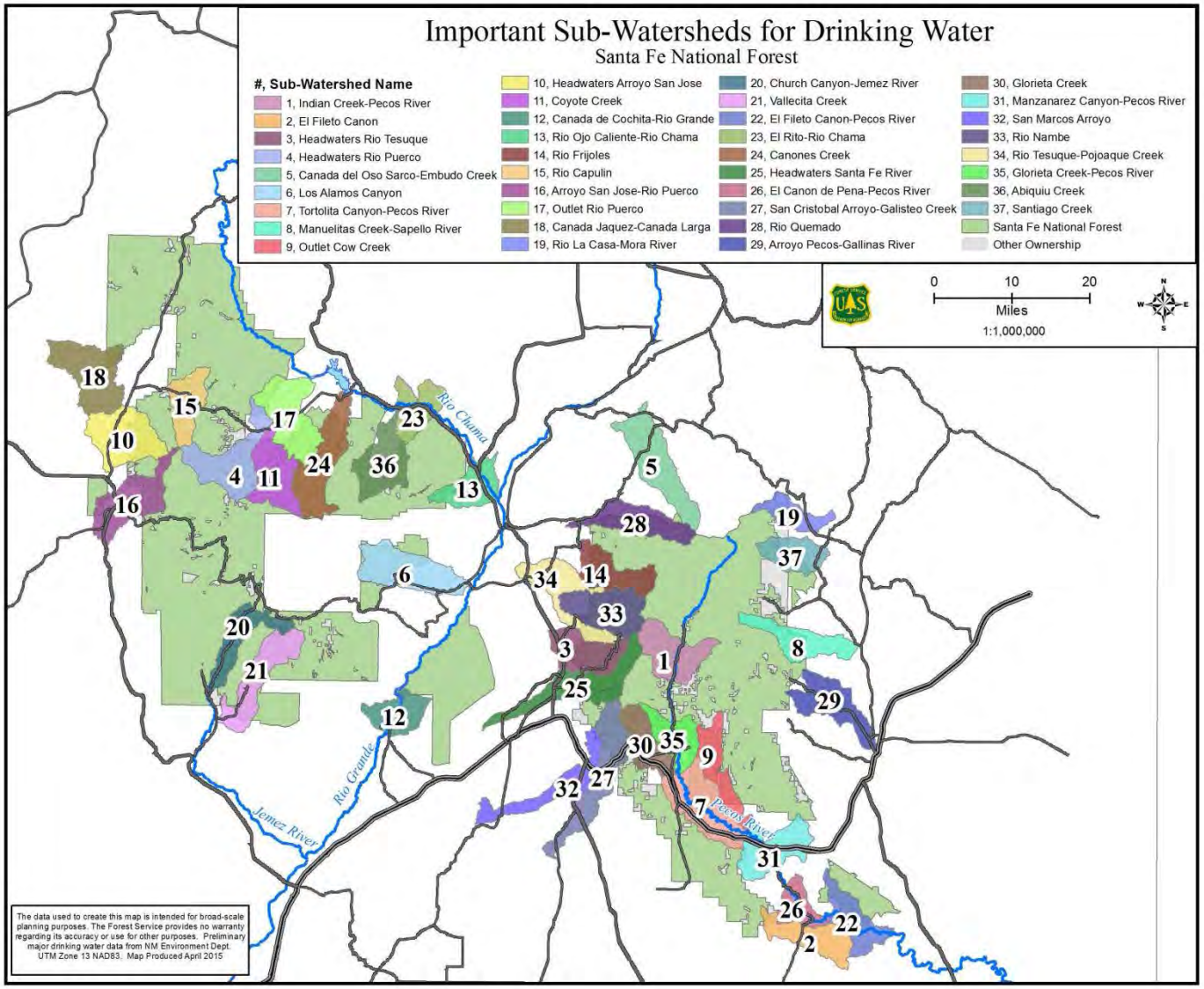


Figure 28. Important sub-watersheds for drinking water, Santa Fe NF

Infrastructure and Related Uses on the Santa Fe NF

Roads and its related infrastructure, water and wastewater systems, range improvements and recreation residences all have an impact on the water quantity and water quality of the Santa Fe NF. Each of these topics is briefly addressed.

Based on the Santa Fe NF roads geospatial database, the Forest contains approximately 6,500 miles of road. Seventy-five percent (approximately 4,880 miles) are passable to passenger or high clearance vehicles; the remaining 25 percent are reported as closed in the database. Roads increase the drainage network, affect water quality, and affect overland and subsurface flow. Yet roads provide the public access to forest products and many places to recreate at the same time. In addition to roads, there are 53 bridges, approximately 3,700 culverts, and nearly 3,000 road drainage/stream crossings. While these numbers don't necessarily represent every occurrence of infrastructure, it paints a picture of how human impacts have affected water interactions on the Santa Fe NF over time.

Another query of the Infra database, revealed 40 water systems and 53 waste water systems. Most of these are tied to developed recreational facilities and administrative sites. In order to provide for a quality recreational experience at many of these campgrounds, fresh water is often provided. This water must meet drinking water standards. Similarly, the waste water must be treated to a certain set of standards as well. In addition to these systems, the infra database reported 172 recreation residences on the Santa Fe NF.

Range is another multiple-use that also impacts the water resources of the Santa Fe NF. Based on the Santa Fe NF GIS data, approximately 300 spring developments, 43 well developments, and approximately 840 storage improvements exist to support livestock (and wildlife) watering. In addition, approximately 205 miles of water distribution line are in service to supply water from the sources (springs or wells) to the watering sites.

Cultural Services

As previously stated, cultural services are nonmaterial benefits people obtain from forests through recreation, spiritual enrichment, reflection, and aesthetic experiences. Please see other portions of this Socioeconomic Assessment for a more detailed discussion of these cultural services, a brief snapshot of unique landscapes with special designations and assessing areas of tribal importance follows.

Many unique landscapes on the Santa Fe NF have received special designations such as: wilderness areas, national or state designated scenic byways, national recreation areas, and wild and scenic rivers. In each one of these places, you will find water is an important feature. The Assessing Designated Areas section of this report provides an in-depth look at these unique landscapes.

The Assessing Areas of Tribal Importance section of this report provides insight to the 31 federally recognized tribes. As stated in this section, "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." Visiting springs is listed as one of the cultural and religious activities.

Regulating and Supporting Services

Recall that Regulating services are benefits obtained from the regulation of ecosystem processes, and supporting services include the basic ecological elements and processes necessary to sustain ecosystems. These services will be explored in greater detail within the Ecological Assessment Report.

Conditions and Trends

As previously stated, watershed services are the most important ecosystem services. Moving into the future it will take a concerted effort across all levels of government along with everyone's participation to sustain, improve, and manage for these watershed services on the Santa Fe NF now and well into the future. It is important to understand the effects that climate change, changes in population and the amount of water usage, and the need for planning as laid out in the New Mexico State Water Plan (2013) has on watershed services. Watershed services are reliant upon functioning and sustainable watersheds; therefore, existing conditions of the resource must always be factored into the equation. Each of these topics is addressed briefly.

Climate Change and Watershed Services

As stated in the *Water, Climate Change, and Forests* (General Technical Report, USDA 2010), "the long-term provision of watershed services is not guaranteed. The amount and quality of these services depend on the condition of the forest – when watershed conditions are stressed or degraded, critical services can be threatened or compromised. In many areas, these systems have suffered from significant alterations of natural flow patterns, water pollution, and habitat degradation and fragmentation (Postel and Richter 2003). In the arid and semiarid Western United States, over-allocation and use of water is a principal threat to watershed services and a source of significant conflict."

The background section of the technical report closes with climate change. The report states that "climate change further threatens essential watershed services. Climate change has directly affected and will continue to affect the global hydrologic cycle and thus the quality, quantity, and timing of streamflows from forests. It has also initiated indirect effects on water resources, such as increased extent and severity of wildfire and forest mortality. Together, these effects will interact with existing threats and impacts. As a result, the consequences of this episode of climate change may be larger than those that occurred during previous shifts in climate of similar magnitude (Reid and Lisle 2008)."

The technical report goes on to talk about the "observed and projected changes in climate for the 20th and 21st centuries, describes some of the direct and indirect effects of these changes on watershed hydrology, and explains how some of these changes will interact with existing impacts. It then describes how those changes will affect the flow of watershed services from forests: the water we drink, food we grow and eat, the energy we generate, the recreation we enjoy, and the quality and livability of our communities."

In the West, the projections for the 21st century are: "continued warming and increased precipitation." Temperature is expected to increase 3 to 4 degrees Fahrenheit by the 2030s and by 8 to 11 degrees Fahrenheit by the 2090s. Precipitation is expected to increase in the winter, yet "drier and lower latitude areas are predicted to become drier."

One variable (snowpack), the projected changes, the regional variation, the anticipated watershed response and potential consequences to watershed services are displayed in table 24.

Table 24. Projected climate change example

Projected changes	Regional variation	Anticipated watershed response	Potential consequences to watershed services
Less snowfall, earlier snowmelt, increased snowpack density	Most vulnerable are "warm snowpacks" at lower elevations and lower latitudes.	Higher winter flows. Lower summer flows. Earlier and smaller peak flows in spring. More frequent rain-on-snow flooding in some areas. More erosion of areas previously protected by snow. Changes in stream channels because of altered flows and modified sediment and wood inputs. Altered patterns of groundwater recharge.	Changes in the amounts, quality, and distribution of aquatic and riparian habitats and biota. Decreased capacity for hydropower generation in summer when demand is greatest. Changes in the availability of water supplies. Decreased quality of water supplies, increased treatment costs. Decreased reservoir storage. Decreased soil productivity. Potential for increased frequency of toxic blue-green algae in lakes and reservoirs. Altered recreational and cultural experiences.

Many other variables (in addition to snowpack) have been analyzed in *Water, Climate Change, and Forests* (General Technical Report, USDA 2010). Please see this technical report for a more in-depth review of all the climate variables and the projected changes and potential consequences to watershed services.

Population and Water Use in New Mexico

Population has nearly doubled in the United States from approximately 150 million in 1950 to just over 300 million people in 2005 (USGS 2005). Based on information compiled from the census.gov website, population in the six-county region encompassing the Santa Fe NF has increased 14.5 percent from approximately 315,000 people in 2000 to approximately 368,000 people in 2010.

From the USGS Circular 1344, the *Estimated Use of Water in the United States in 2005* (USGS 2009), the following facts were compiled for New Mexico:

- 3.73 million acre-feet (AF) of total water withdrawals; 84.5 percent was for irrigation, 8.6 percent was for public water supply and the remaining 7 percent was for domestic, livestock, aquaculture, industrial, mining, and thermoelectric power.
- 3.15 million AF of water withdrawals for irrigation. Fifty-five percent was supplied from surface water, and 45 percent was supplied from groundwater.
- 321,000 AF of water withdrawals for public water supply. Eighty-seven percent supplied by groundwater, and the balance supplied by surface water.
- 36,000 AF of water withdrawals for domestic water supply. One hundred percent supplied from groundwater.

- 57,000 AF of water withdrawals for livestock. Ninety-four percent supplied by groundwater, and the balance supplied by surface water.

The estimated use of water in the United States in 2010 was recently made available on the USGS website. This information will be reviewed and incorporated into the planning process as it moves forward. One thing for sure, as population increases, the demand for water will also increase.

New Mexico State Water Plan – 2013 Review

The recently released New Mexico State Water Plan (OSE, ISC 2013) does an excellent job of discussing the framework and issues surrounding water. The following excerpts were pulled from this plan to highlight some of the challenges and planning that is underway. It also defines a way forward in meeting stated goals, and it identifies the need for collaboration.

> "New Mexico's surface water supplies are limited and highly variable. Most, if not all, of the surface water in New Mexico is dedicated to existing water uses and there is little to no "new" water available to meet future demands. In fact, in most areas of the state, for a new use of water to begin an existing use must be retired, meaning that the existing use must permanently end."
>
> "Ensuring water is available to provide safe and adequate supplies for all New Mexicans is a fundamental goal for the state and is critical to the current and future economic viability of our state and its citizens. New Mexico uses a variety of mechanisms, including state, federal and local programs, to protect and restore the quality of its surface and ground waters."
>
> "In a state where water increasingly is either scarce due to drought, or abundantly available due to flooding, planning for our water future is imperative at both the local and state levels."
>
> "With the intent to update the plan for 2010, the Interstate Stream Commission held 22 public meetings throughout New Mexico to solicit public comments about key water issues for the plan update. Common issues expressed at multiple meetings included:
>
> - support for water conservation,
> - water quality protection,
> - better subdivision and land use regulations (to protect water supplies)
> - watershed management
> - public education
> - better coordination between state and federal agencies, and
> - protection of the agricultural sector."
>
> "The Interstate Stream Commission has revised the 1994 Regional Water Planning Handbook to provide a common technical platform and process for updating the 16 regional plans. Regions will be responsible for identifying water projects, programs, and policy priorities. Stakeholder involvement will provide the continuity between local, regional, state, and federal water planning efforts so that policies are informed throughout the planning process (NM ISC 1994)."

Conditions on the Santa Fe National Forest

The watershed condition assessment evaluated the sub-watersheds within the Santa Fe NF in 2010. This assessment found that 90 percent of these watersheds were functioning-at-risk, just less than one percent of the watersheds were impaired, and nearly 10 percent were functioning properly. For an explanation of the assessment process and its results, please refer to the Assessment report.

The New Mexico Environment Department (NMED), Surface Water Quality Bureau uses data to determine if state surface water quality standards are being met and to ensure that designated uses are supported. Standards and designated uses (for example, cold water aquatic life (e.g., trout) or domestic water supply) are established by the New Mexico Water Quality Control Commission (WQCC). Water quality parameters generated are used extensively for reporting obligations to the WQCC and the United States Environmental Protection Agency (US EPA).

NMED has listed 350 miles of streams within the Santa Fe NF as impaired (exceeds established criteria, referred to as 303d streams) in 2012. NMED also reported in 2012 that approximately 785 miles of streams and approximately 125 acres of lakes within the Santa Fe NF have a water quality concern (potential to exceed or previously exceeded established criteria) (NMED 2012). For further information on these listed stream segments and lakes, please see the Assessment report or the NMED website.

Conclusion

The importance of the surface water (stream network) system at any scale cannot be understated. "New Mexico's surface water supplies are limited and highly variable. Most, if not all, of the surface water in New Mexico is dedicated to existing water uses and there is little to no "new" water available to meet future demands. In fact, in most areas of the state, for a new use of water to begin an existing use must be retired, meaning that the existing use must permanently end (OSE, ISC 2013)." In the Western United States, 65 percent of the water supply comes from forests. Again, the total number of perennial stream miles on the Santa Fe NF account for 29.3 percent of the total perennial stream miles covering the 8 sub-basins. This fact demonstrates the importance the Santa Fe NF plays in maintaining and sustaining its perennial streams both at the local and broader landscape scales.

Current trends of a reduced proportion of winter precipitation (snowfall) along with earlier spring snowmelt are predicted to continue and possibly increase in effect. These factors may result in reduced groundwater recharge and changes in the magnitude, frequency, and duration of streamflows.

Ground water levels have declined due to both withdrawals and recent drought conditions, primarily on the private lands outside the National Forest boundary. Population growth, along with predicted drought impacts will continue to increase the demand on the groundwater resource. It is likely that proposals to construct diversion facilities for groundwater and storage for water supply will also increase on or immediately below the Santa Fe NF.

Water is essential to all of life. As presented herein, water provides a variety of ecosystem services not just to the human race but also to all of the water-related dependent resources both on and off the Santa Fe NF. The question was posed in *Water, Climate Change, and Forests*, "What is the value of water?" According to Brown, "a lower bound on the total value of water from national forests alone is estimated to be several billions of dollars per year (Brown, 2004). Yet the report goes on to say that "an accurate estimate of the total value is impossible to achieve."

Ecosystem Services

In Volume I, the foundational supporting and regulating services provided by functioning watersheds were discussed in detail. Of 1,180 miles of perennial streams on the SFNF, 270 miles have been given outstanding natural resource waters standing; and of 7000 acres of wetlands, 1,810 acres have also been labelled outstanding. On the other hand, 1, 135 miles are listed as impaired or having a water quality concern; and fully 90% of watersheds are showing as at-risk. These are important factors to acknowledge

when reading the Volume II information about water in its provisional aspect, directly supporting human communities through drinking water, household and business uses, and agricultural uses.

About 3,850 water rights are held across the SFNF, with over 2,600 of those privately held. Beyond the forest boundaries, the 6-county area has 60,000 water rights locations in the state database. Twenty miles of acequia are also present on the forest. Both on and off-forest, drought has impacted water supply and quality, with below-normal surface discharge since the early 2000's. Aquifer recharge is considered low, leading to groundwater depletion. Area population has grown by almost 15%, creating greater pressure on these already-stressed systems, with more wells, diversions and other developments. Some land-use plans now carry a water sufficiency requirement for proposed subdivisions, which may slow the current land conversion rate somewhat. The state has already declared that no new water is available, requiring relinquishment of one water right for any new application.

Water quality is also critical, in both its provisioning and cultural service aspects. Again, extreme wildfires and associated erosion and/or flooding negatively affect water quality. On-forest uses listed as potential risks include roads and wastewater systems, especially those with high levels of deferred maintenance, and stock developments. Fracking has become a concern with the public as well. Water standards for contact recreation like swimming require the same quality as for drinking water. In the arid northern New Mexico, water is a primary recreational attractant, bringing friends and families together to enhance social ties and share a respite from urban lives. Historically, waterways have provided the routes linking peoples and resources across landscapes, and this connection offers interpretive opportunities to help residents and visitors better understand the many ways water has been significant through time. Beyond the many recreational pursuits—boating, floating, fishing, swimming—tied to water, other cultural services rely on supplies of high quality water. Both the sights and sounds of clear water, along with the associated riparian system trees and wildlife, are often cited as valued amenities drawing people to live in communities surrounding the forest. Springs especially have an ancient attachment to the sacred for many area peoples.

Protecting this wide array of ecosystem services will require ever stronger collaborative relationships among the many beneficiaries of the water resource, including among those varied entities along each waterway that carries stewardship responsibility for its management.

Fish and Wildlife

The Santa Fe National Forest manages fish and wildlife habitat that is critical to species whether they are found nowhere else or whether they readily move across ownership borders. Healthy ecosystems on land, air and water are necessary to continued provision of the many benefits people receive from fish and wildlife species. Over the past several decades, there has been an increasing recognition of the broader ecosystems services provided by wildlife, including supporting services such as nutrient cycling and seed dispersal; regulating services such as herbivory and pollination. Information on the underlying ecosystems was discussed in Volume I. This section will focus on direct human benefits: the provisioning services such as meat, antler, or bone; and cultural services including recreation, cultural traditions, or spiritual inspiration.

Wildlife and fish resources have long been directly used by people, providing substantial economic and nutritional benefits. Traditionally, views on wildlife resources were utilitarian and commodity-oriented. Wildlife provided not only food, but material for clothing or traditional garments, parts of tools or implements (awls, spoons, knife handles, decorative items, etc.). Values about wildlife have changed over the past several decades, with transitions away from utilitarian views being noted across the United States.

Understanding how wildlife-associated recreation and social importance are changing along with socio-demographic change and how these shifts will affect management of resources and wildlife communities is essential to ensure science-based policy and informed decision making. This section of the assessment will include information about legally-harvested species, habitat improvement projects, bird and wildlife watching, commonly-used plants, rare plant habitat and socio-economic contributions provided by this resource area. It will conclude with an overview of the cultural and provisioning services and any indications of risk to sustainability for these topics.

Current Condition and Trends of Legally Fished and Hunted Species

Species listed here are regulated by the NM Department of Game and Fish, and the Forest Service works collaboratively with the state in managing their habitat to respond to various ecosystem drivers. The hunted species are classified as big game species, but a few are also classified trophy species. Trophy species are limited in opportunity to hunt by their lower numbers and have higher demand and higher license fees. They all occur on the Santa Fe NF.

Rio Grande Cutthroat Trout, Rainbow Trout, Brook Trout, and German Brown Trout are found in streams and lakes on the forest. The Rio Grande cutthroat trout is on the 2013 USDA Forest Service Region 3 Regional Forester's sensitive species list (USDA Forest Service 2013). It is the native trout of the Rio Grande and its tributaries in New Mexico. It is limited in distribution on the Forest; however, several small streams in the Pecos Wilderness and the west side of the forest have populations of Rio Grande cutthroat trout. They are insectivorous and adapted to the smaller streams and insect food sources available. They do not compete well with the non-native German brown trout or Brook trout which are more piscivorous (consume other fish) and feed on juvenile Rio Grande cutthroat trout where they occur in the same streams. German brown trout tolerate warmer water and higher sediment loads than Rio Grande cutthroat trout and may be more prolific in many of the lower portions streams on the forest where habitat may be marginal for Rio Grande cutthroat trout. Rainbow trout also are not native fish of New Mexico. They are closely related to Rio Grande cutthroat trout and they are able to cross-breed with them. The result is hybrid fish referred to as "cut-bows." Rainbow trout can eliminate a pure population of Rio Grande cutthroat trout through cross-breeding. They are hatchery raised by NMDGF to meet angler demand and are stocked in streams and lakes. In 2012, NMDGF transitioned all stocked Rainbow trout to triploid (sterile) strains to help limit future

impacts on native trout species. NMDGF raises Rio Grande cutthroat trout at the 7 Springs Hatchery to stock out in select lakes and streams for restoration projects and recreational fishing.

The trout species are stable in most streams but have declined or been eliminated in some of the streams impacted by large fires and post-fire floods since 1996 starting with the Dome Fire. All streams with trout are open to fishing on the Santa Fe NF. Special regulation waters for limited bag limit or special tackle restrictions exist in several areas on the forest.

Fishing and related spending in New Mexico based on 2011 data is estimated at $397,208 annually (US Census Bureau 2011).

Rocky Mountain Bighorn Sheep occur on three ranger districts, Española, Pecos-Las Vegas, and Jemez. The Jemez District bighorns were just reintroduced to the Jemez Mountains by NMDGF in August 2014, after an absence of over 100 years. The bighorn sheep use very open vegetation or high elevation habitat types. During summer in the Pecos Wilderness, they are frequently encountered in higher elevation meadows and open forests with forage in the understory. During winter, they remain at higher elevation using areas that are windswept or south aspect slopes to obtain forage and live off fat stores put on during summer months.

These are trophy animals under NMDGF state regulations. They are a once-in-a-lifetime hunt and bring in very high revenue to the state. Licenses are very limited in number and are issued to applicants through a draw system. Only 16 Rocky Mountain bighorn sheep ram licenses were issued in 2014 statewide. Two licenses for New Mexico are auctioned annually through the Wild Sheep Foundation. The successful annual auctioned license is regularly sold at over $50,000 dollars each. The successful bid in 2013 was $180,000 for a Rocky Mountain bighorn sheep license in New Mexico. These funds come to the state for bighorn sheep management actions, habitat improvement, and research. State and Transition Simulation Modeling Tool (STTMT) modeling of vegetation types conducted for this assessment indicated that bighorn sheep habitat (montane/subalpine grassland) is currently in low departure from reference condition and under current management are predicted to remain in low departure over time.

Mountain Lions, also known as cougars, occur in each of the five ranger districts. This is a trophy species which brings in revenue to the NMDGF. They are hunted annually on the Santa Fe NF. The forest is encompassed by two cougar management zones that actually go beyond the forest boundary. The number of licenses issued per cougar management zone is set by NMDGF. The mountain lion is a wide-ranging and elusive animal. Hunting it involves hiring local guides with trained dogs. Mortality must be reported immediately. When the quota or the success within 90% is reached for a cougar management zone, the hunt in that zone is closed for the season (March 1 to April 30). Costs associated with hunting, such as hiring a guide, gas, lodging, food and other items, is revenue that passes to the local community. The species is found in a variety of habitat types. Information in the database “Biota Systems of New Mexico” (BISON-M (http://www.bison-m.org/)) states that mountain lions frequently use rough, rocky terrain for denning sites (BISON-M, 2013). Mule deer are reported as common prey for mountain lions in New Mexico (BISON-M, 2013), and therefore, trends in those populations are likely to affect mountain lions. The population objectives set by NMDGF for 2011 to 2015 for the two cougar management zones on the Santa Fe NF are to “Manage for stable to decreasing cougar populations.”

Elk occur on all the ranger districts and use a variety of different habitat types. During the summer, they are frequently encountered in higher elevation meadows and forests with a grass understory. During winter, they typically move to lower elevation piñon-juniper woodlands, mixed conifer, grasslands, or desert scrub (BISON-M 2013). They eat predominantly grass, but rely on denser areas

of shrubs and trees for cover. More hunting licenses are sold for this species than any other; providing habitat for elk is a socially and economically important contribution to the area. Elk are stable to increasing on the forest. STTMT modeling of vegetation types conducted for this assessment indicated that these habitats are currently in low or moderate departure from reference and under current management are predicted to remain the same over time.

Mule Deer occur on all of the ranger districts. They also use a variety of different habitat types, although they tend to prefer open areas and patch edges with a higher preponderance of shrubs and forbs (BISON-M 2013). This species has been identified by NMDGF in the Comprehensive Wildlife Conservation Strategy of New Mexico (CWCS) New Mexico Department of Game and Fish 2006) as "Species of Greatest Conservation Need" (http://www.wildlife.state.nm.us/conservation/comp_wildlife_cons_strategy/cwcs.htm).

The term a "Species of Greatest Conservation Need" is applied to species that were identified by the NMDGF through a process looking at the ranking of the species through national databases, habitat, and threats to the habitat, climate and other factors. The CWCS states that threats to mule deer include habitat loss, fragmentation, ecological succession, and drought.

Mule Deer are predominately browsers and their diets consist of forbs (leafy, non-woody plants) and browse (leaves and twigs of shrubs and trees) (Watkins et al. 2007). Mule Deer are hunted on the forest but are not as numerous as elk. They are one of the primary species that provide food to local hunters and revenue to the community. STTMT modeling of piñon-juniper conducted for this assessment indicated that this habitat type is in low departure from reference condition and under current management is predicted to remain so over time.

Wild Turkeys are found throughout the five districts and are associated with a variety of different habitat types, including mixed conifer and spruce-fir forests as well as piñon-juniper woodlands and various grassland types (BISON-M 2013). Ponderosa pines are identified as an important mast tree and favored roosting tree (BISON-M 2013). Turkeys are very mobile and not tied to a particular habitat type. They seek out foods advantageously and move to areas that are favorable. Habitats and populations are relatively stable and are expected to remain stable over the next 20 years. Hunting of turkeys has increased over the past ten years as their population has expanded, providing social and economic benefits. Annual populations often fluctuate, depending on annual nesting success tied to favorable weather when poults are newly hatched in spring.

Black Bear are common in the five districts and are typically found in nearly all forested habitat types including mixed conifer, ponderosa pine, piñon-juniper, oak woodland, and spruce fir (BISON-M 2013). They typically feed on mid-seral fruit-producing shrubs, grasses and forbs; these food sources are enhanced by fire (BISON-M, 2013). Black bears have been identified by NMDGF as a "Species of Greatest Conservation Need" and threats to the species include upland habitat conversion/loss, drought, and human conflicts (New Mexico Department of Game and Fish 2006). They are hunted on the Forest often with the use of local guides, which may be a once-in-a-lifetime experience for many visitors. The population on the Forest is stable and a few bears are relocated every year from urban areas to remote areas on the forest.

Habitat Stamp Program Wildlife Enhancement Projects on the Santa Fe NF

The Sikes Act is a Federal law that permits state wildlife agencies to require hunters, anglers, and trappers using Forest Service or Bureau of Land Management lands to purchase a "stamp" in addition to the normal hunting/trapping/fishing license (New Mexico Administrative Code (NMAC) Title 19 Chapter 24

Part 6). Funds collected from these habitat stamps are then redirected to the public land management agencies. The funds are used to construct, create, and maintain habitat improvement projects.

Agency biologists and other specialists prepare project proposals each year. Projects are reviewed and prioritized by a Citizen Advisory Committee and are often implemented, monitored, or maintained by volunteers. Implementation is also done by Forest service personnel or awarded contracts. A number of projects are located on the Santa Fe NF and include: rainwater catchment tanks and drinkers (Jemez, Cuba, and Coyote Districts), habitat improvement such as manual thinning or prescribed burning (Española, Jemez, and Coyote Districts), fence installation to protect spring water quality and sensitive wildlife areas from livestock (Coyote, Pecos-Las Vegas, and Española Districts), fisheries improvement projects (Pecos-Las Vegas District) and installation of informational wildlife signs on projects. Since 1992, approximately $1,271,600 has been spent on wildlife habitat improvement projects on the Santa Fe NF according to the NMDGF HSP Implementation Reports 1992-2014.

Current Conditions and Trends of Commonly Observed Species and Important Bird Areas

Bird watching or "birding" during the last decade or more has become an increasingly recognized recreational activity with revenues generated to the surrounding community. According to the report *Birding in the United States*: *A Demographic and Economic Analysis*, 21 percent of New Mexico residents 16 years and older self-identified as birders. New Mexico is listed as having 415,000 birders, 78 percent resident and 22 percent non-resident (USDI FWS 2011). The economics of birding is the cost of equipment (including backyard equipment such as feeders, cameras, and bird houses), travel, gas, fees, food, lodging, and more. Nationally, birding trip-related expenditures were $14.9 billion. Total trip and equipment expenditures were $40.9 billion (USDI FWS 2011).

Important bird areas (IBA) are designations created by National Audubon Society and Bird Life International (http://web4.audubon.org/bird/iba/iba_intro.html) to recognize the importance of specific areas for breeding or migrating birds (National Audubon Society 2014 (http://web4.audubon.org/bird/iba/iba_intro.html)). These sites provide essential habitat for one or more species of birds for breeding, wintering, or migrating. IBAs range from a few acres to thousands of acres and may include public or private land or both. Throughout New Mexico, 62 IBAs have been identified and they span four bird conservation regions: Sierra Madre Occidental, Chihuahuan Desert, Southern Rocky Mountains, and Shortgrass Prairie. These are used by 375 species on a regular basis (the state has recorded 516 species). Another 140 species are irregular in occurrence or vagrants. There are currently six IBAs on or adjacent to the Santa Fe NF (National Audubon Society 2014 (http://netapp.audubon.org/iba/Map/US-NM)).

The IBA on or near the Santa Fe NF are:

- **Valles Caldera National Preserve** in the center of the Jemez Mountains contains large mountain grasslands and is surrounded by volcanic mountains and ridges. These contrasting habitats have both upland and grassland species that influence the surrounding national forest lands.
- **Bandelier National Monument** in the Jemez Mountains contains mature piñon-juniper and populations of black-throated gray Warblers.
- **Chama River Gorge/Golondrino Mesa** in the Jemez Mountains support water fowl, other riparian birds, and acorn woodpeckers. Bald eagles use the Rio Chama for wintering due to the waterfowl and fish available for winter food.
- **Caja del Rio** has extensive areas of juniper with known nesting gray vireo on the plateau. It also supports a diverse array of birds from hummingbirds to golden eagles. The only known population of burrowing owls is nearby on Santa Fe County property.

- **Santa Fe River Canyon below the Caja del Rio Plateau** is a narrow riparian area along the lower Santa Fe River connected to wetlands below Cochiti Lake. Riparian-dependent species use this area and the area provides ledges for cliff nesting birds such as the common raven. The area is not accessible to the public because the Forest does not hold a right-of-way access across the Kewa Pueblo (formerly known as Santo Domingo Pueblo) owned land to the canyon.
- **Randall Davey Preserve/Santa Fe Canyon Preserve** features a trail in upland habitat and in the canyon bottom, a restored river channel and ponded water with a riparian area of cottonwood and willow at the lower end of the Santa Fe Watershed. These adjacent areas are owned by Audubon Society (Randall Davey Preserve) and The Nature Conservancy (Santa Fe Canyon Preserve). Both areas allow public access.

Other birding opportunities on the forest include:

- **Santa Fe Ski Basin** where winter visitors have an opportunity to see gray jay, red-breasted nuthatch, mountain chickadee, and Clark's nutcracker.

Current Condition and Trends of Commonly Used Plant Species

- **Piñon nuts** or seeds have been a key dietary staple to people of the southwest and are still a popular food item available both in grocery stores and at road-side stands. New Mexico piñon are a source of food for many in the state and the New Mexico legislature passed the Piñon Nut Act in 1978 requiring labeling standards and instituting genetic research for piñon in the state.

  The public may gather piñon for personal use without a permit. Those interested in harvesting for commercial use (harvest more than 25 pounds of nuts) must obtain a permit from the Forest Service, but there are no permit records for this type of use in the last decade. Harvests over the last few years have been low because piñon nuts take approximately two years to mature on the tree and are highly susceptible to drought. In addition, die-off of piñon pines due to being weakened by drought and attacked by Ips beetles in New Mexico forests has further decreased seed production.

- **Christmas tree** cutting in the plan area is a popular winter pastime for many. The following species are commonly collected: piñon pine, Douglas-fir, ponderosa pine, blue spruce, Engelmann spruce, and sub-alpine fir. Trees may only be cut from specified areas and a Christmas tree tag (permit) for each tree is required. The public is asked to cut trees as close to the ground as possible and to not take just the tops of trees. Permits issued from 2008 to 2013 ranged from a high of 5,387 to a low of 3,829 permits with the average at 4,717 permits per year.

- **Wildflowers and Other Botanical Sightseeing.** The Santa Fe NF mountain ranges are popular and convenient destinations for wildflower viewing. The Celebrating Wildflowers website (USDA Forest Service 2014 (http://www.fs.fed.us/wildflowers/regions/southwestern)) states two areas for the Santa Fe NF—Las Conchas Trail and Santa Fe Ski Basin—and describes flowers that can be seen there. Another popular botanical viewing area is the Hyde Park Road, which is known for viewing wildflowers along the road and spectacular fall color when the aspen change to gold. Also see chapter 6, Designated Areas.

- **Forest Products Gathered for Medicinal and Ceremonial Use.** An Internet search (i.e., "Sangre de Cristo Mountains medicinal plants" and "Jemez Mountains medicinal plants") indicated that these plants are present. Guide books and Internet sites are available advising on plant identification, collection, and use. Traditional medicinal plant users routinely seek and collect plants from the plan area such as "osha" or Porter's lovage and "Spanish oregano," or wild bergamot. Tribal members also use the plan area to gather a variety of plant materials for traditional and ceremonial uses including fuel wood, green boughs, mushrooms, and herbs.

Mushroom gathering by wild mushroom enthusiasts is a very popular activity in late summer after the monsoon rains in forest areas close to Santa Fe.

Habitat for Rare, Endangered, Threatened, and Narrow Endemic Plant Species

The Jemez Mountains and southern end of the Sangre de Cristo Mountains in northern New Mexico are under the jurisdiction of the Santa Fe NF. These mountain ranges provide the only suitable areas in terms of altitude, aspect, slope, and soils for some narrow endemics. Some examples of rare endemic species are Springer's blazing star, tufted sand verbena, Pecos mariposa lily, and the Holy Ghost ipomopsis, a federally endangered plant. More information is available at (New Mexico Rare Plant Technical Council, 1999 (http://nmrareplants.unm.edu/ and the USDA Forest Service Region 3 Regional Forester's 2013 List of Sensitive Plants. A more complete discussion of habitat requirements and protections, including a number of specially designated Research Natural Areas highlighting key plant populations, is available in Volume I, and in the Assessing Designated Areas section of this report. Development of housing and sub-divisions, and conversion to agricultural on private land adjacent to and within the Forest during the last 27 years since the last Forest Plan was written further emphasizes the importance of the Santa Fe National Forest's role in maintaining habitat for special plant species that may not occur elsewhere.

Contributions of Commonly Enjoyed Species to Social and Economic Sustainability

Wildlife and plants on the Santa Fe National Forest contribute to social sustainability by promoting recreational and educational opportunities. They also provide for cultural aspects of social sustainability such as preservation of traditions, history, art, and traditional uses in the plan area. Pueblo people and rural residents rely on resources within the plan area for cultural and traditional uses. These are *cultural* ecosystem services and they contribute to social wellbeing and quality of life.

Wildlife and plants in the Forest contribute to economic sustainability as well by added employment opportunities, support of small businesses, and federal receipts shared with local governments. Hunting, fishing and wildlife watching make valuable contributions to local economies in purchases for both supplies and services (USDA Forest Service RPA 2010). The *2011 National Survey of Fishing, Hunting, and Wildlife –Associated Recreation* (USDI FWS, 2011) found that 783,000 New Mexico residents and nonresidents fished, hunted, or participated in wildlife viewing in New Mexico that year.

Of the total number of participants, 278,000 fished and 69,000 hunted. Around 566,000 participated in wildlife-viewing activities, which include observing, feeding, and photographing wildlife. The sum of anglers, hunters, and wildlife-viewers exceeds the total number of participants in wildlife-related recreation because many of the individuals engaged in more than one wildlife-related activity. Much of the Forest is remote, requiring the use of horses and outfitter guide services (USDOI, USFWS 2011). These participants contributed to economic sustainability in the plan area by spending approximately $881 million in 2011 (table 25).

Table 25. Comparison of expenditures in New Mexico by U.S. sports persons for 2001 and 2011

	2001	2011
Fishing	$224,146,000	$418,249,000
Hunting	$194,819,000	$136,264,000
Wildlife Watching	$709,098,000	$327,117,000
Total	$1,128,063,000	$881,630,000

Ecosystem Services

Fish and wildlife of all sizes have ecological roles and niches in many supporting and regulating services discussed in Volume 1, from cycling nutrients to creating soil. Certain species also, of course, have offered key provisioning and cultural services to humans across northern New Mexico for thousands of years. People still hunt and fish for subsistence purposes, or some choose wild meat for its health and wellness benefits. Because the pursuit of wild fish or game is a time-honored tradition in many communities or families, this activity also contributes to social cohesion as skills and insights are passed through the generations. In other cases, families and friends may experience the Forest's fish and wildlife without consuming it—learning to track or photograph or following the interactions and behaviors of various animals. Either way, area small businesses benefit from the economic contributions of people who seek guide services or gear and supplies to enjoy their chosen activities. Individuals, families and communities, through their interest in the wild inhabitants of the forest, become more connected to nature and the many resources found there. Some also derive spiritual connections through wildlife, another non-material benefit.

The Santa Fe is successfully providing habitat for 6 legally hunted big game or trophy species, 2 upland game bird species, and 4 legally-fished species (for ecological discussion of the status of the native cutthroat trout habitat, see Volume I). Mule Deer and Black Bear both have state status as being of conservation need due to habitat loss, fragmentation, ecological succession, drought, and for bear, human conflict. Their predominant habitat types on the Santa Fe NF, however, are stable. Potential risks to habitat are assessed in Volume I, and include primarily climate change and non-native species impacts. In the case of cutthroat trout, non-natives also have a direct competitive impact. For most of the species described in this section, these underlying ecosystem services are currently mostly stable on the Santa Fe but as particular Ecological Resource Units (ERUs) increase in departure from reference condition (See Volume I) the stability of that ERU may decline.

The Forest Service maintains a stewardship responsibility for the habitat of these valued animals, while the state manages wildlife populations and hunting and fishing programs. The state's Habitat Stamp Program contributes to various habitat improvement projects through a competitively awarded grant process. Some national data sources suggest a slight downward trend in consumptive fish and wildlife activities. Bird-watching is on the rise, however, and the greater Santa Fe NF area contains 6 Important Bird Areas, attracting visitors and economic contributions to local communities, as well as quality-of-life benefits for residents, including the wellness attributes of outdoor exercise and social benefits of group interactions with other birders (22% of New Mexico residents self-identify as bird-watchers).

Chapter 5. Recreational Settings, Opportunities, Access, and Scenic Character

Introduction

As directed under the Multiple Use, Sustained Yield Act, the national forests of the United States provide a diversity of outdoor recreation opportunities, connecting people with nature in an unmatched variety of settings and activities. Participation in recreational activities is what draws most people to the national forests, making it an important portal for understanding the meaning, history, and relevance of public lands as a whole. Recreation contributes greatly to the physical, mental, and spiritual health of individuals, bonds family and friends, instills pride in heritage, and provides economic benefits to communities, regions, and the nation. All of these contributions by recreation and scenery on the Santa Fe National Forest can be thought of as providing a host of *cultural* ecosystem services to society. And because many of the cultural ecosystem services are unique to the forest and limited off the forest, the value of these services is most certainly increasing.

The Santa Fe National Forest Recreation Facility Analysis (2007) identified the forest's niche as, "A Confluence of Landscapes and Cultures. Rising from deserts, meadows and grasslands, the mesas, canyons and peaks of the Santa Fe National Forest are a place for re-creation. Whether gathering of families or gathering piñon nuts and firewood, the forest is a *querencia* - a special place. The past meets the present in this environment where year round day use, water focused recreation and trail opportunities offer a refuge of cool mountain air. Use by many cultures imbues the Santa Fe with a rich historical heritage highlighted by special sites found throughout the forest."

Managing people instead of natural resources is what sets this program area apart from the more extractive programs. Rather than delivering products to locations off the forest, people come to the Forest to enjoy their recreation benefits. The setting of the forest, including water, a rare natural resource in New Mexico, is a welcome change from the surrounding high desert landscape for many.

This chapter will cover the diversity and enormity of recreation. It starts with settings from the Recreation Opportunity Spectrum, describing the goal to provide a diversity of natural settings for visitors to recreate in, and supporting various types of resource-related experiences. Next it will cover trends in recreation, types of recreational activities available on the Santa Fe National Forest, access and infrastructure, compatibility of activities, conditions and trends affecting the quality of recreation, and finally, a summary of the projected sustainability of these recreation resources on the forest.

In the second half of this chapter, aesthetics and scenery management on the Santa Fe NF is described. This section will cover the ongoing transition from the Visual Management System utilized in the current Forest Plan, which provided Visual Quality Objectives, to the more updated Scenery Management System. The ecosystems services section concludes the chapter, with a summary of key findings regarding the ability of the Santa Fe NF to continue providing quality services and benefits through these programs and the potential threats to sustainability.

Recreational Opportunity Spectrum

The Forest Service uses the recreation opportunity spectrum (ROS) to provide a spectrum of recreation opportunities that can be enjoyed in diverse settings. A recreation opportunity is the availability of a real choice for a user to participate in a preferred recreation activity within a preferred recreation setting, in order to realize those satisfying experiences which are desired (ROS Users Guide). Recreation

opportunities include non-motorized, motorized, developed, and dispersed recreation on land, water and in the air. The social, managerial, and physical attributes of a place, when combined, provide a distinct set of recreation opportunities.

The ROS provides a framework for defining the types of outdoor recreation opportunities the public might desire, and identifies that portion of the spectrum a given national forest might be able to provide (USDA Forest Service 1982). The ROS defines recreation settings based on social, managerial and physical attributes and arranges them into a continuum of six distinct classes. The classes include:

- **Primitive** areas are characterized by essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls including such things as railings for safety or traffic control, trail definition barriers, and in some cases signs. Motorized use and mechanized equipment within the area is not permitted. Primitive areas on the Santa Fe National are Pecos, San Pedro Parks, Dome, and Chama River Canyon Wildernesses (figure 29 and figure 30).
- **Semi-Primitive Non-Motorized** areas are characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Interaction between users is low, but there is often evidence of other users. These areas are managed in such a way that minimum on-site controls and restrictions may be present but are subtle. An example of this might be trail delineation by naturally appearing rocks to help keep people on a trail, or a native material fence or railing to keep visitors away from a hazard or to protect an area where resource damage may be occurring. An example of a Semi-Primitive Non-Motorized area would be White Rock Canyon just west of the Caja del Rio Plateau near Santa Fe (figure 30).
- **Semi-Primitive Motorized** areas are characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Concentration of users is low, but there is often evidence of other users. These areas are managed in a similar way as to Semi-Primitive Non-Motorized areas, and minimum on-site controls and restrictions may be present, but are subtle. Controls and barriers would be similar to Semi-Primitive Non-Motorized. Motorized use is permitted. Semi Primitive Motorized areas include areas generally surrounding corridors such as Glorieta Mesa or the Caja del Rio where dispersed recreation is frequent (figure 30).
- **Roaded Natural** areas are characterized by predominantly natural-appearing environments with moderate evidences of the sights and sounds of people. Such evidences usually harmonize with the natural environment. Interaction between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. There is generally no evidence of synthetic materials used. Facilities are rustic and rudimentary. Conventional motorized use is provided for in construction standards and design of facilities. An example of a Roaded Natural area on the Santa Fe National Forest is the area surrounding corridors (in the view shed foreground), such as the Santa Fe Ski Basin Road or Pecos Canyon road (figure 29 and figure 30).
- **Rural** areas are characterized by substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of people are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by large numbers of people. Facilities are often provided for special activities, such as amphitheaters, group pavilions, group fire rings and cooking units, and so forth. Moderate densities are provided far away from developed sites. Facilities for intensified motorized use and parking are available. Some facilities may be designed primarily for user comfort and

convenience. Some synthetic but harmonious materials may be incorporated. Design may be more complex and refined. An example of a Rural area would be the base area of the Santa Fe Ski Area (ski lodge and parking lots) (figure 29).

- **Urban** areas are characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resource modification and utilization practices are to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of people on-site are predominant. Facilities are mostly designed for user comfort and convenience. Synthetic materials are commonly used. Facility design may be highly complex and refined but in harmony or complimentary to the site. Large numbers of users can be expected, both on-site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site. Urban areas on the Santa Fe NF comprise less than 1% of the total land (200 acres).

These settings represent a range from very high probability of solitude, self-reliance, challenge and risk to very social experience where self-reliance, challenge, and risk are less important (USDA Forest Service 1982). The physical setting is defined by the absence or presence of human sights and sounds, size, and the amount of environmental modification caused by human activity. The social setting reflects the amount and type of contact between individuals or groups. The managerial setting reflects the amount and kind of restrictions placed on people's actions by the respective administering agency or private landowner (USDA Forest Service 1986).

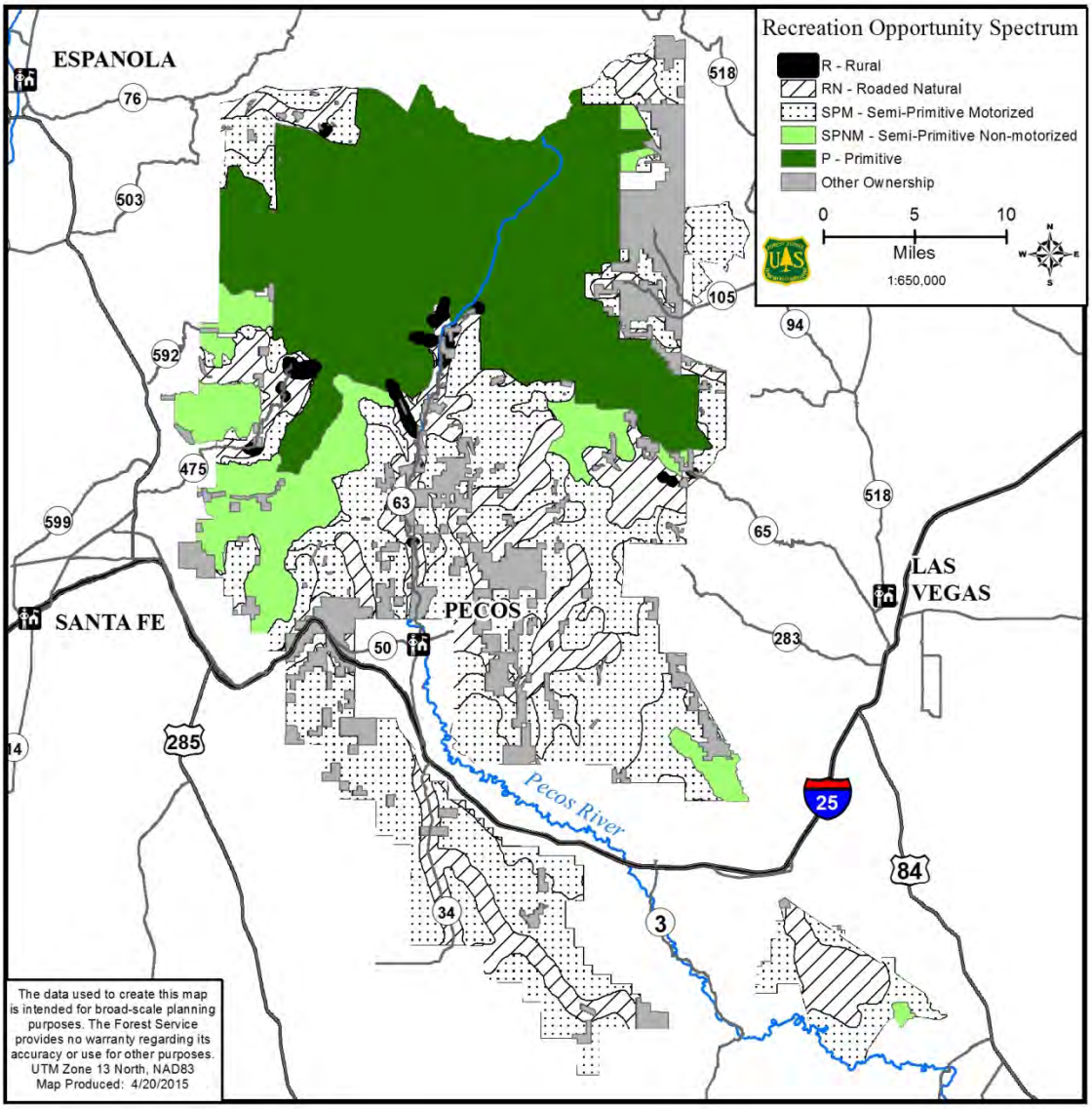


Figure 29. Recreation opportunity spectrum map, east side of Santa Fe NF

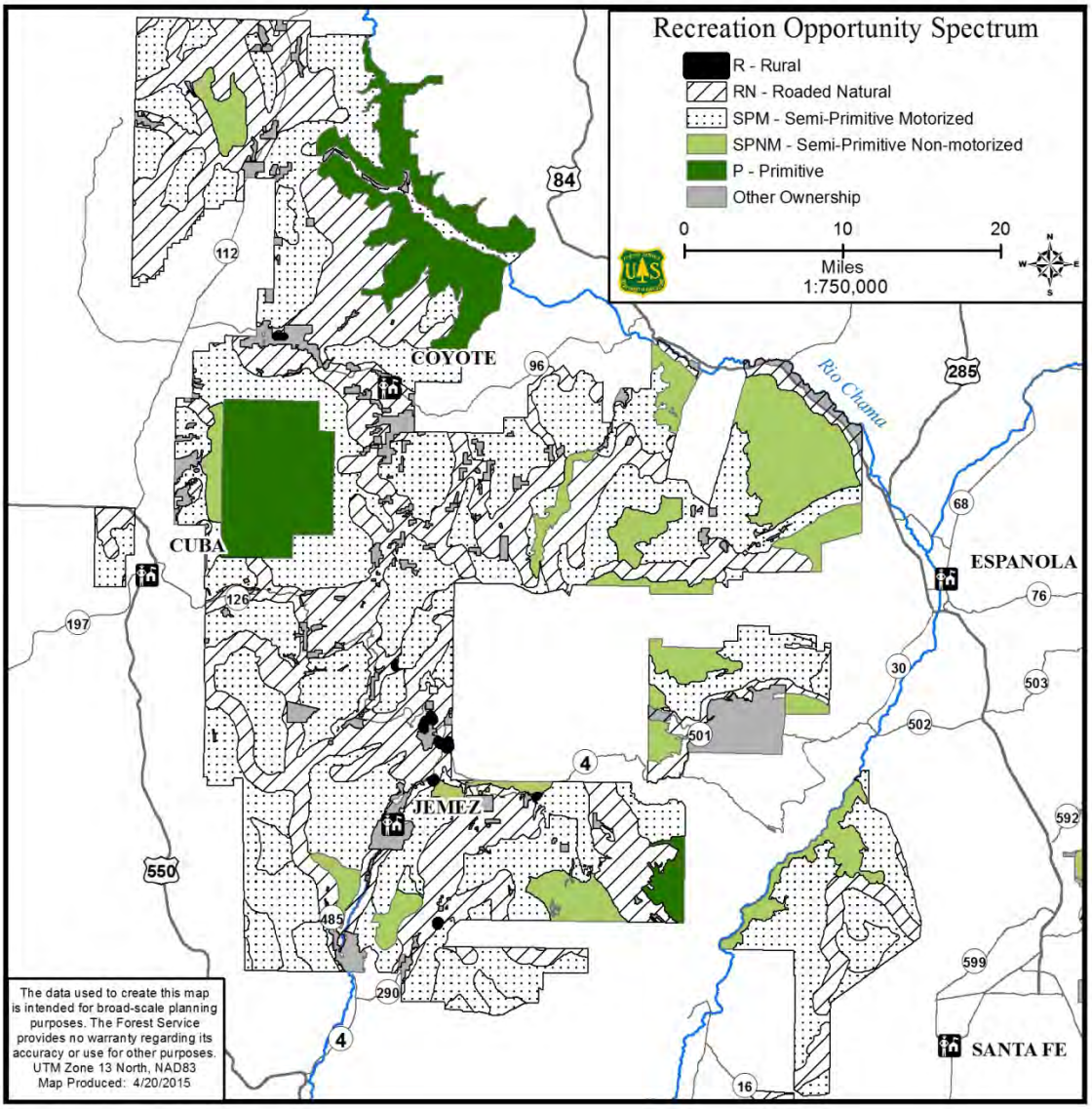


Figure 30. Recreation opportunity spectrum map, west side of Santa Fe NF

The ROS Users Guide was published in 1982 and expanded into the ROS Book in 1986. ROS classes were delineated and incorporated into the Santa Fe National Forest Plan (Forest Plan), which was published in 1987. Definition of the ROS classes was based on the criteria in the 1982 ROS Users Guide during the forest planning process, which included public involvement. The Forest adopted the ROS activity, setting and experience characterizations as described in the 1982 ROS Users Guide. About 37 percent of forest lands offer recreation opportunities in the semi-primitive motorized setting, 11 percent in the semi-primitive non-motorized setting, and about 33 percent in the roaded natural setting (table 26). About 19 percent of forest lands are in the primitive and less than 1 percent each in rural and urban settings (table 26).

Table 26. Recreation opportunity spectrum classes (in acres and percentage) on the Santa Fe NF and as established under the 1987 Forest Plan

ROS Class	Acres	Percentage Overall
Primitive (P)	292,329	19%
Semi-Primitive Non-Motorized (SPNM)	163,989	11%
Semi-Primitive Motorized (SPM)	575,952	37%
Roaded Natural (RN)	518,211	33%
Rural (R)	1,500	<1%
Urban (U)	200	<1%

The Forest's ROS classes have not been updated since the 1987 Forest Plan. Thus, it is possible that the existing inventory does not identify which areas are currently providing what kinds of opportunities. Part of the importance of ROS is to ensure the Santa Fe NF is providing diversity of recreation settings and opportunities that respond to public desires and expectations. In addition, the ROS helps managers ensure that activities people want to pursue are consistent with the desired recreation setting. However, types of recreation activities change over time (i.e., introduction of new activities), as does the popularity of recreation activities (i.e., some activities are more popular now than they were in the past). The Forest recognizes there is a need to re-inventory the recreation supply opportunities by ROS class, and anticipates making any necessary changes as needs for change are identified.

The Travel Management Rule (USDA Forest Service 2005), required each forest nationwide to establish a system of roads, trails and areas designated for motorized travel throughout the forest. After a lengthy Environmental Impact Statement was prepared, a decision was signed by the Forest Supervisor in June of 2012. This decision may lead to minor changes in the ROS mapping on the Santa Fe NF, but no major alterations are expected. The forest is currently in the process of reviewing the ROS class mapping with the new Travel Management designations in place.

The Santa Fe NF Wilderness areas (Pecos, San Pedro Parks, Chama River Canyon, and Dome) have been classified as Primitive areas in ROS.

Trends in Recreation

Numerous studies show outdoor recreation is a major component of many Americans' lifestyles, and participation in outdoor recreation activities has been on the increase since the Great Depression and World War II (Roper 2004, Cordell 2008). However, studies differ on whether participation in outdoor recreation activities has been increasing or decreasing since 2001. Some reports show a decline in recreation participation nationally beginning in 2001. Reasons suggested for this trend include travel concerns following the September 11, 2001 attack on the World Trade Center and the expansion of indoor recreation opportunities through the growth of computer games, the Internet, and television (Roper 2004). Alternatively, other studies show an overall increase in outdoor recreation participation, but a change in the mix of outdoor activities and their relative popularity. For instance, participation in some "traditional" outdoor activities (such as hunting and fishing) has been declining, and is being replaced by other activities such as wildlife or bird watching and photography (Cordell 2008).

All national forests nationwide go through a yearlong survey process every five years to determine visitation levels. This survey is known as the National Visitor Use Monitoring (NVUM) process. The Santa Fe NF has completed two cycles of the survey, one in 2003, and one in 2008 (results published the following years). The third survey cycle was completed in FY 14 and results are expected to be available in spring 2015. Based on results of the NVUM, recreation use on the Santa Fe NF for FY 2003 was

estimated at 1.36 million visits. Recreation use on the forest for FY 2008 had increased to 1.37 million visits (USDA Forest Service 2004, USDA Forest Service 2009). The primary reason for visitors who were surveyed is overwhelmingly recreation (figure 31).

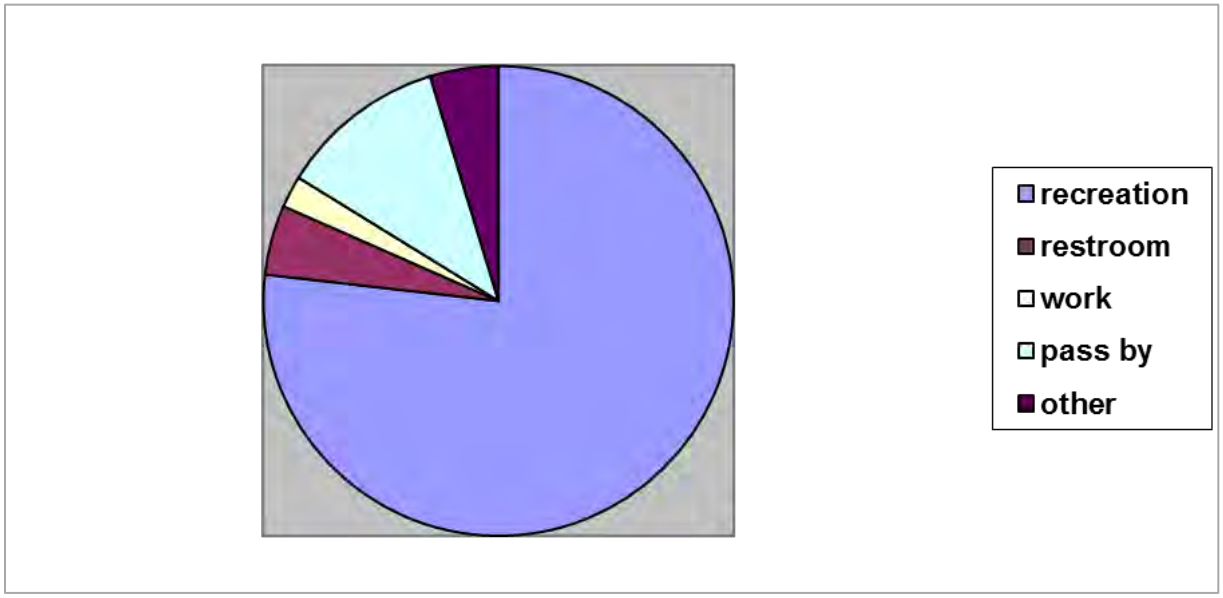


Figure 31. Purpose of visit by Santa Fe National Forest visitors who agreed to be interviewed as part of the 2008 National Visitor Use Monitoring survey (NVUM FY2009)

No unusual weather patterns or forest fires that could affect recreation use levels were noted for either the 2003 or 2008 survey. The small increase in recreation visits to the forest may have been a result of an increase in the population of New Mexico (10 percent between 2000 and 2010) (UNM-Bureau of Business & Economic Research 2013). However, the sampling design of the survey does not provide a sound basis for that conclusion.

The Santa Fe NF has five districts that are not all contiguous, and cover areas in six different counties. Each ranger district has portions of counties that are more rural in nature. These rural counties include Rio Arriba, San Miguel, and Mora. The U.S. Census Bureau showed a decrease in population from 2000 to 2010 in each of these three rural counties (table 27), likely due to the recession, which caused people living in rural areas to relocate to urban areas offering more abundant economic opportunities. Los Alamos County also had a slight decrease in population (table 27), most likely due to privatization of Los Alamos National Laboratory, the county's major employer. Only the population of Santa Fe and Sandoval Counties, the most populous and the most densely populated counties associated with the Santa Fe NF, increased during this period (table 27) (United States Census (Census.gov)).

Table 27. Population estimates for counties that include Santa Fe NF (U.S. Census data for 2000 and 2010)

County	2000 Census estimate	2010 Census estimate	Percentage Change
Los Alamos	18,343	17,950	-2%
Mora	5,180	4,881	-6%
Rio Arriba	41,190	40,246	-2%
San Miguel	30,126	29,393	-2%
Sandoval	89,908	131,561	+46%
Santa Fe	129,292	144,170	+12%
All	314,039	368,201	+17%

Types of Recreation Activities

Many different developed and dispersed recreational activities take place across the forest. According to the NVUM, some of the more popular activities include: hiking/walking, viewing natural features, viewing wildlife, relaxing, driving for pleasure, nature study, cross-country skiing, fishing, and downhill skiing (table 28) (NVUM 2009). However, it is important to note people's preferences for outdoor recreation activities change over time. In other words, what people choose to do now for outdoor recreation is noticeably different from choices made by and available to previous generations of Americans (Cordell 2008, Cordell 2012). Participants in the Values, Attitudes and Beliefs report repeatedly expressed concerns about the increase in popularity of motorized vehicle use, and the importance of providing non-motorized opportunities both within wilderness areas and outside of wilderness areas (Russel and Adams-Russel 2005). NVUM data from 2003 and 2008 (the only years for which data are available from the NVUM) do not support this perceived increase in motorized recreation; self-reporting by survey respondents actually indicated a decrease in total motorized activity (any vehicle which is self-propelled) from 25 percent to 13 percent. However, the sample design does not support statistically reliable conclusions about reported use trends from a small sub-set of respondents.

Table 28. Recreational activity participation as self-reported by visitors on Santa Fe NF in 2008 (NVUM FY2009)

Activity	% of visitors who participated in this activity	% indicating as their primary activity	Average hours per visit spent in primary activity
Developed Camping	5.3	2.3	22.2
Primitive Camping	1.9	0.4	15.2
Resort Use	0.7	0.0	5.7
Nature Center Activities	4.2	0.0	2.0
Nature Study	10.1	0.4	2.9
Viewing Wildlife	22.3	0.6	4.0
Viewing Natural Features	32.3	9.3	6.1
Visiting Historic Sites	2.7	0.1	2.0
Relaxing	21.7	4.3	17.9
Picnicking	7.9	1.7	3.0
OHV Use	0.4	0.0	0.7
Motorized Trail Activity	0.9	0.0	.
Snowmobiling	0.0	0.0	.
Driving for Pleasure	11.3	1.7	3.0
Motorized Water Activities	0.1	0.0	.
Other Motorized Activity	0.0	0.0	.
Fishing	9.3	5.3	4.3
Hunting	2.6	1.5	27.3
Gathering Forest Products	3.1	0.1	2.6
Hiking / Walking	66.7	51.1	3.0
Backpacking	1.9	0.7	34.9
Horseback Riding	0.5	0.1	3.9
Bicycling	2.6	2.0	2.6
Downhill Skiing	8.6	8.4	3.6
Cross-country Skiing	9.8	9.3	2.1
Non-motorized Water	0.9	0.8	5.9
Other Non-motorized	2.2	0.6	4.9
Some Other Activity	3.3	1.9	2.3
No Activity Reported	0.0	0.0	.

Motorized Recreation

From 1982 to 2000–2001, driving motor vehicles "off-road" became one of the fastest growing activities in the country, growing in number of participants over 12 years by more than 100 percent (Cordell, Betz et al. 2005). According to the Motorcycle Industry Council (MIC) reports, OHV annual sales more than tripled between 1995 and 2003, to more than 1.1 million vehicles sold in 2003. ATVs continued to account for more than 70 percent of the OHV market. The population of OHVs – 4-wheel drive Jeeps, automobiles, sport utility vehicles, motorcycles designed for off-highway use, all-terrain vehicles (ATVs) and other motor vehicles specially designed for off-highway use – in the U.S. grew nearly as fast, increasing 174 percent between 1993 and 2003 (figure 32) (Cordell, Betz et al. 2005). ATVs specifically were the most popular, tripling in 10 years (Dolesh 2004) and accounting for 70 percent of OHVs (not including 4-wheel drive vehicles) (Cordell, Betz et al. 2005). Based on the National Survey for Recreation and the Environment conducted in 2004, almost one quarter of Americans participated in OHV recreation at least once in the last year (Cordell, Betz et al. 2005).

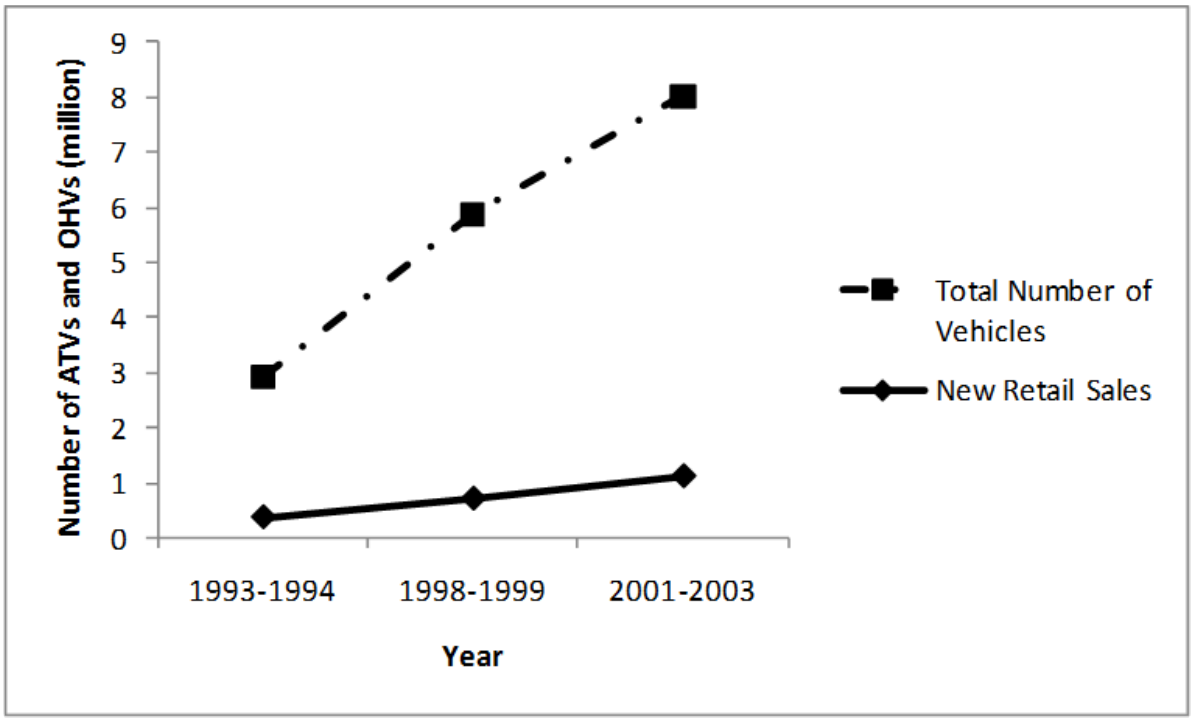


Figure 32. Number of new retail sales and estimated total number of off-highway vehicles in the United States, 1993–2003 (modified from (Cordell, Betz et al. 2005)

On November 9, 2005, in response to the threat of unmanaged recreation, the Forest Service published the final rule regarding management of off-highway vehicles (OHV) on National Forests and Grasslands. This rule prohibits cross-country or unrestricted travel by motorized vehicles, and requires the designation of roads, trails, and areas where motorized vehicles will be allowed. The Forest began an intensive collaborative effort in January 2006, to comply with the Travel Management Rule by making a decision (Record of Decision for an Environmental Impact Statement) regarding OHV use on the Forest.

After extensive public involvement, on July 28, 2012, the Forest announced the decision and released the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) to the public (USDA Forest Service 2012, USDA Forest Service 2012). This decision designated 2,255 miles of road, 208 miles of trail, and 41 acres of areas open to use by motorized vehicles; in addition 269 miles along the designated

road system were designated as open to motorized use for dispersed camping and big game retrieval, allowing vehicle travel within 150 feet of the centerline of roads indicated for this use on the required Motor Vehicle Use Map (MVUM). The Travel Management decision on the Santa Fe NF was controversial, as evidenced by the 25 appeals that were filed, and the current lawsuit from New Mexico Off-Highway Vehicle Alliance, where they are seeking to overturn the decision.

Motorized recreation is a valid use of national forests. The Forest Service recognizes unmanaged recreation, including OHVs, as a potential threat to the condition of the national forests. A managed system of roads, trails and areas designated for motor vehicle use will better protect natural and cultural resources, address user conflicts, and secure sustainable opportunities for public enjoyment of national forests and grasslands. The Santa Fe NF is committed to protecting the values and traditional uses of the people served by it. Some traditional, rural-life uses include tending livestock, firewood gathering, and picking piñon. These activities will continue.

The Forest developed a comprehensive Travel Management Implementation Plan in 2013, which sets guidelines for education, signing, enforcement and evaluation, and monitoring. The Forest began implementing its July 2012 Travel Management Decision with distribution of the Motor Vehicle Use Map (MVUM) on April 15, 2013. As required, the MVUM has been reissued annually since then.

Although the Implementation Plan is in effect, implementation has been slow. It is expected that travel management implementation will be an on-going process. As with any significant change, it takes time to get the forest users educated and compliant. Although little formal monitoring has been accomplished, we do know that as we continue with education efforts, it is evident that more and more visitors are knowledgeable about the decision. Compliance seems to be improving as visitors are educated. We also know of areas (such as Glorieta Mesa, Medenales area, and Church Meadows,) where illegal cross-country motorized vehicle use continues to occur.

Some conflicts have been reported by hunters who have walked into an area only to have a motorized vehicle drive by and frighten game. There also have been continued reports of motorized vehicles in wilderness areas, especially the Pecos Wilderness.

Non-Motorized Recreation

Forest Service employees have noticed an increase in mountain biking popularity since the 1987 Forest Plan, most notably on the Española RD, and this activity will likely continue to increase elsewhere on the Forest within the next few years. In some cases, mountain bikers are traveling cross country and creating unauthorized routes. They also have actually constructed unauthorized trails. When located perpendicular to the slope of the natural terrain, these routes, known as fall-line alignments, trigger substantial rill and gully erosion because they essentially act as a drainage channel. Some pack and saddle users, as well as hikers and rock climbers are also traveling cross county and creating unauthorized routes with fall-line alignments, and this too is a concern with regard to soil erosion.

Rock climbing is a long-time activity which is growing in popularity on the Forest, especially in the Santa Fe, Los Alamos, and Jemez areas. Climbers share resources and information freely on the Internet and there are also books pointing out areas to climb on the Forest. The Santa Fe NF has not taken on a formal management process for climbing. Currently climbers are allowed to climb anywhere they would like. There are no current closures for climbing.

Recreational shooting, a form of dispersed recreation, takes place on each district. This activity has proven to be a safety hazard in two areas on the Forest because of proximity to dwellings. One area (Glorieta Mesa) currently has a closure order prohibiting the discharge of firearms. The Caja Del Rio area has had a closure in the past, and analysis is underway to consider reinstating that order. The Santa Fe NF

has also been approached by shooting groups and law enforcement entities about developing a shooting range. This subject needs more data collection.

Hang gliding is another activity that occurs on the Forest. Most of this use takes place along the La Bajada escarpment and Tetilla Peak area of the Española Ranger District. Although this activity may not produce many effects on its own, travelling off of designated roads for motorized use is common for the participants to reach launch sites. Recently, a launch site which had been constructed illegally with features (wind sock, tie downs with concrete, etc.) was discovered in an area where many archeological resources are located.

Dispersed camping occurs throughout the ranger districts and motorized dispersed camping is permitted in accordance with the Travel Management decision. There are 9,807 acres of designated dispersed camping corridors on the motorized vehicle use map (figure 33). Additional dispersed recreation activities include hiking, mountain biking, hunting fishing, trapping, bird watching, site seeing, pleasure driving, 4-wheeling, horseback riding, rock crawling, geocaching, fishing, boating, snowshoeing, cross country skiing, snowmobiling, sledding and target shooting.

There is a growing interest in adventure races and similar events such as boot camps, mud events and endurance races. These events are usually held by “for profit” organizations but some are conducted as fundraisers. The types of activities associated with these events may include: running, bicycling, paddling, climbing, orienteering and other activities that require endurance, strength and agility. These types of activities if commercial, or group size exceeds 75, or competitive in nature, require a Special Use Authorization. Authorizations can prescribe location of activity, sanitation and safety measures, or other resource or social protections.

Other factors that may affect the demand for recreation in the plan area includes the growing interest in zip lines, geo- or eco-tourism, expanding use at ski areas beyond the traditional winter season, and so forth. Depending on where these activities may surface and, if not managed, they could exacerbate the environmental and social stressors addressed throughout this chapter, resulting in increased degradation of the natural resources. Unmanaged activities could displace current recreationists entirely to other areas. If activities such as these are managed appropriately, the impacts could be positive. Additional visitors could contribute to the local economy and appropriate levels of management will ensure that current users are not completely displaced. Ski area expansion into nontraditional seasons of use would be an example of bringing in new (or more) visitors which would not conflict with existing use due to the time of year new activities are being introduced.

Not only do certain recreational activities grow in popularity over time, but new and unique activities can also emerge that may raise new management concerns. For instance, geo-caching and zip-lining are activities that have emerged in the past decade. Management direction for these kinds of growing and new recreational uses is needed to ensure that the activities are sustainable and appropriate for the recreation setting where they are occurring, opportunities are available into the future and forest resources are protected from damage.

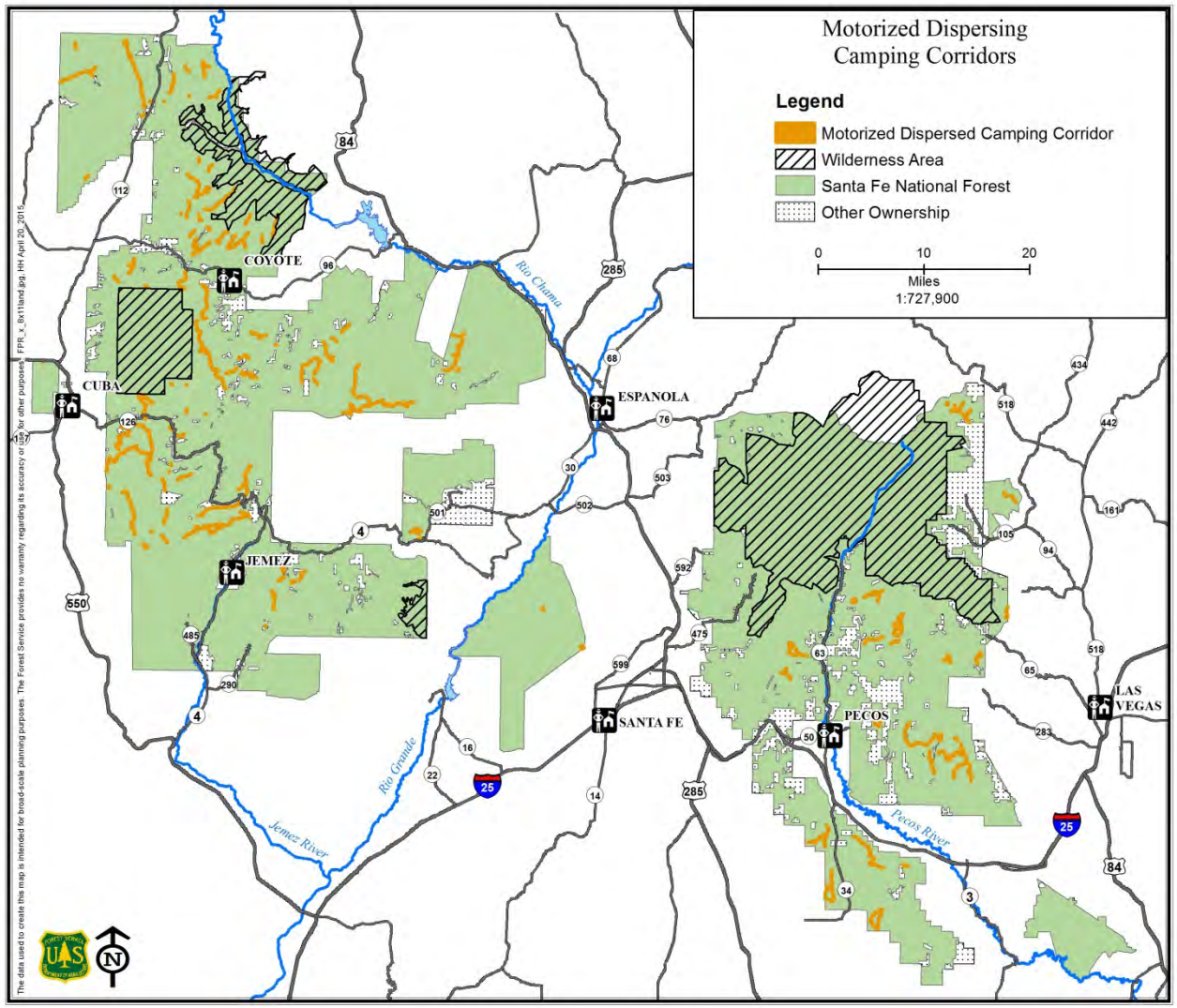


Figure 33. There are approximately 269 miles of motorized dispersed camping corridors (orange lines) on the Santa Fe NF

Compatibility of Different Recreation Activities

As established in chapter 3 of this volume (BBER 2013) and in other sections, population is increasing in New Mexico, and the Albuquerque metropolitan area is the fastest growing area in the state.

Participants in the Values, Attitudes and Beliefs Survey (Russel and Adams-Russel 2005) discussed multiple uses, the combination of increasing use resulting from population growth, and increased demand for limited recreational resources. Some of these factors result in the increased potential for one type of use to conflict with another (Russel and Adams-Russel 2005). Participants in the Values, Attitudes and Beliefs Survey were more concerned about conflicts between motorized and non-motorized uses. Participants also believed that many of the "problem users" simply lacked information about appropriate forest rules and regulations. Unauthorized routes continue to appear and are created by both motorized and non-motorized activities, such as OHVs, horses, and hikers. Mountain biking is becoming an increasingly popular activity. There is a variety of opportunities for bikers on the Santa Fe NF, but there is potential for conflict with other trail users, in addition to impacts to the resource if bikers travel off designated routes.

On the Santa Fe NF, user conflicts do occur. Most of the incompatibility of uses occurs between equestrians, mountain bikers, and hikers, especially on the trails surrounding the City of Santa Fe; uncontrolled dogs with equestrians and hikers; and shooting with adjacent use or residences close to the Forest.

Cross-country skiers and snowshoers can conflict when snowshoers use groomed cross-country trails. Conflicts arise by snowshoers making tracks on groomed ski trails, which severely compromise the benefit of grooming. Dogs also become an issue on these trails. Dogs tend to walk in the trails (the path of least resistance in snow) creating uneven surfaces and hazards for fast skiers who may hit the dog coming around corners. Nordic skiers generally do not bring their dogs along while participating in this sport for these reasons. Snowshoers, on the other hand, do not travel fast and do not need smooth trails so they can bring their dogs with no harm done to their sport.

Ecological-related conflicts can also occur, such as between rock climbers and peregrine falcons during nesting season.

Recreation on the Ranger Districts

Recreation occurs across all five ranger districts on the Santa Fe NF (figure 34). This section describes recreation on each district including developed recreation sites, dispersed recreation activities, recreation trends for the district, and popular or special recreational sites or activities.

Coyote Ranger District has 4 campgrounds with a total of 38 campsites, 2 interpretive sites, 3 boating (day-use) sites, 2 developed trailheads as well as several less developed trailheads and approximately 160 miles of recreational trails. Of these miles, there are two trails with national Designation; the Cañones National Recreation Trail (9.2 miles), and the Continental Divide National Scenic Trail (30 miles).

The Coyote RD is near several rural communities including Gallina, Coyote, Youngsville, and Abiquiu. Many of the residents of this area have used local campgrounds and dispersed recreation areas, as well as trails and forest roads, for generations to hunt, fish, camp, and conduct family reunions.

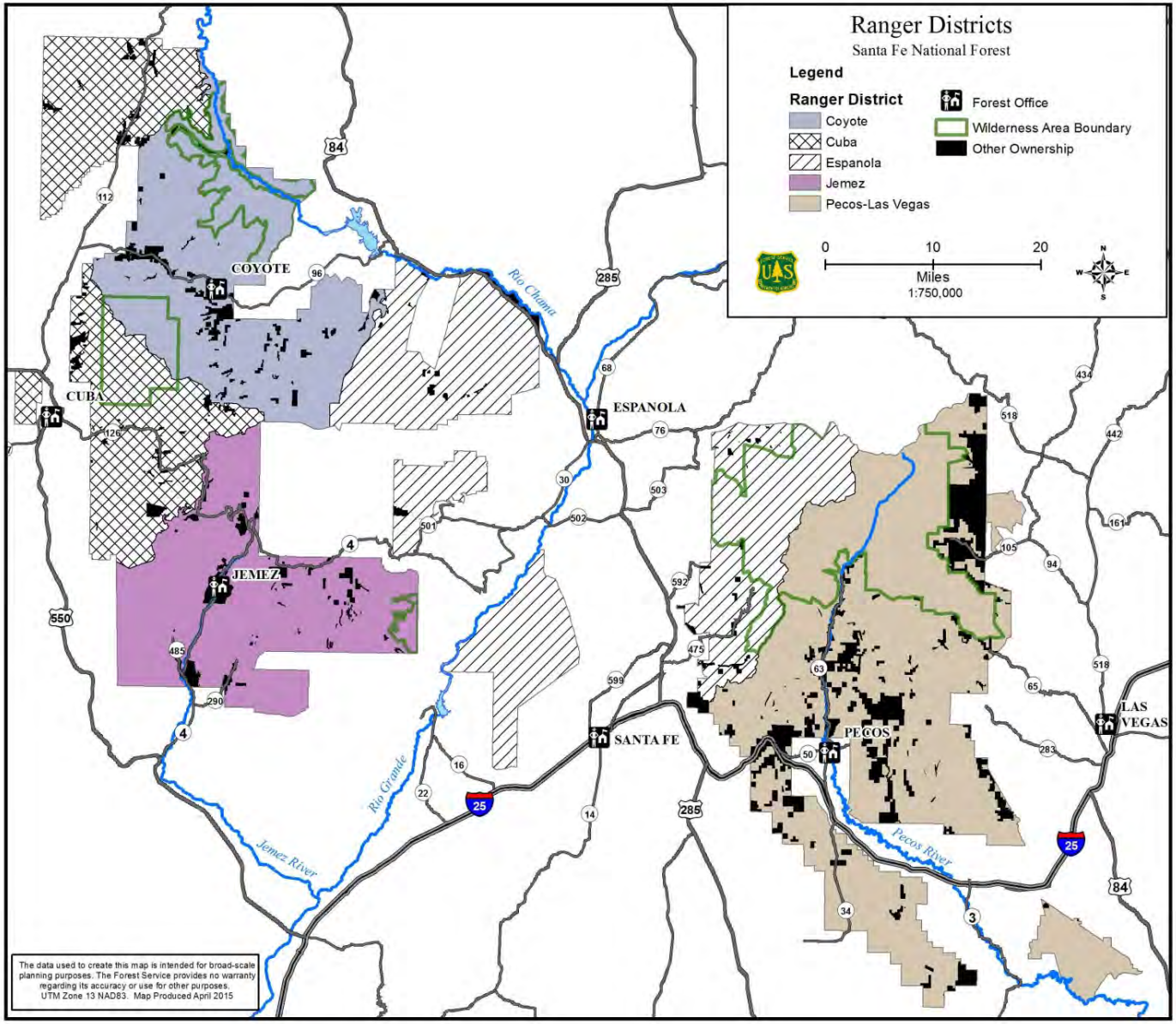


Figure 34. Location of ranger districts on Santa Fe NF

The District offers recreational opportunities year-round, with the highest visitation occurring during the summer and fall. Visitation spikes on major summer and fall holidays including Labor Day, Memorial Day and Fourth of July. Resumidero, Rio Puerco and Coyote Canyon campgrounds offer few amenities, but wonderful opportunities to experience the lush greens of the upper elevations of the district. Resumidero and Rio Puerco feature limited picnic tables and fire rings and may have portable toilets present during the summer months.

The Rio Chama Campground houses vault toilets, which are locked during the winter months. This campground also has picnic tables and fire rings.

The Coyote RD draws many visitors to its non-motorized boating (float boating) opportunities on the Rio Chama Wild and Scenic River. Boaters can float the river over several days, passing through Forest Service as well as Bureau of Land Management lands, or participate in day trips on the Coyote RD. The Rio Chama Wild and Scenic River passes through the Chama River Canyon Wilderness, providing spectacular views of colorful canyon cliffs, wildlife, and slot canyons (see chapter 6 for more on special designated areas). For hikers, the Ojitos Trail, which is part of the Continental Divide National Scenic Trail, presents a wonderful opportunity to hike through the Chama River Canyon Wilderness.

The boating activity on the Rio Chama through the Wilderness (non-day-use) portion of the river is partially managed by the Bureau of Land Management with a Memorandum of Understanding.

San Pedro Parks is shared with the Cuba RD. Several trails lead into the San Pedro Parks Wilderness including the Cecilia Trail, the Corralitos Trail, and the Rio Puerco Trail. The district has conducted limited maintenance on these trails over the past several years, and trail conditions may be poor (see chapter 6 for more on special designated areas).

Additional attractions on the district include several archeological sites such as Tsi'pin Owinge (see Important Recreation Sites section in this chapter) that offer unique views of the history and past of the landscape.

Hunting is quite popular both in and out of the San Pedro Parks Wilderness. Hunting brings many visitors to the area. As snow and ice begin to accumulate on forest roads, recreation use tends to decrease. Over the winter, skiing and snowmobiling may occur on the district. Use levels are low.

Cuba Ranger District has 2 campgrounds with a total of 29 campsites, 1 group campground with three sites, 1 picnic area with 4 sites, three developed trailheads, and 2 interpretive sites. This district has approximately 54 miles of recreational trails, including approximately 10 miles of the Continental Divide National Scenic Trail).

The Cuba RD is near several rural communities including Cuba, La Jara, and Regina. Many of the residents of this area have used local campgrounds and dispersed recreation areas, as well as trails and forest roads, for generations to hunt, fish, camp, hike, and hold family reunions. The Cuba RD is approximately an hour away from the urban area of Rio Rancho. Visitors from Rio Rancho and other areas in and around Albuquerque often travel to the Cuba area to participate in recreation activities including camping, fishing and hiking.

The district offers recreational opportunities year-round, with the highest visitation occurring during the summer and fall. Visitation spikes on major summer and fall holidays including Labor Day, Memorial Day, and Independence Day.

Clear Creek and Rio de las Vacas campgrounds are fee areas and offer potable water (via hand pump), vault toilets and trash cans. Both campgrounds are in proximity to creeks and stay relatively cool, even

during the hottest months. Fishing and wading are popular activities in both campgrounds. As of 2014, the campgrounds are under a reservation system.

There are several popular dispersed camping areas on the Cuba RD. Such areas include Church Meadows, an area often used by large groups such as family reunions, and a variety of sites along the Rio de las Vacas.

During the summer months, many visitors flock to the San Gregorio Reservoir. The reservoir is located one mile from the Vacas Trailhead and is nestled in the San Pedro Parks Wilderness. The reservoir is stocked with fish (via motorized vehicle, allowed in the Wilderness as per 1987 Forest Plan) by New Mexico Department of Game and Fish. 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.

San Pedro Parks Wilderness is shared with the Coyote RD. Several trails lead into the San Pedro Parks Wilderness for the Cuba RD including the Vacas Trail, the San Jose Trail, and the Palomas Trail. The district has conducted limited maintenance on these trails over the past several years, and trail conditions may be poor. Backpacking and horseback riding are popular activities in the San Pedro Parks Wilderness. The terrain is relatively easy for hikers and the open meadows, which the wilderness area is known for, offer great opportunities to view deer and elk as well as other wildlife.

Additional attractions on the district include several archeological sites such as the Nogales Cliff House and Rattlesnake Ridge ruins that offer unique views of the past and history of the landscape (see Important Recreation Sites section in this chapter).

Hunting is quite popular both in and out of the San Pedro Parks Wilderness. Hunting brings many visitors to the area. As snow and ice begin to accumulate on forest roads, recreation use tends to decrease. Over the winter, skiing, snowshoeing and snowmobiling occur on the district, but minimally.

Jemez Ranger District has 5 campgrounds with a total of 189 sites, 4 picnic areas with 55 sites, 1 group day-use site accommodating up to 100 people, 5 trailheads, 8 fishing accesses, 1 group campground with 2 sites which will accommodate up to 125 people, one informational kiosk area and one scenic overlook. This district has approximately 67 miles of recreational trails.

The Jemez RD has the majority of developed recreation sites on the Forest and generates approximately 60 percent of the forest’s annual recreation fee revenue. San Antonio Campground receives the highest occupancy use on the district throughout the summer and has a group camping area consisting of nine walk-in campsites and a pavilion which will accommodate upwards of 100 people. The developed campgrounds and picnic areas generally fill up every weekend and holidays during the summer months. Mid-week use is less, but still significant. Being so close to Albuquerque, the Jemez RD is often considered the backyard to 1,000,000 people who live and work in the metropolitan area.

The Jemez RD receives moderate to high visitation during most of the year due in part to the close driving distance from the Albuquerque metro area but mostly due to its natural and scenic attractions that offers a wide range of recreational opportunities and experience levels. Outdoor enthusiasts come to hike, camp and picnic; anglers to try their luck on the numerous perennial streams, rock climbers have opportunities to challenge technical climbing skills, while others find more passive enjoyment of viewing natural settings in contrast to their hectic urban existence.

Many visitors come to the district to drive the highways for pleasure or to view the changing fall colors, or simply just to get away from the desert heat. The abundance of flowing water is an important resource

that draws visitors to the Jemez Mountains. The Jemez River provides year round recreation while the San Antonio and East Fork Jemez Rivers cascade through deep canyons and the Rio Cebolla meanders through lush green meadows.

The Jemez Mountains National Recreation Area is located along New Mexico Highways 4 and 126, and Forest Road 376 and most of the public recreation on the district occurs within the national recreation area. All but two of the district's developed campgrounds and one picnic area are located within the national recreation area to meet recreational demand. The East Fork Jemez Wild and Scenic River is also located in the national recreation area. See chapter 6, Designated Areas, for more information.

Within the 67 miles of recreational trails, the popular 10-mile East Fork Jemez Trail draws hikers from Los Alamos and Albuquerque metropolitan areas. The 5,000-acre Dome Wilderness shares a boundary with Bandelier National Monument with connecting trails for expanded hiking opportunities and experiences. The Jemez RD surrounds the Valles Caldera National Preserve on three sides. The Preserve draws high numbers of tourists year-round and does not allow overnight use so the Jemez District fills this need with nearby camping.

The district has two heavily used hot springs which are popular attractions for forest visitors. These hot springs pose unique management challenges since one is in close proximity to New Mexico Highway 4 and the other hot spring is located in a remote setting. See more detailed information about hot springs in the "Important Recreational Sites and Areas" section in this chapter.

Dispersed camping mostly occurs along the Forest Roads 376 and 10, which are highly used forest roads on the forest. Both roads have through access to state highways and provide entry to privately owned in-holdings. This district experiences a high volume of dispersed camping during hunting seasons. During holidays dispersed camping spills over to Forest Road 144. Trash left by recreation users during high use times is an ongoing management challenge, as well as abandoned campfires.

Hunting use on the district is heavy. Some of the largest elk and deer in the state, and in the country, are found here. Jemez Falls Campground is left open through November to accommodate Forest and Valles Caldera hunters.

Winter recreation use on this district is moderate partially due to the Valles Caldera drawing cross-country skiers. Motorized winter use is low, although some snowmobile use on Forest Road 144 occurs during normal snowpack years.

Pecos/Las Vegas Ranger District has 10 campgrounds with 174 sites, 2 group campgrounds with a total of 3 sites, 1 equestrian campground with seven sites, 5 picnic areas with 25 sites, 7 developed trailheads, 1 lookout, and 3 fishing sites. This district has approximately 287 miles of recreational trails, including the Winsor National Recreation Trail.

The Pecos Canyon Corridor is a popular recreation destination along the Pecos River. The proximity of the canyon to New Mexico's population centers lends itself to multi-day users coming from nearby urban areas. There is also heavy use from out of state (Oklahoma, Texas) users. There are multiple developed and dispersed sites managed by both the Forest Service and New Mexico Department of Game and Fish (NMDGF) within the Canyon. Recreation use remains high on weekends during the summer months and drops mid-week to a moderate usage. Noticeably significant visitation spikes occur over the summer holiday weekends (Memorial Day, Independence Day, and Labor Day). The ranger district also experiences a smaller but still significant spike in use on Easter Sunday and on Mother's Day.

Portions of the Pecos Wild and Scenic River, which are designated as scenic, run through developed areas in the Pecos Canyon. The Wild section of this river is within the Pecos Wilderness.

The majority of the Pecos Wilderness lies within the Pecos District boundary. Management of this wilderness is shared with the Española RD and the Camino Real District of the Carson National Forest. The Pecos Wilderness is a big draw for recreation users on this district. There are trailheads surrounding the wilderness which get moderate to heavy use all summer long. Fall hunting brings in another wave of recreation users eager to visit the wilderness for a trophy elk or a once-in-a-lifetime bighorn sheep hunt and other big and small game.

The eastern portion of the Pecos/Las Vegas District is located near the Town of Las Vegas. Several other small rural communities also surround this eastern perimeter of the district. Recreation opportunities (picnicking, camping, and viewing for wildlife) exist all along this side of the district and are often used by local college or university students, local residents, or visitors who are drawn to the area by the historic districts in Las Vegas and other smaller communities in the area. Recreation use for this portion of the district is low to moderate with the higher use periods occurring during the summer holiday weekends.

Pecos/Las Vegas is the only district with recreation residences and leases and isolated cabins. There are a total of 105 recreation residences across the district. The four different tracts are Gallinas, Holy Ghost, Winsor, and Grass Mountain. There are 12 cabins under lease, known as the Cowles Leases. Three isolated cabins exist under individual leases.

Winter recreation use on this district exists, but is considered low use. Most of the use comes from recreationists who access the Forest for sledding or cross-country skiing activities. Recreational snowmobile use is available when snow accumulations occur, but is not a high use. District areas where snowmobile activities might take place are: Elk Mountain, Cow Creek and Bull Creek.

Partnerships and volunteers are active on the district. Events such as annual trash cleanups, and project work, such as trail maintenance, are fairly well attended. The volunteer base largely consists of local business people interested in promoting visitor opportunities for economic gain in local communities. Other groups coordinate with district personnel to promote restoration projects through programs such as “Respect the Rio.” Local college students, through volunteer internship opportunities, help maintain trails, educate visitors, and in return, gain agency experience.

Española Ranger District has 4 campgrounds with a total of 65 sites, 2 picnic areas with 15 sites and approximately 419 miles of recreational trails, including the Winsor National Recreation Trail.

The district encompasses the west portion of the Pecos Wilderness and, except for the Winsor Trail, some of the lesser travelled areas within the wilderness. Several trailheads on the district are located along the north and west edges of the wilderness and offer opportunities for those seeking solitude.

The Española RD is strongly identified as an “urban interface” forest, adjacent to the cities of Santa Fe and Los Alamos, with the population of approximately 100,000 and 20,000, respectively. The proximity of forest resources to nearby residences is a valued characteristic that offers a range of opportunities that have become part of the lifestyle of those residents. Many new residents choose to live here specifically because of the amenity values of recreation access and aesthetic enjoyment. Recreation use remains moderately high year-round on the Española District, but noticeably significant visitation spikes occur over the summer holiday weekends (Memorial Day, Independence Day, and Labor Day), and during some annual events in Santa Fe such as Indian and Spanish Markets. The Española District also experiences a smaller but still significant spike in use on Easter Sunday and on Mother’s Day. Participants in the Values, Attitudes and Beliefs discussions (Russel and Adams-Russel 2005) expressed the importance of providing

both summer and winter recreation activities, and opportunities to add to the mix of year-round recreation on the Forest.

Partnerships and volunteers are active on the district. Events such as annual trash cleanups and project work such as trail maintenance are fairly well attended.

The Rio Grande borders the Española RD and the district issues some Special Use Authorizations for float boating outfitters through White Rock Canyon to Cochiti Lake. This is the only place (Buckman Crossing) on Santa Fe NF where there is vehicle access to the Rio Grande. This area is moderately to heavily used by picnickers, anglers, and party-goers. The district is developing a long-term partnership with the Buckman Direct Diversion Board, which operates a water diversion (under a Forest Service special-use permit) in the vicinity, for enhancing the recreation experience at the river. Trail access along the Rio Grande from Santa Fe to Taos is limited or unavailable due to bordering land grants and private property where easements and rights of ways were never established.

The Santa Fe Ski Area accommodates much of the demand for developed winter facilities on the Forest. Cross-country skiing and snowshoeing also occur on the district during the winter when snowfall and temperatures are favorable. The Southwest Nordic Ski Club, within a challenge cost share agreement, maintains a groomed Nordic trail on the Santa Fe NF near the base of Pajarito Mountain Ski Area (privately owned) near Los Alamos. In the Santa Fe area, the Norski trails just down from the Santa Fe Ski Area, accommodate cross-country skiers on the east side of the district, but those trails currently are not groomed.

Other winter activities include cross-country skiing on dispersed trails, snowshoeing, and hiking when snow levels are minimal. Very little snowmobiling takes place on the district. Although there are no designated snow play areas on the Española District, there are locations on Forest Service land, along Hyde Park Road, that are popular for sledding and general snow play. There is an annual snowshoeing race that takes place near Santa Fe Ski Area.

Mountain biking has become increasingly popular on the Española District with mountain bike clubs joining other existing volunteer groups to assist with trail work. The International Mountain Bike Association Annual Conference was held in Santa Fe in 2012, bringing more attention to the Santa Fe trails system for mountain biking. The International Mountain Bike Association and local mountain bike clubs have visions of enhanced trails and opportunities for the sport in future years, working to bring increased numbers of riders and business to both the Los Alamos and Santa Fe areas.

Dispersed and developed camping and hiking are popular activities in the summer, while big game hunting and viewing “fall colors” are popular activities in the fall. Spring attracts turkey hunters.

The Española District borders the Valles Caldera and there has been recent interest and discussion in coordinating connecting trails between the Forest and the Caldera. The Southwest Nordic Ski course now extends about 1 kilometer into the Valles Caldera near the Canada Bonita Natural Research Area. Each year there is an ultra-marathon race in Los Alamos County called the Jemez 50 where runners race a 50-mile network of trails that cross the Valles Caldera, Santa Fe NF, Bandelier National Park, Department of Energy (DOE), and County of Los Alamos lands. Many trails around Los Alamos seamlessly cross several jurisdictional boundaries, where the public is seldom aware of the land ownership. Many trailheads are on Los Alamos County land or DOE land with the trail then extending onto the Forest.

Illegal dumping and improper disposal of household waste, construction waste, and even dead animals, is an issue on the district, especially on the Caja del Rio Plateau located near the Santa Fe County Landfill

and the Buckman Crossing area. Vandalism and disrespect for forest resources have also been issues for the Caja del Rio Plateau and the Borrego Mesa area to the northeast.

Forestwide Facilities Conditions

Conditions of facilities vary throughout the Santa Fe NF. However, all facilities are not being maintained at the rate they should be. Declining or flat budgets combined with increasing demand from forest visitors for well-maintained facilities has led to a state of disrepair for some and a growing backlog of deferred maintenance. Some water systems are not functional in part due to the lines not being used in campgrounds, which are closed due to lack of operating budget. We have fewer employees to perform operations and maintenance duties.

Some facilities are being used almost to full capacity. Generally, developed sites are completely full on Jemez and Pecos Districts almost every weekend and holiday throughout the summer season. During the week, these facilities are at about an average of 50 percent capacity. On the other three districts, developed site use is a little less, but holiday weekends are generally at full capacity and weekends can bring 100 percent occupancy several times throughout the summer. Newer and more modern facilities are preferred and generally see higher use than older or more degraded facilities.

Sites that accommodate group use on the Cuba and Coyote Ranger Districts are often occupied for family reunions, a traditional use of national forests in rural northern New Mexico, and most weekends during the summer. Reservations for these sites, where available, fill up quickly.

Many of the trails on the Santa Fe NF have been “loved to death,” and are entrenched and eroding. Fallen trees are removed yearly on the majority of trails, thanks to an army of volunteers who have stepped up to help keep the resource available to them. Especially in the Santa Fe and Los Alamos areas, the volunteers contribute an astounding number of hours each year to the trail maintenance duties that the Forest can no longer accomplish.

Caves

The Federal Caves Resources Protection Act of 1988 directs the Secretary of Agriculture to prepare and maintain a list of significant caves. The criteria for listing are in 36 CFR part 290.3(c) (Congress 1988). The Forest Service policy is to identify and manage significant caves to protect and maintain the caves and cave resources. The type and degree of protection is determined through the agency resource and management planning process with full public participation. Under certain circumstances, the location of significant caves can be withheld. See chapter 9, Renewable and Nonrenewable Energy and Natural Resources for more information on significant caves. We currently do very little active management of caves for recreation purposes. Additional caves exist on the Forest that do not meet the criteria for a classification as significant.

Caves are used for different recreational activities on the Santa Fe NF, although recreational cave use is low. Some of the caves are large enough for spelunkers to explore underground; others are not deep enough for this opportunity. The Santa Fe NF has had interest from outfitter/guides who are interested in guiding caving experiences on the Forest, but no special use authorizations have been issued. Some caves have been explored and mapped by caving groups such as the New Mexico Speleological Society. Many of the caves on the Santa Fe NF have ties to Native American tribes in the area and are protected for this purpose. Two caves have been closed to public access for this purpose, the Jemez Cave and the Terrero Cave. The Terrero Cave opening is located on New Mexico State Land, but the cave extends onto Federal land.

Jemez Cave is located adjacent to Highway 4 just north of Jemez Springs near the geologic feature commonly known as Soda Dam. This cave is on the National Register of Historic Places because of its cultural significance to local Pueblo people. The cave resources were significantly damaged by rock climbing activity, including the installation of rock bolts in the ceiling. The cave is currently closed to public entry to protect the significant cultural resources.

Important Recreational Sites or Areas

See chapter 6, Designated Areas, for a discussion of wildernesses, wild and scenic rivers, research natural areas, inventoried roadless areas, national scenic byways, national scenic trails and the Jemez National Recreation Area.

A number of recreation sites or areas on the Forest are considered important because of their local, regional, national or historic significance or the number of public served (levels of use). Some of these sites and areas include:

- **Tea Kettle Rock Interpretive Site** sits in a field right next to Forest Road 103 in the Jemez Mountains 24 miles southwest of Coyote. The rock is named for its distinctive and largest arch, which spans 12 feet and is formed from red sandstone. This feature was likely formed by millions of years of gradual weathering. In addition to the large arch, Tea Kettle Rock also contains several smaller archways and holes as well as a small cave. Vandalism is present but not prevalent. People enjoy climbing on the rock (without ropes or other equipment) and this has been allowed with no visible damage to the site from this activity. If monitoring were to show damage from human climbing, it would be reevaluated.

Figure 35. Tea Kettle Rock Interpretive Site

- **Tsi Pin Pueblo**, also called Tsi'pin or Tsi'pinouinge, is a remarkable pueblo ruin located on Pueblo Mesa near the village of Cañones in the northern Jemez Mountains. Although the site is on Santa Fe NF land, it is accessible by permit only. Numbers of visitors are limited per day. Permits are obtained from the Coyote Ranger Station. This permit system seems to be working well, in part due to the difficult access to the ruin. The demand for permits does not often exceed to supply. We occasionally have to turn down groups who have more people than we allow at one time. Tsi Pin was occupied between A.D. 1200 and A.D. 1325. Tsi Pin was the northernmost and largest of the Classic Period pueblos. The village had somewhere between 335 to 400 ground floor rooms, 16 kivas, and a central plaza. Cavate dwellings are located on the southeastern side of the mesa.

Figure 36. Tsi Pin Pueblo

- **Nogales Cliff House** is situated in an alcove formed by sandstone cliffs. This well-preserved ruin is a structure that was probably built around A.D. 1000 by a Pueblo Indian Group specific to this area called the Gallina. It was abandoned sometime in the 1200s. The Gallina were not a part of, and were isolated from, other, pueblo cultures like those at Mesa Verde and Chaco. Perhaps because of this isolation, they lasted longer. Nogales Cliff House had some 30 rooms for living and storage built in two levels. The bottom level here has eroded away. The location of this ruin is not widely distributed to visitors. Although it is not closed at this time, further vandalism and destruction by forest visitors may warrant closure or active management in the future.

Figure 37. Nogales Cliff House

- **Rattlesnake Ridge** is the largest documented village site in the Gallina area. Extending more than half a mile along a ridge, the village comprises nine single unit dwellings, two multiroom structures, three towers, three pit houses, related storage rooms, and a reservoir system. The Forest Service constructed a path to the primary site features; backcountry hiking trails lead to the remainder. Like Nogales Cliff House, this site is not advertised to the typical visitor, although it is open for those who know about it.

- **San Gregorio Lake** is a man-made reservoir which serves as an irrigation catchment as well as a stocked fishery. A simple less than one mile hike from the Wilderness Boundary, San Gregorio is frequented by local visitors to San Pedro Parks Wilderness. Although in the Wilderness, the New Mexico Game and Fish uses motorized vehicles to stock this lake in accordance with the Santa Fe National Forest Plan of 1987. The Forest has completed minimum requirements decision guides (MRDGs) to analyze this use, but also recognizes that the 1964 Wilderness Act specifically prohibits motorized use in designated wilderness areas.

- **Gilman Tunnels** are on Forest Road 376, the most highly travelled forest road on the Forest, part of the loop that is the heart of the Jemez National Recreation Area (see below). The road runs through the unincorporated town of Cañones (or Gilman) as a County Road, then turns into FR376, terminating at New Mexico State Road 126 east of San Pedro Parks Wilderness. The route incorporates the Gilman Tunnels 1 mile beyond the transition to Forest Road 376, which was part of the former Santa Fe Northwestern Railway through the canyon that was used to haul lumber from the Jemez Mountains. The railway opened in 1924, but never recovered financially from the Wall Street Crash of 1929, and ceased operations in May 1941, following flood damage from the Rio Guadalupe. Gilman Tunnels are used in many films including recent films such as The Lone Ranger and the 2007 filming of 3:10 to Yuma. Filming can be inconvenient for forest visitors who might want to go through the tunnels to get to the Rio Guadalupe. Sets have been constructed and traffic halted while filming happens.

  Graffiti at the Gilman tunnels is a problem. Names and groups' names are frequently spray painted in and around the tunnel entrances. The Jemez District has a hard time staying on top of graffiti removal in this area.

Figure 38. Gilman Tunnels on Forest Road 376 of the Santa Fe NF

- **Hot Springs**
    - **Spence Hot Spring** is reached from a short hike from the parking area. Located 5 miles north of Jemez Ranger District Office along New Mexico Hwy 4, the popular Spence Hot Spring includes a small pool that can accommodate a relatively low number of people. The area has suffered considerable resource damage from overuse. No glass containers, camping, or campfires are permitted along the trail or at the spring. Water quality is not monitored, so there are possible health hazards. Visitors should avoid getting water in their noses to minimize the risk of contracting a potentially fatal parasitic amoeba called *Naegleria fowleri*, common in warm springs. Also, poison ivy is found along the trail.

      Nudity, litter, and overcrowding continue to be an issue at these springs. A sunset closure is in place, but there is seldom anyone to enforce it.

    - **San Antonio Hot Springs, on the Jemez Ranger District,** is a collection of hot springs flowing out of a steep hillside and forming several usable pools. Due to an endangered species in the area, several roads are closed during nesting season, making it a 5-mile trek to get there. However, after nesting season, the road is opened allowing visitors to drive further in, shortening the hike considerably. The water comes out of the ground at about 129 degrees F and forms the first of several pools. The springs' source was actually bolstered by the Civilian Conservation Corps (CCC) in the 1930s to ensure a regular flow. The top pool is large and shallow, and is perfect for a hot soak. The water then flows downhill into several smaller pools, each one successively cooler. The viewshed of the surrounding valley, creek, and forest is exquisite. Visitors can generally expect to find others at this spring. Although against Federal regulations, nudity is common at San Antonio Hot Springs. The only improvement has been the formation of several rock-lined pools.

- **McCauley Hot Springs** is about a 1.5-mile climb up the trail from Battleship Rock and another 1.5 miles to the waterfall. The springs are beautiful with crystal clear, warm water. The top pool is about 30 feet wide and 2 to 3 feet deep and there are a few smaller, deeper pools downstream. This is the least popular of the hot springs probably due to the warm water temperature versus the hot water at the others.

- **Soda Dam** is a natural dam formed in the Jemez River by the precipitation of minerals from a collection of hot springs. The dam is located immediately off Highway 4 just 0.25 mile from the Jemez Ranger Station. Soda Dam was created over hundreds of years by hot mineral water flow. The hot springs precipitated minerals (including calcium carbonate) that eventually formed a dam across the Jemez River. Small caves have been constructed by the springs, making for a very interesting site. An archaeological deposit was found in neighboring Jemez Cave during the 1930s, indicating that the area around Soda Dam has been used for more than 2,000 years by a variety of cultures. A variety of hot-spring sources exist in the area of Soda Dam, including several small seeps, which can be found in the small cave adjacent to the dam. You can see some other hot springs immediately across the road from Soda Dam, but these are little more than puddles of warm water, running along the highway for a short distance. No improvements have been made to the springs. Portions of the original natural dam were blown up for construction of the highway.

Figure 39. Soda Dam

- **Pecos Canyon** contains several of the districts' developed recreation sites. There are also private recreation sites and New Mexico State Department of Game and Fish sites. This canyon is extremely busy on weekends and holidays during the summer months and moderately busy weekdays during these months. Crowding can be a problem, with campers spilling into areas that are not safe or legal for such use. Overcrowded conditions, along with alcohol and drug use, lead to some conflicts between visitors on a relatively frequent basis. In the winter visitation is light. The canyon has one of the state's most popular trout fishing streams (Pecos River) and several popular rock-climbing areas. One of the popular climbing areas in Pecos Canyon is a picturesque roadside pink granite cliff called Cathedral Rock. Fishing holes are sometimes crowded which can lead to negative interactions between anglers, sometimes becoming violent.

- **Santa Fe Ski Area** is a year-round mountain retreat for local residents of Santa Fe and tourists from all over the world. Just 16 miles from downtown Santa Fe, the ski area offers many different levels of skiing for skiers of all abilities and has an award-winning adaptive ski program for persons with disabilities. In the summer, the ski slopes offer hiking and mountain biking dispersed recreation opportunities, but no ski area run programs at this time. During the fall, the ski area opens a lift for viewing of fall colors. This lift is opened during the leaf-changing season

and in October for the Albuquerque International Balloon Fiesta crowd. The parking lot of the ski area serves as parking for the Winsor National Recreation Trail trailhead and a gateway to the west side of the Pecos Wilderness. The Winsor Trail, specifically this stretch from the ski area to the wilderness, is the most heavily used trail in the Pecos Wilderness. Although solitude is seldom experienced on the first part of this trail into the Pecos Wilderness, it does not seem to be an issue for the trail users.

- **Poshuouinge Interpretive Site,** which lies in the lower Chama valley, is ancestral to the Tewa Indians, who presently live in a series of pueblos near Española. The closest are San Juan and Santa Clara. Poshuouinge is located right next to the highway along U.S. Highway 84, 2.5 miles east of Abiquiu, New Mexico. A trail leads from a parking lot off the south side of the highway to a hill overlooking the site and the Chama River Valley.

- **Southwest Nordic Ski Club trails** are located near the base of Pajarito Mountain Ski Area near the town of Los Alamos. The Southwest Nordic Ski Club, under a cost share agreement with the Santa Fe NF, maintains and grooms a cross-country ski trail system. This is one of a very few non-fee trail systems groomed on NFS lands for cross-country skiing in the state. A groomed snowshoe trail is also provided within this system to provide snowshoers an opportunity for their activity and a route to get to other trails. This keeps snowshoers off the groomed trails for the skiers, lessening conflict (figure 40).

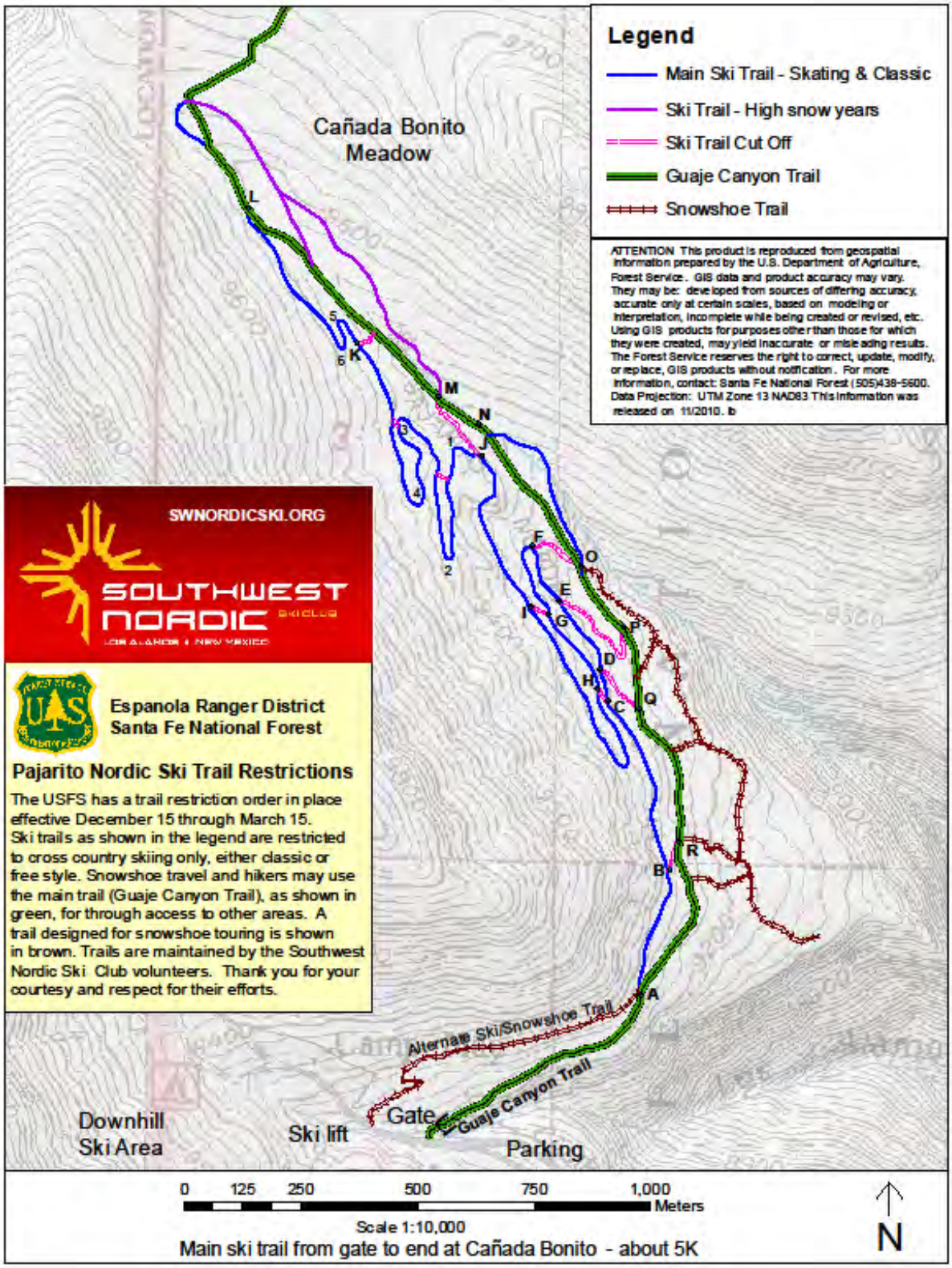


Figure 40. Map depicting the cross-country and snowshoe trails maintained by the Southwest Nordic Ski Club

Nature, Extent, and Condition of Trails, Roads and Other Transportation and Infrastructure to Provide Recreational Access

The condition of recreation facilities and associated infrastructure on the forest is monitored through a deferred maintenance program in which facilities are routinely inspected and evaluated. Facility conditions range from excellent to poor, with most Santa Fe facilities falling somewhere in the middle. Annual and deferred maintenance needs and costs are identified and tracked in the Natural Resource Manager system (NRM), a national database where information on many Forest Service programs is housed. Routine maintenance on facilities is planned and prioritized; however, the growing backlog of deferred maintenance needs and vandalism (e.g., graffiti, litter, deliberate destruction of facilities, etc.) present a growing and constant challenge at recreation sites throughout the Forest and often force visitors to seek alternate sites. The most recent deferred maintenance has been completed with funds from programs such as American Recovery and Reinvestment Act in 2008 and 2009, and the Capital Investment Program in 2010.

Prolonged drought conditions and rising levels of insect and disease infestations are taking a toll on the condition of trees in recreation areas. Patches of dead and dying trees are visible and expanding in some locations. This situation impacts recreationists because of the loss of trees and shade and increased risks to public safety from weakened or dead trees falling on roads, trails, or facilities. To mitigate the safety concerns, hazard trees are removed in developed recreation sites annually and along heavily used NFS trails and NFS roads where feasible. Developed recreation sites are not opened in the spring until these inspections and subsequent mitigations have been accomplished and documented. The number of diseased and dead trees and the limited number of qualified “fellers” makes the job of removing dangerous trees an ongoing challenge. Presently, only developed recreation sites are required to have annual hazard tree inspections and hazard mitigation.

The Santa Fe NF participates in the Recreation Enhancement Act and charges use fees at approximately 33 percent of the developed recreation sites. The revenue generated helps supplement appropriated funding and is used to enhance the recreation opportunities and amenities provided at the areas. While many forest visitors understand and support charging recreation fees on national forests, not all do. Compliance with the recreation fee program is much higher where recreation areas are routinely patrolled or have Volunteer Campground Hosts present. Routine patrolling also provides the opportunity for employees to talk with visitors, explain the fee program, answer questions, and engage in public education/information. Fee tubes are vulnerable to vandalism and theft, which is an ongoing problem.

As mentioned previously, the Forest published the Final Environmental Impact Statement for Travel Management and Record of Decision in June 2012. The decision designated a system of roads, trails, and areas open for motorized use; and prohibited motorized use off that system, except for certain administrative uses authorized separately. Motorized uses are allowed on 208 miles of the total trail system. See chapter 7, Infrastructure, for more information on the conditions and trends of the road system.

Approximately 481 miles of system trail are in wilderness areas, and an additional 297 miles of trail outside wilderness are non-motorized. Trail use continues to increase, resulting in ongoing challenges in the maintenance, construction, and reconstruction of trails. Additionally, unauthorized routes (created both by motorized and non-motorized users) are plentiful. User groups have created trails specifically for their own interests that other groups may not be inclined to use. These trails continue to be built, partially to alleviate some user conflicts. Over time, implementation of travel management decisions should reduce the amount of motorized travel off the designated system, but travel management only addresses motorized uses. It does not address non-motorized uses (such as mountain bikes and horses) that may travel off the designated system and create unauthorized routes.

Some trails on the Santa Fe NF were not properly designed, creating issues with erosion, and other environmental impacts. Many were not designed at all. They were created by cattle, wildlife, or humans who were trying to get from one place to another and repeated use created trails. Some historic trails, such as the Winsor Trail, as well as most trails in the Pecos Wilderness, were created by Native Americans or early European settlers to the area, to move sheep or cattle to the higher country to graze. These trails were eventually adopted as National Forest System trails. In many cases, the Forest has opted to relocate major sections of a trail to build in proper sustainable design features. Some trails were severely impacted by recent large fire events, and there are ongoing issues with trees falling across these trails and post-fire flooding. Some trails have erosion problems from hikers and/or bikers straying off-trail and cutting switchbacks.

Lack of adequate trail maintenance is also a concern. In some cases, trails are becoming re-vegetated and disappearing on the ground or overgrown with vegetation. In other cases, trails are becoming entrenched, or incised, resulting in channelization of water and sedimentation into nearby streams. Hazard trees along trails are also a public safety concern and will likely be an ongoing issue.

Opportunities to Foster Greater Connection between People and Nature

Participation in outdoor recreation is the way that most Americans come to know their national forests and grasslands, making it an important portal for understanding the meaning, history, and relevance of public lands. Connecting with nature reminds people of the resources that sustain life and helps them understand and care about those resources.

The Forest's trails, picnic grounds, campgrounds, downhill ski area, group use areas, and interpretive displays present countless opportunities for visitors to connect with nature. Other opportunities for visitors to get connected with the Santa Fe NF include:

- **Volunteering** can provide a meaningful connection with nature and benefit the Forest. Recreation volunteers are engaged in a variety of activities, including maintaining and constructing trails, serving as campground hosts and presenting interpretive/conservation education programs. The Santa Fe NF continues to explore opportunities to expand the volunteer base. The Forest has a very active volunteer Site Steward program to monitor archaeological sites.
- **Fee Waiver Days** waive recreation day use fees at most Federal recreation areas to promote public use of public recreation. The Forest Service participates in five fee waiver days: Martin Luther King, Jr. Day; President's Day weekend; National Get Outdoors Day; National Public Lands Day, and Veterans Day Weekend. Santa Fe NF waives overnight use fees during these fee waiver weekends, as well as day-use fees, with the exception of any campgrounds that are on the National Recreation Reservation System.
- **Conservation Education/Interpretation -** the forest offers a variety of conservation education and interpretive programs including Smokey Bear Fire Prevention, Junior Rangers, career fairs, nature hikes and programs for schools on and off site. Several youth groups and summer camp programs use the forest for their programming. There may be an opportunity to improve on program delivery in this area by using some combination of forest staff and volunteers.
- **Agreements** with youth development programs such as the Southwest Conservation Corps, Rocky Mountain Youth Corps, Youth Conservation Corps, and the Forest Guild provide meaningful outdoor work opportunities for young people between the ages of 14 and 25. Conservation Corps trail crews have completed trail rehabilitation projects on all of the districts, as well as recreation facilities maintenance and routine trail maintenance. The Forest has had youth agreements for many years and no plans to discontinue this effort.

- **Special Uses,** such as the Santa Fe Ski Area on the Española RD, offer opportunities to connect with nature through downhill skiing and snowboarding. Events such as weddings or family reunions are also administered under Special Use permits and provide groups the opportunity to share special occasions on the national forest where memories often already create important connections. Additionally, several public recreation events, organized hikes, runs, snowshoe races, and bike rides on the ranger districts offer opportunities to introduce new people to the great outdoors. The Forest has an active special uses program on every district.
- **Outfitters/Guides** can provide a valuable service for people who may not possess the skills, equipment or knowledge of the area to recreate on the Santa Fe NF independently. Outfitter/Guide permits range from hunting to rock climbing to jeep tours. A few outfitters use Santa Fe lands for environmental, historical, and cultural education. Quality assurance through permit administration ensures public safety and to maximizing visitor understanding of the many values of national forests. Commercial permit fees also contribute directly to the Santa Fe NF for needed improvements. Unfortunately existing and predicted staffing will limit our capacity to consider new proposals and administer existing permits to standard.
- **Partnerships** with various organizations support the mission of connecting people with nature through a variety of recreational and educational opportunities. Southwest Nordic Ski Club, Friends of the Santa Fe National Forest, and International Mountain Biking Association, are a few examples of existing partnerships on the Santa Fe NF. The Forest can improve on maintaining, and creating, partnerships. A more strategic use of existing partnerships may better align the interests of partners and the public and help create new partnerships.
- **Timber Product Permits** allow the public to gather firewood. Christmas tree cutting and wilding permits are also available.
- **Mineral Permits** can be obtained to collect minerals/rocks**.**
- **Scenic Byways/Scenic Highways** such as the Santa Fe National Forest and Jemez Mountain Trail Scenic Byways offer opportunities to drive for pleasure and view natural features and wildlife. There are also opportunities for interpretation along the byways and at pullouts. See descriptions of byways on the Santa Fe NF in chapter 6, Designated Areas.
- **Recreation Residences** are privately owned, limited-use cabins in national forests that are under 20-year special use permits. These tracts were first authorized in 1915 to encourage recreation within national forests (16 U.S.C. 497d)(1997), although current policy is not to create any additional supply of this particular use. The Forest has 110 recreation residences on the Pecos/Las Vegas RD. There are four recreation residence tracts: Winsor Creek, Holy Ghost Canyon, Grass Mountain, and Gallinas Canyon. These permits were re-issued in 2010 with updated appraisals.

In addition to the recreation residences, there are 23 summer cabins on leased NFS land near Cowles in the Pecos River Canyon. These cabins are privately owned and are on land acquired and added to the Santa Fe NF in 1976. The cabins and leases existed at the time of purchase, and the lease authorizations will continue until their lease terms expire, at which point they are expected to be removed. Some leases expired in 2000 and 2002, and the cabins were removed. Other leases expire as late as 2058.

For both recreation residences and Cowles Lease cabins, permits and leases require that the authorized area be available for access by the general public for recreation purposes.

Conditions and Trends Affecting the Quality of Recreational Settings and Scenic Character

Several recent uncharacteristic stand-replacing wildfires, insects and disease outbreaks, and weather events have affected the quality of forest recreational settings and scenic character. These fires have caused several area closures and alterations to the landscape and resulted in many continued risks including flooding, erosion, hazard trees, loss of trails, damage to roads, invasive plant species infestations and an overall alteration of scenic character. Some specific examples include:

- **Cerro Grande Fire** of 2000, burned through the town of Los Alamos and adjacent NFS lands on the Española RD. Trails, roads, areas, and dispersed sites were closed for up to five years following the high-severity, uncharacteristic wildfire. Flooding from the hydrophobic soils caused by the intense burn was extreme and caused great damage to trails and facilities in the area. The fire caused widespread tree mortality along the State Highway 4 corridor and forest roads associated with that highway, reducing scenic quality. The "backdrop" of the town of Los Alamos was the pine-forested mountains, which now are covered with less scenic shrubs and some aspen regeneration as well as burned, dead trees.

  Recovery has been slow in this area. Although some restoration has been done, many trails and other facilities were completely lost and will not be rebuilt. One popular site near Los Alamos, the Los Alamos Reservoir, which was a popular fishery for the local residents, located just a mile from town, was damaged extensively. The reservoir has silted in and no fish survived. The toilet building was vandalized with a bulldozer after the fire and has been removed. All facilities, including accessible fishing platforms and picnic tables have been removed or destroyed. The area is part of a land transfer planned to go to Los Alamos County in the near future.

- **Borrego Mesa Fire** of 2002 in the Sangre de Cristo Mountains on Española RD caused widespread tree and vegetation mortality. This wildfire temporarily closed the Borrego Mesa Campground due to hazards of burned trees and flooding. It created hazard trees along Forest Road 306, and Trails 157 and 227 were damaged by the fire and subsequent flooding. Many of the trees have been blown down, but many more still remain. This high-severity burn has decreased scenic quality in this area and increased occurrences of invasive plant species.

- **Viveash Fire** of 2000 affected the Skyline Trail # 251 and Forest Road 645, and ongoing hazard tree and erosion issues are present. It also burned down Cow Creek Campground, which has not been rebuilt.

- **Trampas Fire** of 2002 affected a series of trails and junctions including the Skyline Trail # 251, and trails 240 and 235 with erosion and hazard trees.

- **Las Conchas Fire** of 2011 was at the time the largest wildfire in this state's history and grew almost 40,000 acres the first night. The fire had widespread effects across much of the Jemez range. Subsequent flooding completely washed out some roads in the fire area and downstream of the area and destroyed buildings and facilities, including a historic apple orchard (Dixons) – all of these have significant impacts on the recreation opportunities in the area. This created long-term access issues to land owners in subdivisions only accessible through Cochiti and Bland Canyons and eliminated dispersed recreation possibilities in these canyons, which used to be popular camping areas. These areas still do not have road access. The high intensity of the burn created unstable slopes and essentially destroyed several trails. This fire also burned through the previous Cerro Grande Fire surrounding the town of Los Alamos, burning many of the last surviving trees in that area. It continued on to burn the upper watersheds of Santa Clara Canyon, which produced

severe flooding hazards, including hazards to the Pueblo of Santa Clara. The effects of this fire to recreation in the area are permanent. Many trails will not be rebuilt. Restoration is slow, but progressing on trails that are considered salvageable.

- **Tres Lagunas Fire** of 2013 created many roadside hazard trees and affected the streambed of the Pecos River because of high levels of erosion. Holy Ghost Canyon watershed was especially affected by severe burning in the upper watershed. This has affected the developed recreation, especially in Holy Ghost Canyon due to flooding potential closing the campground during monsoon season, and washed out roads prohibiting access when flooding occurs. Fire effects will continue for a long time in the bottoms of these canyons and will affect visitors. Seasonal closures will be necessary until stabilization takes place to ensure visitor safety.

- **The Blowdown** in the Pecos Wilderness, likely caused by a microburst, made nearly every tree in a 1,300-acre area fall over or break off (figure 41). This blowdown affected several trails in the Pecos Wilderness, including the Panchuela West Corridor, a major throughway involving trails 253, 158, and 156 by burying the trails in multiple layers of downed trees, making them impassible to hikers, and livestock. This event likely occurred in 2005. In 2013, the Jaroso Fire burned through portions of this blowdown.

Figure 41. The 13,000-acre blowdown in the Pecos Wilderness, prior to Jaroso Fire including an aerial view (above) and close-up (below)

- **Pacheco Fire** of 2011: This fire burned the lower portion of the Rio Nambe Trail # 160, completely obliterated trail 162 in the Pecos Wilderness.
- **Jaroso Fire** of 2013 within the Pecos Wilderness affected several trails. However, some of the trails have been reopened for the most part and recreational travel has resumed. The blowdown (figure 41) was partially burned, creating future opportunities to regain trails covered by fallen trees, and therefore inaccessible for use, by this wind event.

These severe events are becoming the norm in the Southwest and result in a marked contrast to the pre-existing landscape. After this type of event, the scenic quality can be dramatically altered for many years

due to the time needed for soils and vegetation to recover. See Scenery section of this chapter for further discussion.

Climate Conditions

The Southwest has experienced an extended drought, and forecasts indicate it is likely to continue. Drought conditions are impacting the Santa Fe NF's recreation program in a number of ways. As fire danger increases, restrictions may be put in place to reduce the risk of human-caused fires. Depending on the severity, restrictions typically range from a ban on open campfires to outright closure of the forest to public access. These restrictions limit access to recreational settings and opportunities. The Forest experienced extensive fire closures several different times over recent years. Fire damage to trails and recreation facilities limit recreational opportunities until rehabilitation and/or restoration can be completed. Rehabilitation and restoration projects typically take several years to fund and complete.

Inadequate snowfall affects winter recreational settings and opportunities such as the Santa Fe Ski Area and the cross-country trail systems near Los Alamos and Santa Fe on the Española RD.

Extended warm weather leads to a longer "summer" recreation season; starting earlier in the spring and extending later into the fall. A longer summer recreation season warrants extending seasonal staff and can be expected to incur additional operations and maintenance costs.

Sustainability of the Set of Recreation Opportunities and Scenic Character

The goal of sustainable recreation is to:

- Provide a diverse range of quality natural and cultural resource based recreation opportunities, and protect the natural, cultural, and scenic environment for present and future generations to enjoy;
- Partner with public and private recreation benefit providers to meet public needs and expectations; and
- Perform and plan by implementing systems and processes to ensure effective decisions and sound investments.

National forests and grasslands cannot depend solely on appropriated funding to meet constituents' needs, and must unite diverse interests and focus scarce resources to sustain and expand the benefits of outdoor recreation. To sustain these benefits, the recreation program must achieve a sustainable balance among the three spheres of environmental, social, and economic conditions (USDA Forest Service 2010).

Increasing demand for services and recreation uses in conjunction with flat or declining budgets and loss of key Forest Service personnel present challenges to operating and maintaining infrastructure (such as developed recreation sites and trails) to standard. In addition, recreation facilities (social conditions), particularly older sites, may no longer align with the capacity or use for which they were designed. Vandalism and gang activity are also changing how some recreation areas are used and are displacing recreationists. The increasing backlog of deferred maintenance needs and impacts to the resources by unmanaged/undermanaged uses or extreme environmental conditions also affect the sustainability of the recreation program.

The Forest Service recognized the need to create a program that aligns recreation sites and management funding with visitors' desires and expectations. The national forests and grasslands conducted a Recreation Facility Analysis process in 2007. Through this process, recreation staff analyzed their recreation facilities and evaluated how they might operate and maintain these sites and facilities more efficiently—both as prudent financial managers and in terms of meeting the changing preferences and patterns of the public. It is important to note that the Recreation Facility Analysis generates information

that is essential for managing recreation facilities regardless of budget. The process helps establish priorities for operations, maintenance, and investment in recreation facilities, helping sustain existing recreation facilities and plan for future ones.

The result of the Recreation Facility Analysis was a 5-year program of work, or the tasks needed to bring the forest's recreation infrastructure into alignment with the resources available to operate and maintain it to standard. These tasks included making fees consistent for sites across the forest, adding fees for some sites, changing season of use and adding capacity at some sites, and repairing or replacing facilities at some sites. Revisions to fee structure have not been accomplished at this time; toilet replacements have been accomplished.

This analysis regarding the sustainability of its recreation facilities revealed that the forest cannot maintain the current infrastructure without ongoing adjustments in management. In response to this, the Santa Fe may need to consider changing the mix of infrastructure, adjusting the season of use, or reducing the amount or capacity of infrastructure. Reducing or changing infrastructure does not mean the forest is reducing recreation opportunities. Starting in FY 2013, the Santa Fe NF reduced amenities at some sites due to level of maintenance funding. In some cases, this meant that trash would not be picked up (trash cans removed) or toilet buildings would be locked and unavailable for use, and in other cases, gates were swung shut and parking lots and campgrounds offered no services. Although visitors were still welcome to use facilities available (tables and grills), they had to park vehicles outside gates and walk in to the area, which few people were willing to do.

In a document titled, *A Framework for Sustainable Recreation* (USDA Forest Service 2010), the Forest Service noted the importance of analyzing recreation program needs and available resources and assessing potential ways to narrow the gap between them. Building on this, the Southwestern Region developed a Sustainable Recreation Strategy (Strategy) to guide the region toward a recreation program that is vital to the well-being of visitors and communities and is essential to the future of the agency. The Strategy sustains America's great outdoors and builds greater capacity to serve the citizens of the southwest by focusing the recreation program on building strong relationships with diverse publics while improving management effectiveness and program resiliency.

The Strategy identifies goals and objectives for the recreation program, one of which is to develop and implement a forest-specific action plan for sustainable recreation. Santa Fe staff began this effort in 2014 in collaboration with its diverse communities and partners, and a draft document was crafted by June 2015. Draft action items include the possibility of incorporating cross-jurisdictional efficiencies and clearly improved partnership relationships to decrease costs, as well as potential statewide efforts to increase revenues in order to better meet the extensive needs and desires of publics interested in a diverse and highly-valued program. Stronger stewardship relationships with forest visitors may also decrease costs through behavior changes as peer-to-peer communications can be effective at lowering the negative ecological or social impacts that currently require management investment.

Other recreation opportunities in the general vicinity of Santa Fe National Forest exist for the public and can help meet some of the public's recreation desires as well. The Valles Caldera National Preserve, Bandelier National Monument, Pecos National Historic Park, and Jemez National Monument are National Park Service sites that draw recreationists to the area. Kasha Katuwe Tent Rocks National Monument, managed by the Bureau of Land Management, and the "Fun Valley" motorized area are other federally managed areas, as well as Cochiti Lake and Abiquiu Lake managed by the Army Corp of Engineers. State Parks in close proximity to the Santa Fe NF (and in some cases surrounded by the forest) include Fenton Lake, Morphy Lake, Villanueva, and Hyde Memorial State Parks. Many of these sites have developed and dispersed camping opportunities as well as hiking trails and other amenities offered by the Santa Fe NF.

The public has expressed a desire to see stronger coordination across these many jurisdictions for more seamless provision of desired opportunities.

Recreation Fees

The Federal Lands Recreation Enhancement Act was signed into law by President Bush in 2004. It permits Federal land management agencies to establish, modify, charge and collect modest recreation fees at campgrounds, rental cabins, and at day use sites that have certain facilities. Recreation fees provide crucial resources that allow the federal agencies to respond to increased demand on federal lands. The goal is to provide visitors with a quality recreation experience through enhanced facilities and services.

The revenues collected vary greatly from year to year (table 29). The fees vary due to a variety of occupancy factors including, host availability, economic conditions, weather, fire closures, fire danger conditions, etc. The average amount of annual fee collection is roughly 25 percent of our allocated recreation and Wilderness funding. This funding covers all recreation including developed, dispersed, and wilderness. It does not cover trails or recreation facilities. Therefore, it is reasonable to estimate that recreation fees cover approximately one-third to one-half of all the costs incurred by personnel, fleet, and materials and supplies for developed sites on the Santa Fe NF.

Table 29. Recreation fees collected on the Santa Fe NF by fiscal year (2010 to 2013)

Fiscal Year	Recreation fees collected ($)
FY10	**$293,000**
FY11	$191,000
FY12	$308,000
FY13	$160,000
FY14	$210,582

The Santa Fe NF participates in the recreation fee program, which contributes to sustaining and enhancing its facilities and services. For example, revenue from this program has enabled the Forest to replace and repair facilities, increase visitor contact, and disperse information. Increasingly, as allocated budgets decline, the Forest is more dependent on the fee revenue to maintain the operations and maintenance of the developed recreation sites where fees are charged. A statewide effort to bring consistency to fees throughout national forests in New Mexico and increase fees collected (by increasing existing fees or adding new sites to existing program) will begin in FY15.

Trails

The Forest Service manages more than 158,000 miles of recreation trails nationwide. The Santa Fe National Forest manages approximately 1,000 of these miles. To remain safe and usable, these trails need regular maintenance. The U.S. Government of Accountability Office (GAO) was asked to review the agency's trails program and examine funding and staffing resources, the extent to which the Forest Service is meeting trail maintenance needs, and factors that might complicate agency trail maintenance efforts. The Southwest Region (Arizona and New Mexico) was included in that review.

The GAO recommended that the Forest Service analyze trails program needs and available resources and develop options for narrowing the gap between them. Findings include:

- Nationwide, the Forest Service has more miles of trail than it has been able to maintain, resulting in a persistent maintenance backlog with a range of negative effects. In FY 2012, the agency

reported that it accomplished at least some maintenance on about 37 percent of its 158,000 trail miles and that about one-quarter of its trail miles met the agency's standards. The Forest Service estimated the cost of its trail maintenance backlog to be $314 million in FY 2012, with an additional $210 million for annual maintenance, capital improvement, and operations. Trails not maintained to quality standards have a range of negative effects, such as inhibiting trail use and harming natural resources, and deferring maintenance can add to maintenance costs.

- The Forest Service relies on a combination of internal and external resources to help maintain its trail system. Internal resources include about $80 million allocated annually for trail maintenance activities plus funding for other agency programs that involve trails. External resources include volunteer labor, which the Forest Service valued at $26 million in FY 2012, and funding from federal programs, states, and other sources.
- Collectively, the agency officials and stakeholders with whom GAO spoke identified a number of factors complicating the Forest Service's trail maintenance efforts, including:
    - Factors associated with the origin and location of trails
    - Some agency policies and procedures, and
    - Factors associated with the management of volunteers and other external resources.

For example, many trails were created for purposes other than recreation, such as access for livestock, timber harvesting or firefighting, and some were built on steep slopes, leaving unsustainable, erosion-prone trails that require continual maintenance. In addition, certain agency policies and procedures complicate trail maintenance efforts, such as the agency's lack of standardized training in trails field skills, which limits agency expertise. Further, while volunteers are important to the agency's trail maintenance efforts, managing volunteers can decrease the time officials can spend performing on-the-ground maintenance.

Agency officials and stakeholders GAO interviewed collectively identified numerous options to improve Forest Service trail maintenance, including:

- Assessing the sustainability of the trail system
- Improving agency policies and procedures, and
- Improving management of volunteers and other external resources

Many officials and stakeholders suggested that the agency systematically assess its trail system to identify ways to reduce the gap and improve trail system sustainability. They also identified other options for improving management of volunteers. For example, while the agency's goal in the Forest Service Manual is to use volunteers, the agency’s expectations for trails staff who work with volunteers has not included establishing, collaborating with, and managing volunteers who help maintain trails, and training in this area is limited. Some agency officials and stakeholders stated that training on how to collaborate with and manage volunteers would enhance the agency's ability to capitalize on this resource.

The Santa Fe NF seems to reflect the GAO findings for the most part. The Forest has not had a trail crew to do routine work since approximately 2005 due to budgetary constraints. At the time, we were no longer able to hire crews to maintain trails, we began to establish a stronger volunteer program. Due to this very active and interested volunteer program, the Forest is able to maintain approximately 25 percent of the trails to standard, but most of the volunteer-maintained trail miles are on only two of the five districts. Most of the trail work is done in close proximity to the cities of Los Alamos and Santa Fe where the majority of the volunteer interest is found. There are also groups, such as the Backcountry Horsemen of America, who are very interested in doing projects to maintain trails for their recreational interest. There

has also been an increase in youth program interest. In FY15, the Forest has agreements in place with Rocky Mountain Youth Corps, Southwest Conservation Corps, and Youth Conservation Corps.

The Santa Fe NF has a goal to maintain 20 percent of trail miles forest-wide per year (approximately 250 miles) (see table 30). This can be something as simple as clearing deadfall to major erosion repair, or tread maintenance. The Santa Fe NF has been able to accomplish this with our partners' help. Without these groups, the Forest would be able to accomplish very little.

Table 30. Miles of trails maintained and improved in Santa Fe NF, FYs 2012, 2013, and 2014

FY	Miles maintained	Miles Improved	Miles Meeting Standard	% Miles Meeting Standard
14	212	11	238	24.14
13	267	9	240	24.65
12	206	12	329	36.70

In preparation for the GAO visit, Regional Office (RO) staff analyzed the trail system across New Mexico and Arizona national forests, and determined the cost per mile by trail class for operations, annual maintenance, deferred maintenance, and capital improvements (table 31). The following shows these standard cost results:

Table 31. Costs per mile of trail for various trail classes throughout national forests in New Mexico and Arizona

Trail Class	Operations $ per mile	Annual Maintenance $ per mile	Deferred Maintenance cost per mile	Capital Improvements cost per mile
1	138.50	379.91	1,859.67	1,127.16
2	145.10	437.55	2,256.93	1,604.02
3	200.28	691.79	2,545.60	2,027.25
4	168.61	500.10	2,760.69	810.31
5	292.58	4,227.52	10,517.04	6,995.68
Grand Total	**177.05**	**649.51**	**2,612.93**	**1,794.12**

Trails are categorized into five classes based on their level of development, thus have different costs for maintenance and construction. The estimated costs for all the trails on the Santa Fe NF, using the figures from table 31 above, by trail class (TC) are displayed in table 32.

Table 32. Estimated costs for maintaining trails, by trail class, for the Santa Fe NF

Trail Class (TC)	# of Miles	Operations	Annual Maintenance	Deferred Maintenance	Capital Improvements
TC 1 Minimally Developed	68.27	$9,455.40	$25,936.46	$126,959.67	$76,951.21
TC 2 Moderately Developed *	691.76	$100,374.38	$302,679.59	$1,561,253.90	$1,109,596.88
TC 3 Developed	218.77	$43,815.26	$151,342.90	$556,900.91	$443,501.48
TC 4 Highly Developed	8.10	$1,365.71	$4,050.81	$22,361.59	$6,563.51
TC 5 Fully Developed	0	$0	$0	$0	$0

Trail Class (TC)	# of Miles	Operations	Annual Maintenance	Deferred Maintenance	Capital Improvements
Santa Fe NF (estimated cost for entire trail system, approximately 986 miles)	986.90	$155,101.75	$484,009.76	$2,267,457.17	$1,636,613.08

*Approximately 76 miles of system trails on the Santa Fe NF were not assigned a trail class in the database of record (NRM). They have been added into TC 2 because that is where the majority of miles lie.

Table 33. Trail allocations on the Santa Fe NF

FY	Allocation	Difference in allocation and estimated annual maintenance and operations ($639,112)
10	$398,996	$240,116
11	$418,424	$220,688
12	$240,900	$398,212
13	$193,599	$445,513
14	$217,459	$421,653

Table 33 shows that the allocation to the Santa Fe NF is not enough funding to cover annual maintenance and operations, deferred maintenance or capital improvements. The budget has been trending downward sharply since FY11. The Forest has had to rely more heavily on volunteers and partnerships to accomplish trail work. It is anticipated that this decline will continue or level off. Appropriated funds vary annually, so it is difficult to predict the amount of allocated funding in the future. The needs for trail maintenance and operations are increasing while available resources are uncertain. In anticipation of this trend continuing, the Forest will continue to look to other sources, such as grants, partnerships, and volunteer assistance to accomplish trail maintenance and operations.

Currently, the Santa Fe NF uses sources other than appropriated funds to support trail maintenance. Examples include:

- **Coyote RD** – Youth Conservation Corps Trail Crews
- **Cuba RD** – Volunteer groups and Youth crews (Southwest Conservation Crew and Youth Conservation Corps)
- **Jemez RD** – Forest Guild Youth Conservation Corps Trail Crews and Southwest Youth Conservation Corps Trail Crews, as well as volunteer groups such as Volunteers for the Outdoors
- **Pecos/Las Vegas RD**– Volunteer groups and volunteer days including Backcountry Horsemen, Fat Tire Society, etc.
- **Española Ranger District –** Youth Conservation Corps Trail Crews, volunteer groups, clubs, individuals, Rocky Mountain Youth Corps, Backcountry Horsemen, and Southwest Nordic Ski Club.

Unofficial trails (non-system trails created by users) abound on the Santa Fe NF. These trails are not included in the numbers in table 32. They do not receive funding for maintenance and forest employees do not spend time on them. However, they are used (and sometimes maintained) by forest visitors. We do not have accurate information on how many miles of unofficial trails exist on the Santa Fe NF, but with no sustainable layout planning and no official maintenance, ecological impacts are expected.

Recreation Special Use Permits (SUP)

Mining, timber, grazing, and road uses may be permitted on national forest lands and are governed by specific regulations (USDA Forest Service 2004), (36 CFR 251.50). Other uses of NFS lands, improvements and resources are considered “recreation special uses.” The Forest Service recreation special use program authorizes various uses and temporary occupancy through the issuance of a permit. Permit terms and conditions protect public and natural resource values while affording the permit holder the opportunity to conduct business on the national forest or enjoy private recreation opportunities in limited circumstances, such as recreation residences. Under various laws and regulations set by Congress, the Forest Service collects land use rental fees for special use authorizations.

While most land use rental fees are returned to the U.S. Treasury, some fees are retained by the Forest. Certain recreation special use authorizations, such as outfitter/guides and recreation events, generate a significant amount of revenue for the forest. In FY 2013, the Santa Fe NF collected approximately $130,000.00 in recreation special use permit fees. These fees are used to improve visitor services and repair or replace facilities.

The demand for recreation special use permits, as well as type and complexity of these uses, varies across the Forest. For example, the majority of the permits issued on Pecos/Las Vegas, Cuba, and Coyote RDs are to big game outfitter/guides. Demand for permits for recreation events such as organized trail and bike races is highest on Española RD, the district closest to the city of Santa Fe. In addition, the Española RD administers a permit for the Santa Fe Ski Area.

The demand for outfitter/guides to operate big game hunts on the Santa Fe NF is currently being met, although this situation may change over the next few years as competition for trophy big game animals increases. There is little evidence of conflict among outfitters and guides or environmental impact from this activity. The relatively large land base allows hunters to spread out and not congregate in particular areas. Some hunters stay in hunting camps on the forest, but many stay in hotels or on private ranches.

The desire for recreation special use authorizations to operate a business on the Forest is relatively high, partially due to the proximity of the Forest to Albuquerque and Santa Fe and to the variety of opportunities for outdoor recreation. Issuing permits in a timely manner is problematic for the limited forest personnel as demand and complexity increase. In addition, the generally desired locations have a limited capacity to accommodate growing demand. Compounding this issue are rogue operators conducting tours, guided hikes, hunts, and horseback rides without a permit, which creates conflict with existing permit holders. These issues will be addressed as part of the forest sustainable recreation action plan discussed earlier.

In general, the Forest is having a difficult time responding to all interested proponents for special use permits. Declining or flat budgets have limited staff capacity, and additional people are needed to keep up with the demand.

Social, Cultural, or Economic Conditions Impacting Recreational Participation by Minorities and other Historically Disadvantaged Groups

New Mexico’s culturally rich and diverse population is approximately two million. While the median state income is over $41,500 annually, over 30 percent earn below $25,000 a year, with approximately 43 percent earning less than $35,000. It is estimated that almost 18 percent of the population falls below the poverty line, almost 5 percent more than the nation.

Almost 10 percent are American Indian or Alaska Native living on or off a reservation, pueblo, or on tribal land, as compared with the United States average of 1 percent. Persons of Hispanic or Latino origin represent over 44 percent of the population versus 15 percent for the nation.

Roughly 7 percent of the residents are under 5 years of age, while over 25 percent are under 18 years old. Almost 13 percent are 65 years and older. This age distribution is typical when compared to the United States average.

New Mexico's land area ranks fifth largest in the nation, behind Alaska, Texas, California, and Montana with well over 121,000 square miles. In the 2000 Census, this translated to 15 persons per square mile as compared with the United States average of almost 80 persons per square mile. The state ranks 45th out of 50 states for population density, ahead of South and North Dakota (respectively), Montana, Wyoming, and finally Alaska (New Mexico State Parks Department 2009).

Northern New Mexico is known for its tri-cultural population including Hispanic, Native American, and Anglo influences. This rich diversity is ever-changing, and from 2000 to 2011, the Hispanic population in New Mexico increased by 28 percent (Brown and Lopez 2013). According to the 2003 and 2008 NVUMs, the percentage of Hispanic recreationists on the Santa Fe NF decreased from 18.4 to 10.8 percent (table 34). Given the small sub-sample these numbers reflect, it is unclear whether this change is significant. While the numbers indicate a 41 percent decline, the numbers also indicate a 160 percent increase in the American Indian/Alaska Native users. Many factors influence self-identification choices made by respondents to race/ethnicity questions. These changes may indicate a shift in use trends among sub-groups. We currently do not have enough reliable information to determine whether these shifts are real or an artifact of sampling; and if the shifts are real, what are the causal factors.

Table 34. Self-reporting race/ethnicity for the National Visitor Use Monitoring survey of Santa Fe NF visitors for 2003 and 2008

National Visitor Use Monitoring Survey (NVUM) Race/Ethnicity*	2004 Forest Visits (%)	2009 Forest Visits (%)
American Indian/Alaska Native	2.0	5.2
Asian	1.4	1.8
Black/African American	0.5	1.7
Hawaiian/Pacific Islander	0.1	0.5
White	87.7	94.3
Hispanic/Latino	18.4	10.8
Total	110.1*	114.3*

* Individuals could respond to more than one race/ethnicity category, hence over 100 percent

For many generations, the Santa Fe NF has been extremely important to the people living around it for uses other than purely recreation. The Native Americans have used the forest for hundreds of years for subsistence; gathering fuel wood, hunting game for food, and gathering herbs for health. It has also been used for ceremonial purposes and spiritual well-being. The early Spaniards in the area used the lands for sheep and cattle grazing, in addition to gathering and hunting food, medicinal herbs, and fuel wood. As the Anglo culture moved in, they also used the forest for these same practices. The forest continues to be used for these traditional uses. Some are still dependent on fuel wood exclusively for winter heat. Hunting, piñon gathering, mushroom picking, and herb gathering, among many other uses, continue to be very popular activities, sometimes described as recreational, by the local inhabitants. These traditions are valued and passed down from one generation to the next, even in today's modern society.

Since the percentage of visitors coming to the Santa Fe NF, according to the NVUM results, is not in line with the demographics of the state, there may be barriers to getting certain populations into the forest. One possible barrier could be language related. Many of the Hispanics in New Mexico are relatively new to the United States and not English speaking. Although we attempt to have bilingual signage, it is not everywhere. This may make non-English-speaking visitors uncomfortable because they may not be able to figure out rules and regulations, or even simple instructions. Another barrier could be that the underrepresented populations do not know what opportunities exist or where to find them. The Forest needs to find a better avenue for contacting these groups.

Summary

Recreation resources contribute greatly to the physical, mental, and spiritual health of individuals, bond family and friends, instill pride in heritage, and provide economic benefits to communities, regions, and the nation. Recreation and Forest Service expenditures contribute the most of all Forest program areas to employment in the analysis area economy, each supporting more than approximately 400 jobs on an average annual basis. Almost 3000 visitors each year take advantage of activities supported by permitted outfitter-guide businesses on the Forest. The contributions from recreation and scenery on the Santa Fe NF provide a host of *cultural* ecosystem services to society. And, because many of the cultural ecosystem services are unique to the Forest and limited off the Forest, the value of these services is most certainly increasing.

The Santa Fe NF provides a diversity of recreational settings and opportunities for users from near and far. Outdoor recreation is important across all ranger districts with use generally heaviest near urban centers. This can be attributed to both the higher resident population and to a trend for shorter visits on national forests, with out-of-area visitors tending to base from urban centers and lodging options and to participate in a wider variety of short activities. Increasing demand for competing and conflicting recreational activities is taxing the Forest’s ability to manage use and meet visitor expectations. Recreation areas exceeding design capacity, as well as concentration of users due to displacement from large wildfires, may impact user experience as well as cause resource degradation.

The Jemez National Recreation Area (JNRA) is the only national recreation area in the Southwest Region. This corridor gets heavy use and also contains the East Fork of the Jemez Wild and Scenic River.

Based on results of the National Visitor Use Monitoring surveys (NVUM), recreation use on the Santa Fe NF for FY 2003 was estimated at 1.36 million visits. Recreation use on the Forest for FY 2008 increased to 1.37 million visits. This slight increase contrasts with a slightly downward national trend.

Environment- or place-based education, whether it is specifically about conservation studies or not, has been shown to facilitate critical thinking skills along with social and basic life skills. Research also indicates that it reduces discipline and classroom management issues, increases student engagement in the learning process, promotes leadership skills, fosters health and well-being, facilitates student pride and promotes ownership in achievements. In Santa Fe, networks support environmental and sustainability education throughout the school systems, providing opportunities to connect young people and their communities with the resources that flow from or reside on the national forest. These sorts of cultural services also carry economic benefits, although they are not presently assigned any dollar value.

Forest Service employees have noticed an increase in the popularity of mountain biking since the 1987 Forest Plan, notably on the Española RD, and this activity will likely continue to increase elsewhere on the Forest within the next few years. Not only do certain recreational activities grow in popularity over time, but new and unique activities also emerge that may raise new management concerns. For instance, geo-caching and zip-lining are activities that have emerged in the past decade.

The Santa Fe NF has more miles of trail than it has been able to maintain, resulting in a persistent maintenance backlog, undesirable impacts to natural and cultural resources, and conflicts among different user groups. As appropriated funds remain flat or decline, the Forest is increasingly turning to external resources (volunteers, partners, and other agencies) to help bridge this critical gap in trail system sustainability.

Several recent uncharacteristic wildfires and insect/disease outbreaks on the Forest affect the quality of recreational settings, opportunities, and scenic character. In addition, atypical weather patterns are creating warmer, drier winters that shorten or eliminate the season of use at some winter facilities such as Santa Fe Ski Area. Facilities and scenery may be threatened by wildfire and recreation sites closed due to unsafe conditions.

Scenic Character

Introduction

This portion of the assessment evaluates the existing and potential conditions, trends, contributions, and information gaps regarding scenic character.

People are concerned about the quality of their environment, including aesthetic values of the landscape, particularly scenery and spiritual values (USDA Forest Service 1995). When people experience the landscape, all the ecological features and the human elements are combined, creating a 'sense of place' that is strongly based on scenery, vision being the primary sense for most people. Scenery varies depending on existing natural features including vegetation, water features, landform and geology, and human-made elements. Scenic character is a combination of the physical, biological, and cultural aesthetics that give an area its scenic identity and contributes to its sense of place. Scenic character also describes the existing or desired set of valued aesthetic attributes that express the positive image of the current landscape.

The landscapes of the Santa Fe NF have a wide variety of features providing for spectacular scenery in the Southwest. People are drawn to the Forest for its diversity of scenic features including higher elevation spruce-fir forests, aspen adding brilliant gold during autumn, lush high mountain meadows filled with wildflowers, dramatic landforms with vibrant colors, breath-taking red rock canyons and cliffs, sandstone bluffs, and mountain peaks. The inspiring mountain scenery, cool mountain air and rustling waters provide relief from and contrast to the surrounding desert landscape. The Forest offers dark night skies and provides the backdrop to many communities and homes. The Santa Fe NF area has a variety of scenic settings with mesas, canyons, and peaks rising from deserts, meadows, and grasslands. The Forest also has many prehistoric and historic sites adding richness of character and culture.

When the Santa Fe National Forest Plan was adopted in 1987, scenic resources were inventoried and analyzed using the Visual Management System. The Visual Management System, presented in Forest Service Handbook 462 (USDA Forest Service 1974), National Forest Landscape Management Volumes 1 and 2 (including 7 chapters), provided the framework for inventorying the visual resource and provided measurable standards for managing it.

The Forest Service replaced the Visual Management System in 1995 with the Scenery Management System for the inventory and analysis of the aesthetic values of National Forest System lands. The Scenery Management System is described in Agricultural Handbook 701, Landscape Aesthetics: A Handbook for Scenery Management (USDA Forest Service 1995). Agency policy at Forest Service Manual 2382.3 directs national forests to update the scenery inventory using the Scenery Management System prior to or at the initiation of forest land and resource management plan revisions.

The Santa Fe National Forest is in the process of completing Scenery Management System inventories as part of the plan revision process to update the inventory of the existing condition of the scenic resources. The Scenery Management System incorporates updated research findings which were not available when the Visual Management System was published in 1974. Conceptually, the Scenery Management System increases the role of the public, or constituents, throughout the inventory and planning process. It takes into account, more so than the Visual Management System, that human influences such as rustic cabins, wooden fences, and so forth, can have positive cultural connotations and should be recognized as scenic attributes. Further, it borrows from and is integrated with the basic concepts and terminology of ecosystem management. The Scenery Management System provides for improved integration of aesthetics with other biological, physical, and social/cultural resources in the planning process, and

incorporates more flexibility in recognizing the changing nature of healthy landscapes at larger time and geographic scales.

Scenery Management System is a tool for integrating the benefits, values, desires, and preferences regarding aesthetics and scenery for all levels of land management planning. The process involves identifying scenery components as they relate to people, mapping these components, and developing a value unit for aesthetics from the data gathered.

Scenery Management System is today's best science to achieve high-quality aesthetics through ecosystem management practices. Through the Scenery Management System process, scenic character goals are developed in concert with other resource and social demands or expectations, and scenic integrity objectives are established.

The Santa Fe NF intends for the new Scenery Management System analysis to be a valuable resource for the public in considering a need for change to the 1987 Forest Plan relative to scenic resources and their integration into all future project-level decisions. Additionally, the completion of Scenery Management System inventories will provide for forestwide data layers for managing scenic resources. No digital visual quality objective layer currently exists for the entire forest; most of the 1980s visual resource management inventories are currently only available on hard copy maps.

Existing and Potential Scenic Character

Existing Condition

As stated earlier, when the Santa Fe National Forest Plan was adopted in 1987, scenic resources were inventoried and analyzed using the Visual Management System. This system, which was released in 1974, established standards of measurement (i.e., visual quality objectives) for assessing proposed and existing impact to scenic quality. The current forest plan states that all lands within the Forest are managed to achieve some level of visual or scenic quality. The standards to which they are managed are defined as visual quality objectives (VQOs).

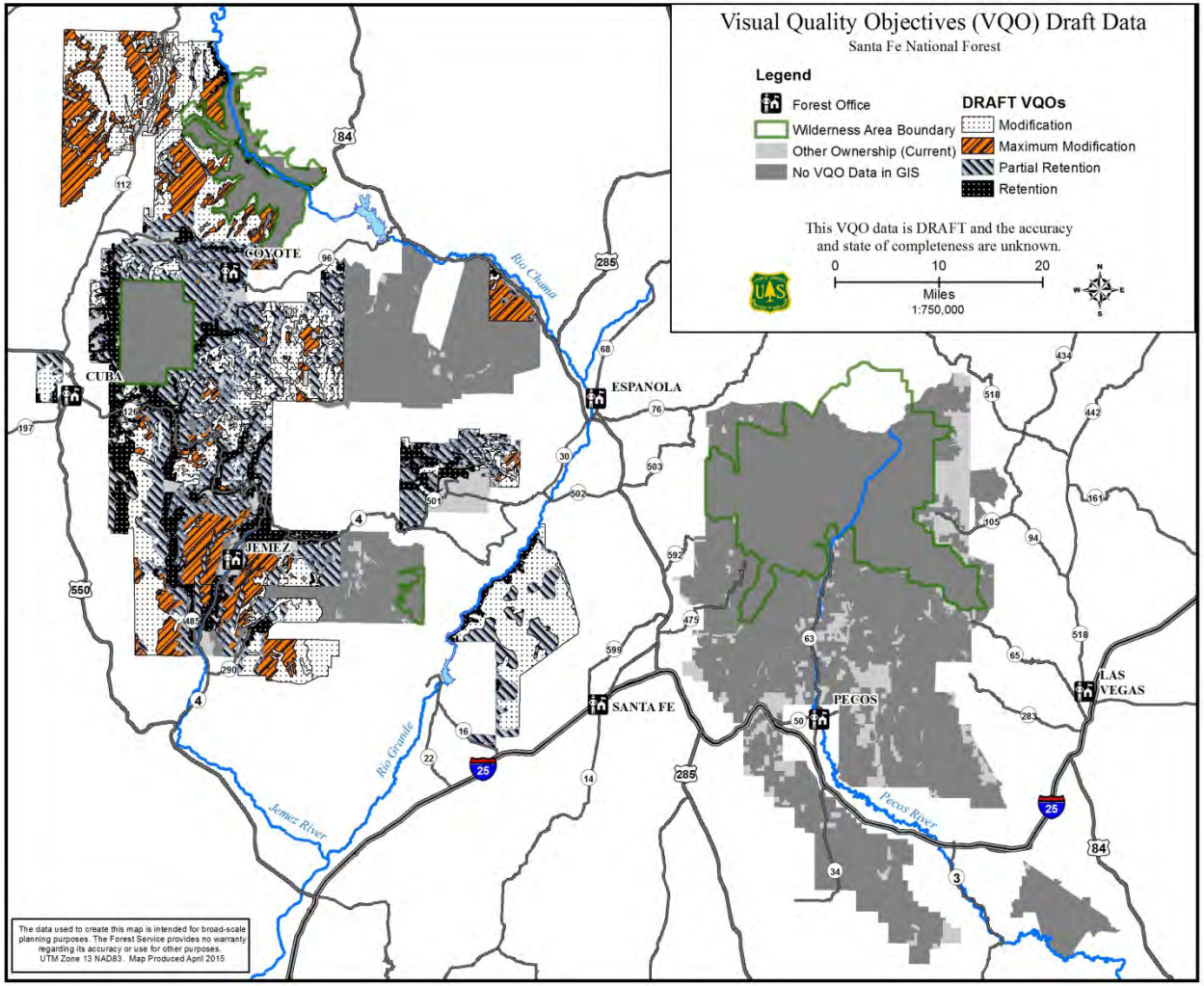
Management area standards and guidelines assign visual quality objectives for each management area, often summarizing the acres for each VQO occurring within the management area. However, digital maps of VQOs are only available for western portions of the Forest and may not accurately reflect VQOs identified in the management area direction. The visual resource inventory completed in the 1980s is mostly on hardcopy maps. The following definitions of VQOs are provided and acreage of each summarized from the amended 1987 Forest Plan.

Table 35. Visual quality objective definitions and acreage summary for the Santa Fe NF, summarized from the 1987 Forest Plan

VQO	Definition*	Acres estimated by Forest Plan**	Percent of Forest
Preservation (P)	In general management activities are not detectable to the visitor.	329,807	21
Retention (R)	In general management activities are not evident to the casual visitor.	345,440	22
Partial Retention (PR)	In general management activities may be evident, but must be subordinate to the characteristic landscape.	323,856	20
Modification (M)	In general management activity may dominate the characteristic landscape but must at the same time, utilize naturally established form, line, color, and texture. Man's activities should appear as natural occurrences when viewed as middleground or background.	234,884	15
Maximum Modification (MM)	Management activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.	364,945	23

* Definitions from 1987 Forest Plan amended (USDA Forest Service 2010, 222)

** Acres estimated from 1987 Forest Plan and Management Area corporate GIS data, if VQO acreage was not listed for a Management Area in the 1987 Forest Plan



Note: Accuracy of this data is in question as the visual quality objectives mapped may not accurately reflect visual quality objectives identified in the Forest Plan management area direction. No digital visual quality objectives data is available for the east side of the Forest.

Figure 42. Visual quality objectives for the west side of the Santa Fe NF

All wilderness and Research Natural Areas, along with the Santa Fe municipal watershed, have preservation VQO. Areas viewed in the foreground from communities, recreation areas, and high use roads and water bodies, as well as scenic backdrops from these areas, have retention VQO. In retention VQO, management activities should not be visually evident within one year of project completion. Timber activities should be designed to promote diversity and the scenic characteristics of the forest. Backdrops with less scenic variety or lands viewed in the foreground from lower use areas have a partial retention VQO. In partial retention VQO, activities may be evident, but must remain subordinate to the characteristics of the landscape. Other areas containing minimal scenic variety or seldom seen from common use areas, have objectives which permit a more managed appearing forest while retaining some qualities of naturalness. (USDA Forest Service 2009).

Management Plans for the Jemez National Recreation Area and the three designated wild and scenic rivers use terminology and concepts from the Scenery Management System (i.e., scenic integrity objectives), but these acreages are summarized and shown with their equivalent visual quality objective.

Existing Scenic Character

The natural and natural-appearing scenic character of the Forest stands out, making it a major local, regional, and national recreation and living destination. A natural scenic character has only minimal human influences, and a natural-appearing scenic character has some human influence present, but that influence is primarily not evident.

The mountain landscapes are a focal point viewed from Santa Fe, New Mexico, and the backdrop to communities in the area. When managing for scenic resources, concern levels are used to measure the public importance placed on landscapes viewed from travelways and use areas. Roads off-forest as well as most Forest roads, trails, and recreation sites have high public concern for viewing scenery, especially those in the Jemez National Recreation Area, designated wilderness areas, Pecos River Canyon, and Rio Chama area. A high concern for viewing scenery means that users expect to see a natural-appearing landscape.

Perennial streams and cold and hot springs throughout the landscape, unique waterfalls, diverse vegetation, higher elevation tree-covered mountains, and steep, vibrant colored cliffs and canyons combine to provide for distinctive landscapes over much of the Forest. The water, landform, and vegetation attributes provide for unique and outstanding scenic quality with a variety, unity, vividness, intactness, order, uniqueness, pattern, and balance.

Existing Scenic Integrity

An existing scenic integrity analysis, including a scenery management system inventory, was completed in 2013. The findings are discussed below.

Large areas of the Forest contain naturally evolving landscapes where processes occur with very little human intervention. The scenic character is intact with only minute, if any, deviations, such as non-motorized trails. These areas include four wilderness areas and inventoried roadless areas that have seen little human influence and make up about 27 percent of the Forest.

Figure 43. Baldy Lake with Truchas Peak in the background, an example of very high existing scenic integrity. Photo from Forest website.

Figure 44. Chama River Canyon Wilderness, an example of very high existing scenic integrity as shown on the map in figure 49

Most of the Forest area, about 41 percent, has a natural appearing scenic character and appears unaltered, although some human activities are present. This describes high existing scenic integrity, or landscapes that appear unaltered. Deviations in the scenic character borrow from elements in the landscape, such as form, line, color, texture and pattern. Roads and trails are a part of the natural appearing landscape. Although roads and trails are evident, they serve as the viewer platform, offering opportunities and access to view scenery. The somewhat modified setting of a viewer platform, (i.e., a road or trail), is accepted as a necessary component allowing travelers to experience the greater landscape (USDA Forest Service 1995). Some prescribed burning, livestock grazing structures, or other low impact facilities may be noticeable, but borrow from landscape elements. Historic and pre-historic structures may be noticeable throughout the Forest, but borrow from landscape elements and are positive cultural elements in the landscape adding to the valued scenic character.

Figure 45. Mesas in the Jemez National Recreation Area, an example of high existing scenic integrity

Moderate scenic integrity, or landscapes that appear slightly altered, is characterized by noticeable evidence of human activities and management along roads and trails where administrative facilities and recreation developments such as campgrounds, visitor centers, trailheads, and picnic areas are noticeable, but remain subordinate to the scenic character being viewed. The landscape has a slightly altered scenic character from these activities. Vegetation management with intermediate harvest methods, causing some noticeable changes in the forest canopy, but leaving most of the forest canopy intact also results in a forest landscape which appears slightly altered. Some other activities which have slightly altered the landscape include fuels reduction activities, wildlife habitat improvements, and oil and gas activities on the Cuba Ranger District. About 29 percent of the Forest falls into this category.

Figure 46. Jacks Creek Campground and Trailhead, an example of moderate existing scenic integrity in close views transitioning to high and very high existing scenic integrity in farther views of the Pecos Wilderness

Figure 47. Oil and gas activity, an example of moderate existing scenic integrity

Low existing scenic integrity, or landscapes that appear moderately altered, is characterized by more intensive vegetation management and small developed communication sites and utility corridors. Some reclaimed mining activities begin to dominate landscape features by adding forms, lines, and color changes to the landscape. These activities result in a moderately altered scenic character, where the activities dominate the valued scenic character but borrow from valued attributes such as color, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles outside the landscape being viewed. More intensive vegetation management, which causes shape and texture changes in the forest vegetation, may be noticeable and begin to dominate some landscapes on the western portion of the Forest. Less developed communication sites and utility corridors occur throughout the Forest and begin to dominate the landscape when viewed, but are smaller in scale and have less right-of-way clearing than other larger scale similar activities. Although dominant on the landscape when viewed, reclaimed mining activities with minimal landform alterations and re-vegetation are beginning to borrow from surrounding landscape features. About 2 percent of the Forest is in this category.

Figure 48. Stumps remaining from past timber harvest, an example of low existing scenic integrity

In about 1 percent of the Forest, larger electronic sites, major utility corridors, ski area development, and most mining activity, when present, begin to dominate landscape features by adding uncharacteristic forms, lines, and colors to the landscape. These areas have a heavily altered scenic character, where the activities strongly dominate the valued scenic character and borrow little from valued attributes, such as size, shape, edge effect and pattern of natural openings and vegetative type changes within or outside the landscape being viewed.

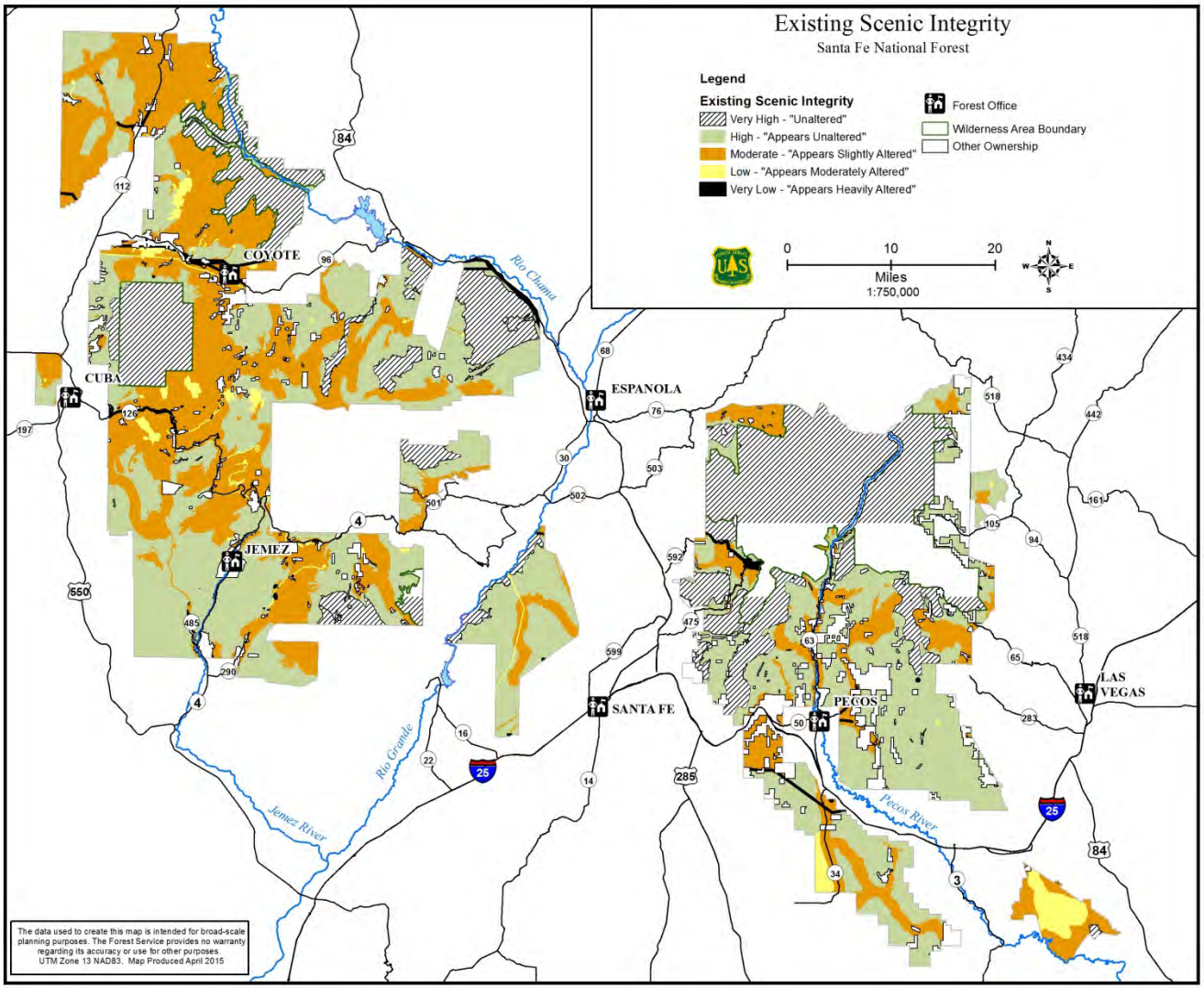


Figure 49. Existing scenic integrity map

Potential Scenic Character

Aesthetics contribute to a 'sense of place' for residents and visitors, and provide ways to foster greater connection between people and nature, which can inspire life-long stewardship for valued landscapes. Consideration for nature appreciation and scenery in land and resource management occurs through scenery management and landscape aesthetics. In scenery management, aesthetics describes landscapes that give visual and sensory pleasure, connecting people to landscapes based on what they see and experience. Scenic character describes this connection through a combination of physical, biological, and cultural images that gives an area its scenic identity. Scenic character also describes valued aesthetic attributes that express the image of the landscape. People expect to see natural or natural appearing scenery when viewing the landscape, and scenery related to natural appearing forests and landscapes enhances people's lives and benefits society in measurable ways (USDA Forest Service 1995).

Scenic character, in the Scenery Management System, recognizes that a landscape is dynamic and a constantly changing community of plants and animals. Scenery management and understanding of a landscape's scenic character provide opportunities to foster the connection of people and nature through stewardship. Incorporating Scenery Management System concepts into revised forest plan components allows for management of aesthetics in an ecosystem context.

The Forest is the beautiful backyard of communities and homes providing the backdrop views and sensory experiences from these areas. The population growth of regions surrounding the Forest, as discussed in the socio-economic chapter of the assessment, has affected concern for scenery. The concern and desire for natural appearing scenery has increased while participating in recreation activities, traveling through the forest, and when viewed from communities since the Visual Management System inventories were completed in the 1980s. Areas previously managed for modification and maximum modification VQO now may have a higher public concern for viewing scenery than identified in the previous Visual Management System inventories. Areas with higher concern for scenery may be managed for more natural appearing scenery than previously managed. This will be determined through the plan revision process with the completion of the Scenery Management System inventories, through an interdisciplinary process with the plan revision team, and incorporating data gathered during public collaboration.

Conditions and Trends Affecting the Scenic Character

The Forest continues to be a popular recreation area for local communities, New Mexico, and surrounding states. Trends to spend more time on the Forest and enjoy the natural scenic beauty of the forest environment exist since viewing natural features or scenery has been among the top two recreation activities on the forest during the last two rounds of National Visitor Use Monitoring (USDA Forest Service 2004, USDA Forest Service 2009). Viewing natural scenery, sightseeing, driving for pleasure, and photographing natural features are among the nation's highest ranking recreational activities (Cordell 2008). Additionally, viewing, taking photos, or otherwise observing and appreciating nature has been the fastest-growing type of nature-based recreation (Cordell 2012). Following these national trends, more demand and use are anticipated for hiking, walking, viewing natural features or scenery, viewing wildlife, driving for pleasure, and relaxing, with use likely concentrated near water sources. Use is anticipated to be near water sources, since the main transportation corridors on the Forest are currently concentrated in such areas (i.e., Pecos River, Jemez River, Rio Chama).

Other sections in chapter 6 of the assessment state that developed sites are full on Jemez and Pecos Districts almost every weekend and holiday throughout the summer season. In Pecos Canyon, crowding of favorite sites and parking areas causes campers to spill into areas not safe or legal for such use. Recreation use beyond capacity often causes natural resource damage adjacent to recreation sites, roads,

and trails, affecting the natural appearing scenery adjacent to these areas. During public meetings, participants stated that scenery has been marred in particular places because of more trash and litter. Traffic congestion during high use times and crowding also affects access and opportunities to view scenery. These types of conditions and trends affecting scenery are most noticeable at specific sites, not at a landscape level. Natural appearing scenery can be maintained or restored through design elements or managerial controls (including increasing emphasis on stewardship ethics) on use, cleaning up of trash and litter, or revegetating areas with resource damage.

The population growth of regions surrounding the Forest, as discussed in the socio-economic chapter of the assessment, and suburban development encroaching on lands adjacent to the Forest, bring challenges for managing scenery. Abrupt changes from a rural or urban setting to a natural appearing setting are often quite apparent. However, communities and homeowners value the natural appearing backdrop the Forest provides.

Most noticeable changes to scenic conditions across the landscape occur through natural processes such as wildfires or flooding. These natural disturbances will continue to shape the vegetation and landform features of the landscape, affecting the overall sustainability of the scenic character. Fire can also benefit scenic character. Historic fires on the Sangre de Cristo Mountains have resulted in large areas of aspen, which provide beautiful golden fall colors intermixed against green conifer covered mountains. Other factors which will continue to affect the sustainability of the scenic character of the forest include: drought conditions affecting vegetation and water features, invasive species affecting native vegetation, tree encroachment on meadows and other forest openings, and conifer encroachment on aspen.

Wildfires which burn with mixed severity have fewer impacts to scenic character than those that burn with high severity, which result in greater tree mortality and sometimes soil sterilization, creating slower recovery rates. Low and mixed severity fires are part of the characteristic landscape. The Tres Lagunas Fire of 2013 burned about 10,000 acres on the Pecos-Las Vegas Ranger District in the Pecos River recreation corridor. When viewed from the NM Highway 63, the fire appears to have burned in a mosaic pattern with mixed severity, a mixture of blackened tree boles, green trees, red needled trees and pockets of crown replacement and blackened trees can be seen. The Thompson Ridge Fire of 2013 burned over 23,000 acres on the Valles Caldera National Preserve causing some vegetation loss. When viewed from the Jemez Mountain Scenic Byway, the fire appears to have burned in a mosaic pattern with mixed severity (Observation from site visit by author, June 2013).

Figure 50. View of the Tres Lagunas Fire on hillside showing a variety of effects to vegetation. Photo taken in June 2013.

Fires are becoming more common in recent years, affecting forest vegetation, access, and visibility due to smoke. Several recent uncharacteristic, stand-replacing wildfires, post fire flooding and erosion risk, and insects and disease outbreaks on the forest have affected the scenic character.

- The Las Conchos Fire of 2011 burned through over 150,000 acres on the Espanola and Jemez Ranger Districts, the Valles Caldera National Preserve, and the Bandelier National Monument. This high severity, uncharacteristic wildfire caused widespread tree and vegetation mortality, facility damage, and resulting hazard trees and has affected the scenery viewed from Jemez Mountain Scenic Byway, Los Alamos, Pajarito Mountain Ski Area, and many Forest recreation sites and roads. It also caused widespread mortality changing the scenic character from views of conifer forest covered mountains to open shrub and grass covered mountains with standing and fallen dead trees. Widespread post-fire flooding and erosion further altered the scenic character by moving and exposing soils and affecting revegetation and access, since some roads remain closed in the fire area. Areas where the fire burned in a mosaic pattern have a more typical scenic character for the area.
- . The fire also caused widespread tree mortality on NFS lands changing the scenic character from views of ponderosa pine forests to open shrub, aspen sprout, and grass covered hillsides with standing and fallen dead trees. The Cerro Grande Fire has been slower to revegetate on NFS lands. Shrubs and aspen are beginning to dominate and may provide for some fall color variety in the future as the area recovers.
- The Borrego Mesa Fire of 2002 in the Sangre de Cristo Mountains on Espanola Ranger District caused widespread tree and vegetation mortality. This high severity fire changed the scenic character in this area and increased occurrences of invasive plant species. The fire also created hazard trees on along Forest roads and subsequent flooding damaged trails, which affects opportunities for viewing scenery.

- The Viveash Fire of 2000 burned on the Pecos-Las Vegas Ranger District resulting in tree mortality with ongoing hazard tree and erosion issues present. It also burned down Cow Creek Campground which has not been rebuilt, which affects opportunities for viewing scenery.
- Insect and disease tree mortality has occurred across most districts from pinyon ips and bark beetles, causing an increase in hazard trees along scenic road corridors, developed recreation areas, and trails and has reduced scenic quality with standing and fallen dead trees. Mitigation of the hazard trees can leave stumps, reduce shade, and leave slash from cut trees, reducing the overall scenic value.
- Defoliation of trees from spruce budworm has affected the scenic quality of areas across the forest by changing the forest views while trees are defoliated.

Most noticeable changes to scenic conditions at the landscape level occur through natural processes such as wildfires or flooding as described above. Scenic character recognizes that a landscape is dynamic and a constantly changing community of plants and animals. Depending on the scale and severity of a disturbance, the resulting scenic character can be more sustainable and resilient. For example, low or mixed severity fire which increases fall color species and creates a mosaic of burned and unburned areas often increases sustainability of scenic character. However, large fires and insect and disease events, such as those described above, are system drivers and stressors affecting scenery. Large fires and insect and disease evens are becoming the norm in the Southwest and can result in a marked contrast to the natural appearing landscape people expect to see. Drought conditions and the potential for large scale disturbance, reduces the sustainability and resilience of scenic character. Events resulting in landscape views dominated by tree mortality can dramatically alter the scenic character for many years due to the time needed for the landscape to recover, particularly with the current drought conditions. People often describe feelings of loss due to the noticeable changes in scenic character and sense of place, which was described by participants at public meetings.

Whether on a small scale at recreation sites or at the landscape level for natural disturbances, understanding the dynamic nature of scenic character, through scenery management, provides an opportunity to communicate landscape changes to the public and to foster a connection between people and nature through stewardship. Scenic character's connection with sense of place can communicate people's attachment to landscapes and identify opportunities to create sustainable scenic character through stewardship.

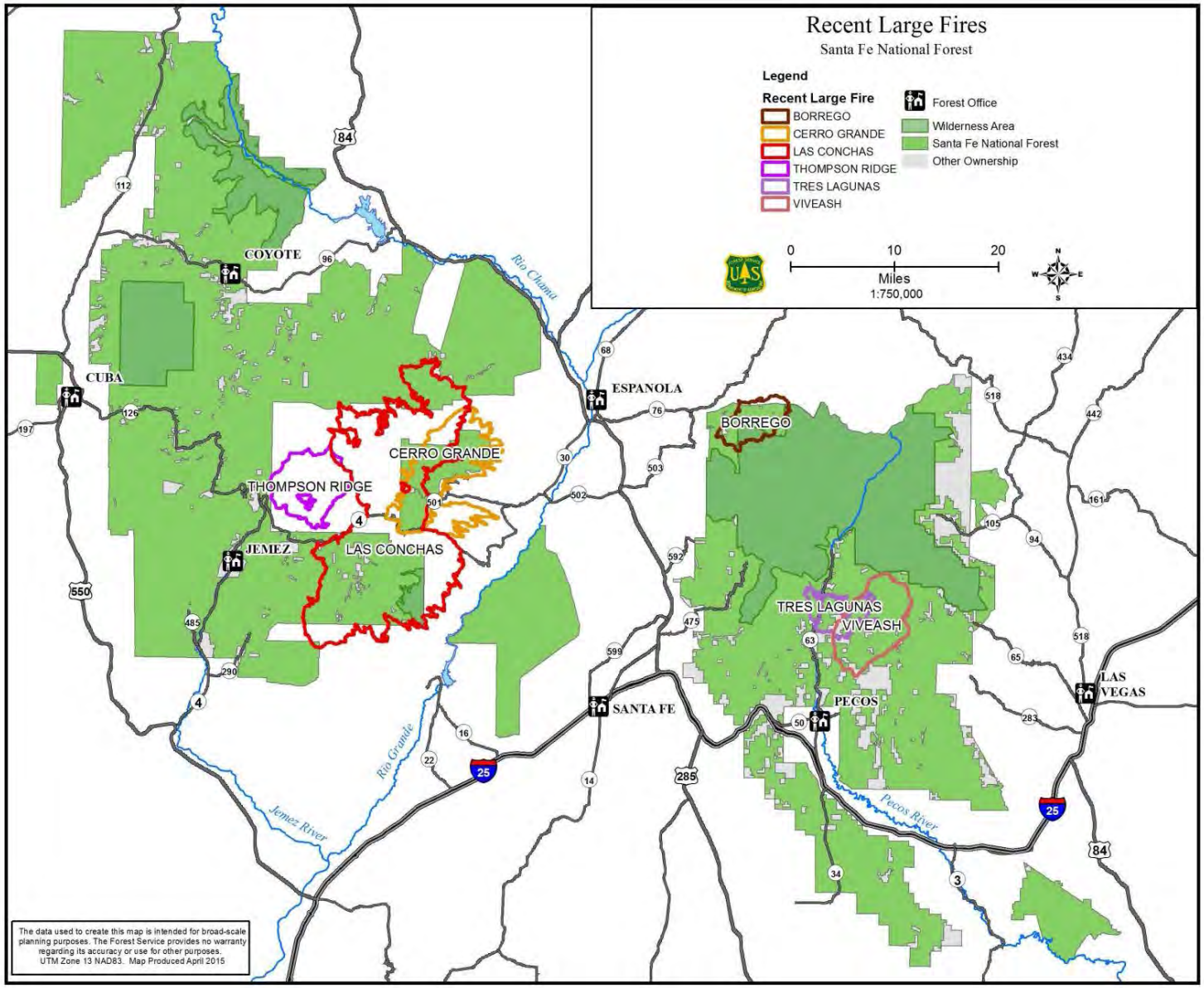


Figure 51. Map showing location of fires referenced above

Figure 52. View of Los Alamos Canyon 13 years after the Cerro Grande Fire, showing revegetation dominated by shrubs. Photo taken in June 2013.

Figure 53. Views of Cochiti Canyon after the Las Conchas Fire, showing widespread tree mortality and remaining standing dead trees. Photos taken in June 2013.

Scenic Character Contribution to the Socioeconomic Landscape

Among the approximately 1.6 million acres of National Forest System lands on the Santa Fe NF, about 300,000 acres are designated wilderness including the Pecos, San Pedro Parks, Dome, and the Chama River Canyon, which provide for distinctive scenic landscape features and unaltered, natural scenic character. There are two Scenic and Historic Byways, one national recreation area, and three designated wild and scenic rivers within the Santa Fe NF. Scenery is an outstandingly remarkable value for the Forest's three designated wild and scenic rivers: East Fork of the Jemez River, Rio Chama, and Pecos River (USDA Forest Service, USDI Bureau of Land Management et al. 1990, USDA Forest Service 2002, USDA Forest Service 2003).

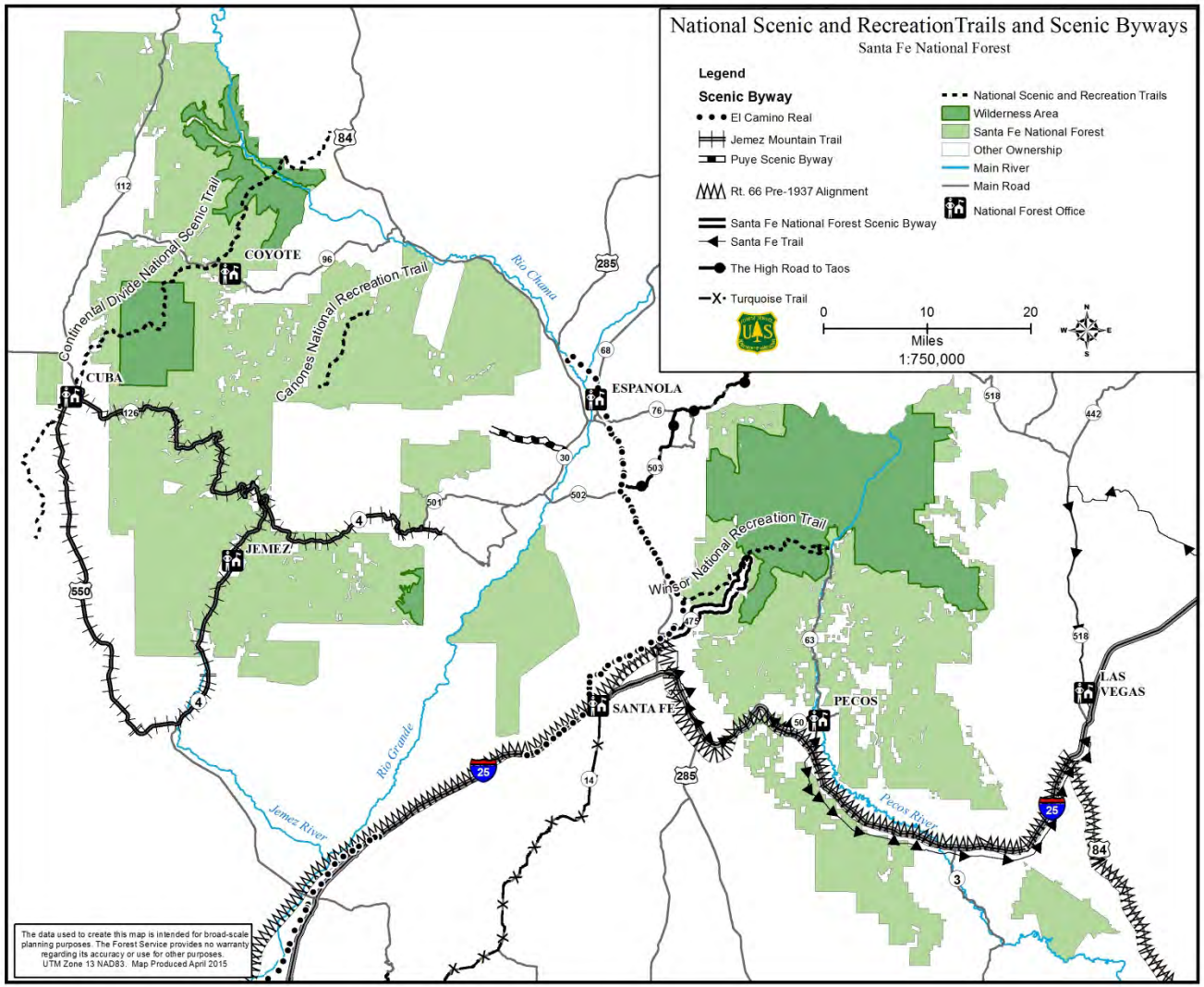


Figure 54. National Scenic and Recreation Trails and Scenic Byways Map

Jemez National Recreation Area provides for outstanding scenery and recreation opportunities. Jemez National Recreation Area is made of dramatic landscapes with breathtaking views of sheer cliff faces, pock-marked tuff exposures, flat topped mesas, lush canyon bottoms. The two main river corridors, Rio Guadalupe and Jemez River, receive the highest recreation use. The outstanding scenery is one of the main resources drawing an estimated nearly 1.6 million visitors to the Jemez National Recreation Area each year (USDA Forest Service 2002).

The Forest Plan manages for natural appearing scenery or retention VQO in the foreground (1/2 mile) from communities, recreation areas, and high use roads and water bodies, as well as scenic backdrops from these areas. In retention VQO, vegetation treatments should not be visually evident within one year of project completion in these areas. Scenery is defined by the arrangement of the natural elements of the landscape along with components of the built environment. All activities forest visitors experience are performed in an environment influenced by the surrounding scenic character.

Managing for scenic quality benefits the local and regional economy of the Santa Fe NF area. The Santa Fe NF is a recreation destination, attracting visitors from the local area, across New Mexico, bordering states, and across the country. Main recreation activities include hiking and walking, viewing natural features or scenery, viewing wildlife, relaxing, and driving for pleasure (USDA Forest Service 2009). According to 2009 National Visitor Use Monitoring, over 32 percent of visitors participated in viewing natural features or scenery with nine percent of visitors listing viewing scenery as main activity. Viewing natural features was the second most popular activity, with hiking/walking being the most popular activity. Additionally, over 50 percent of forest visitors reported using a scenic byway (USDA Forest Service 2009). According to 2004 National Visitor Use Monitoring over 63 percent of visitors participated in viewing scenery (USDA Forest Service 2004). It is important to manage the scenic resources to ensure a quality sightseeing experience for the public. Scenery is an integral component of all forest settings, and contributes to the quality of the users' experience. Providing a natural-appearing landscape for these visitors is important because Forest visitors rank scenery and attractiveness of the forest landscape as important to very important (USDA Forest Service 2004).

Local stakeholders and community members value the scenic character offered by the Santa Fe NF. "The SFNF is described as an important asset for adjacent communities that offers aesthetic and quality of life benefits that are inspiring and enhance community quality of life" (Russel and Adams-Russel 2005). One participant of a discussion group stated that "The variety of the forest sets it apart from what is around us otherwise and the contrast is what I find so aesthetically pleasing" (Russel and Adams-Russel 2005). Discussion groups further "describe forest aesthetics as a valued asset of the SFNF. A varied landscape, diverse vegetation, and snowcapped mountains contribute to a landscape that is described as inspirational and an asset to the setting and lifestyle of adjacent communities….The aesthetics values and benefits of forest resources are also explicit and implicit in other statements about the connection of individuals and communities to the Santa Fe NF" (Russel and Adams-Russel 2005).

Information Needs

Under the current Forest Plan, digital data for visual quality objectives only exists for the western portion of the forest and this data may not accurately reflect visual quality objectives identified in the management area direction. No electronic data for visual quality objectives is available for the eastern portion of the Forest.

Completion of the Scenery Management System inventories is needed to provide a complete understanding of the current condition of scenic resources on the Forest. Collaboration with the public

will continue to provide necessary constituent information to determine desired conditions for scenery during plan revision.

Ecosystem Services

Recreation and Scenery

While many people in northern New Mexico directly utilize and/or harvest various natural resources across the SFNF, most of these people plus many more engage with their public lands through various activities considered recreational and discussed in this chapter of the assessment. This includes not just area residents, but people who are specifically drawn to the distinctive natural and cultural landscapes provided on and around the Santa Fe NF. While outdoor recreation studies nationally show a decreasing trend in annual participation, the Santa Fe NF experienced a slight increase (to 1.37 million) in its most recent survey. Kinds of uses, and locations of those uses, especially new and emerging uses such as mountain biking and zip lines, are changing over time and creating additional unmet needs for planning and management. Wildlife and bird watching are quickly outpacing wildlife consumption as activities contributing both economically and socially to the residents and visitors of northern New Mexico.

The Santa Fe NF maintains 29 campgrounds, 53 various day-use sites, about 120 recreation residences or leased cabins, almost 1000 miles of trails and 10 additional sites of specific recreation interest. Four designated wilderness areas, 3 designated wild and scenic rivers, 3 national recreation trails, 5 designated caves, a popular ski area and a busy National Recreation Area must all be managed to additional national standards. Depending on the type of designation, these areas may be managed primarily for human recreation interests, or to provide for unhindered ecosystem processes with only low-technology recreation and management that will allow for the long-term unfolding of ecological changes, providing an education benefit as system baselines. The qualities of these areas that led to their designations serve as additional attractions and provide needed economic income, especially for smaller communities.

Recreation and aesthetic quality on the national forest serve individuals, families and communities as well-researched health and wellness benefits. Part of that is certainly physical, and the social cohesion and spiritual or emotional benefits also contribute in many ways. Connecting people to their natural and cultural resources creates opportunities for education and understanding of the many interrelationships humans share with the larger world. A robust outfitter-guide and special use permit program (over 80 outfitting permits at present) provides economic opportunity for area communities while contributing to these ecosystem services by introducing people to the landscape in more intimate and extended ways. New kinds of uses and growing interest in providing more guided services are both suffering from lack of staff capacity to develop management guidelines or analyze and administer special use permits.

The aesthetic and scenic values of the Santa Fe NF contribute to the attractiveness of both the recreation resource and the general quality of life for residents, both long-term and newly-arrived. As a tourist destination, northern New Mexico's small businesses and jobs are supported by this high quality aesthetic environment. Demand for properties along the forest boundary is increasing, and prices reflect the higher value given for these qualities. Both residents and visitors experience a particular 'Sense of Place' that is partially dependent on the natural environments of the forest. Development along the forest boundary has been cited as an increasing impact, however, including such issues as noise concerns, soil loss or dysfunction, and water depletion.

Ecosystem drivers that have recently caused some loss of opportunity, service level and integrity include uncharacteristic wildfires and insect/disease outbreaks, exacerbated by prolonged drought. These factors have combined with sharply decreased budgets to create a large backlog in deferred maintenance on trails and recreation facilities. Changing weather patterns also cause concern about the forest's ability to

continue its winter use programs, such as the Santa Fe ski area. Nonetheless, public interest is in *increasing* the mix of year-round activities provided, and increasing cross-jurisdictional coordination of those opportunities. The 8 national scenic byways and 13 adjacent special area designations with a recreation focus can supply some of the growing demand for natural environments, scenic driving and cultural tourism. The forest is actively engaging its many public stakeholders through conservation education, working agreements, partnerships and volunteers, but a critical and growing gap in maintenance capacity for trails, services and facilities on National Forest System lands still exists.

Input Received at Public Meetings

This section summarizes input, perspectives, and feedback relevant to this assessment topic and received from the public between April and July 2014. Input was gathered from 14 public meetings as well as forms available at all Santa Fe NF offices and online.

The diversity of the scenery on the forest is highly valued – from the rock formations and the color of the dirt to the gold of the aspens and the green spaces in summer. Forest users value the variety of landscapes, different terrains, elevation, and seasonal changes. The night sky is also a value of the scenery from the forest as people escape from bright city lights and enjoy the stars in the darkened sky. For many communities, the forest serves as the “backdrop of [people’s] home[s].”

Participants contributed several observations of changes over time, mostly related to fires. One participant discussed the eerie and sad aspects of re-growth in burned areas. A Los Alamos resident observed that there are new, longer vistas because of the fires. The scenery has also been marred, in some places in particular, because of more trash and litter.

Chapter 6. Assessing Designated Areas

Designated areas are specific areas or features within the plan area that have been given a permanent designation to maintain its unique special character or purpose. Some categories of designated areas may be established only by statute and other administrative processes of the Federal executive branch may establish some categories administratively.

This chapter provides a description of the designated areas associated with the Santa Fe, and assesses the types, purposes, range of uses, management activities, and locations of established designated areas on the Santa Fe NF. Public comments received in the earlier technical session are provided, along with a more detailed discussion of the process, within Forest Plan Revision, for making recommendations on new designations. Current management of Wild and Scenic Rivers is detailed, and information regarding many other special designations is gathered in this chapter. The end of the chapter includes a short discussion of the potential for other designated areas.

Designated areas within the Santa Fe NF (figure 55) or immediate area of influence include:

- Four wilderness areas
- Two research natural areas and one proposed
- Two designated and one proposed critical habitats for federally threatened and endangered species
- Fifty-four individually named inventoried roadless areas (IRAs)
- Three national scenic trails
- Three wild and scenic rivers
- The Jemez National Recreational Area
- Eight nationally or state designated scenic byways
- Thirteen adjacent designated areas, monuments, or parks outside the Forest boundary

Pursuant to the 2012 Planning Rule and the directives, the Santa Fe NF must conduct an inventory and evaluation for lands that may be suitable for inclusion in the National Wilderness Preservation System, and inventory of the eligibility of rivers for potential inclusion in the Wild and Scenic Rivers System. The inventory of eligibility and evaluation will be conducted with public participation and are expected to be completed between the release of the final assessment report and prior to the release of the Draft Forest Plan and Environmental Impact Statement. At this time, the Santa Fe NF has not identified any areas to recommend for either additional wilderness or wild and scenic rivers. The revision process will include an analysis of potentially suitable new areas for special designations such as wilderness. The Forest Supervisor would then recommend, as part of the new Plan decision, any specific areas for Congressional designation.

The following is a list of current designated areas within the plan area of influence and the plan area. No specific data projecting visitor use or direct and indirect economic impacts associated specifically with designated area features within the plan area are currently available. Monitoring reports required also typically fall in the ‘implementation’ monitoring category; effectiveness monitoring data is not readily available. Where management plans for individual designated areas are available, they are referenced in the discussion on that area.

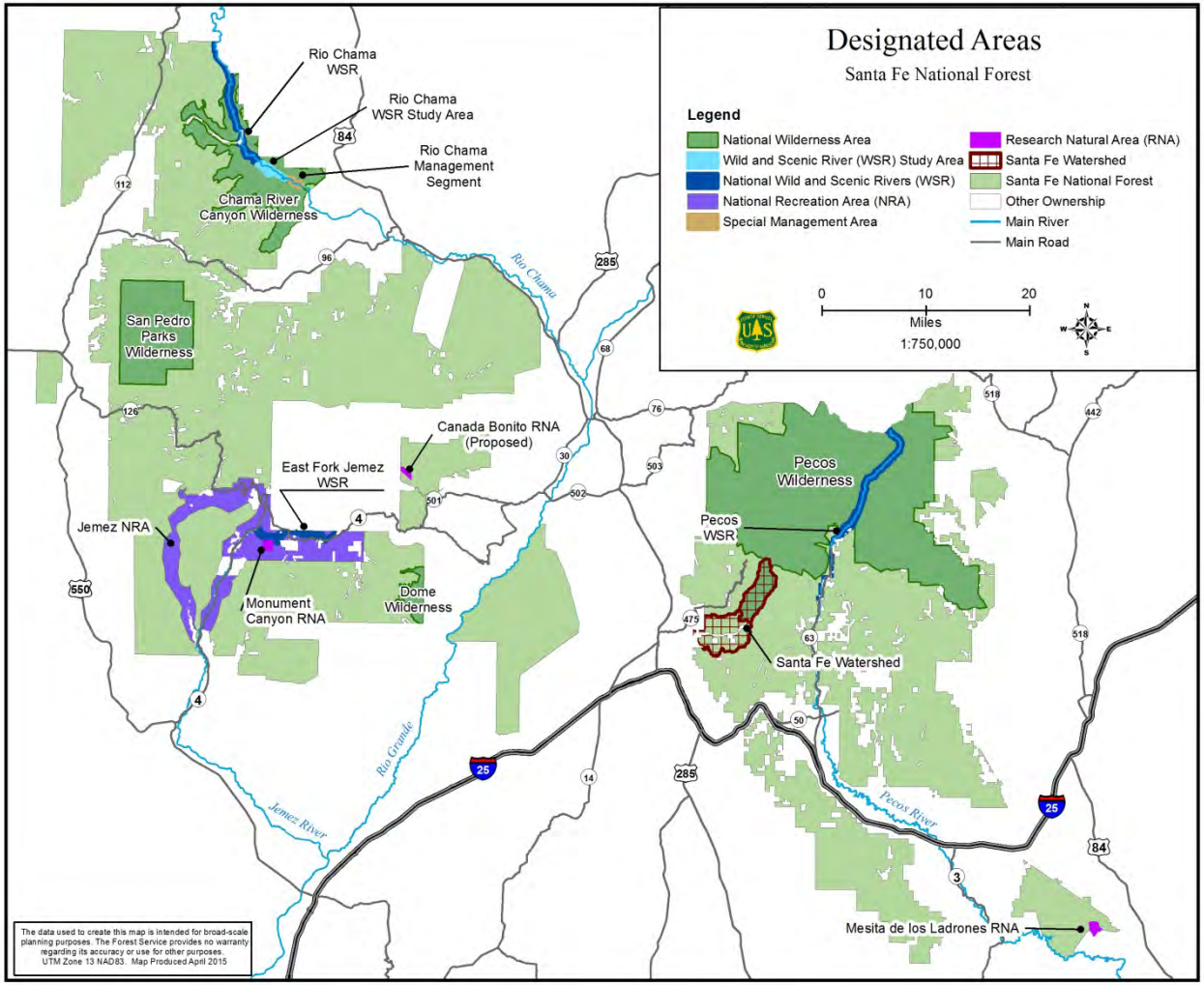


Figure 55. Designated areas map

Contribution to social, economic, and ecological sustainability

Designated special areas contribute to social sustainability by connecting people to their natural and cultural heritage, and providing economic benefits to surrounding communities. They promote the preservation of cultural traditions including historical features that contribute to social wellbeing through education, and provide recreational opportunities. Economic sustainability is supported by increased employment opportunities, supporting small businesses, and sharing Federal receipts with county and state governments. Designated areas contribute to ecological sustainability as well, by preserving intact natural systems and their individual components (see figure 55 in the Recreation chapter, Scenery section for a map).

Small towns, e.g., Abiquiqu and Pecos, benefit from special designated areas such as wilderness and wild and scenic rivers. It is not necessarily the designation itself that draws people to visit, but the qualities that led to the designation. In addition, the protection of the areas is a bonus for visitors. Some visitors come for the purpose of visiting the wilderness or floating on the wild and scenic river, either way, those people subsequently spend time and money in the local communities.

National Scenic and Historic Trails are an attraction to the area and have been attracting labeling of "gateway communities," like Cuba as a CDT gateway community. By these communities establishing themselves as "gateway communities" they are attracting visitors to the town to get onto the trail, which then benefits the economy of the town. The communities then become stewards of the trail and partner with the Forest Service to maintain the sustainability of the recreation resource.

Wilderness

The Wilderness Act of 1964 (Act 1964)(Act; 16 U.S.C. §§ 1131-1136) authorized Federal lands be designated as "'wilderness areas' to be administered for the use and enjoyment of the American people in such manner as will them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness." Lands classified as wilderness through the Wilderness Act could be under jurisdiction of the Forest Service, National Park Service, Bureau of Land Management, or U.S. Fish and Wildlife Service. With some exceptions, prohibitions include: closure to motorized and mechanized vehicles, timber harvest, new grazing and mining activity, or any development.

The four wildernesses on the Santa Fe NF were established under either the original Wilderness Act of 1964, the Endangered American Wilderness Act of 1978 (1978)(Act; 16 U.S.C. § 1132), or the New Mexico Wilderness Act of 1980 (1980)(Act, 16 U.S.C. §1132 et seq.). Lands designated under the Endangered American Wilderness Act of 1978 were found to possess outstanding natural characteristics and met the statutory criteria[8] as established in the Wilderness Act of 1964. 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 wilderness characteristics of the land,

[8] 16 U.S.C 1131 (2)(c), "An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value."

protect watersheds and wildlife habitat, and promote scientific research and primitive recreation. On the Santa Fe NF, only the Pecos Wilderness has a management plan (USDA Forest Service 1968).

In 2012, the Forest Service managed 1,387,498 acres of wilderness in New Mexico, and 291,669 acres on the Santa Fe NF[9].

The Santa Fe NF follows the guidelines set forth in the Wilderness Act for management of the four wilderness areas on the forest, including for motorized equipment and general guidelines for visitors. Motorized equipment and equipment used for mechanical transport is generally prohibited on all federal lands designated as wilderness. This includes the use of motor vehicles, motorboats, motorized equipment, bicycles, hang gliders, wagons, carts, portage wheels, and the landing of aircraft including helicopters, unless provided for in specific legislation. On the Santa Fe NF specifically, 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/transporting any part of a tree or plant is prohibited (exceptions for dead and down trees for campfires), maximum group size for camping/hiking/riding is 15 people, maximum number of pack and saddle stock allowed in a group is 15 head, camping for more than 14 consecutive days in one place is not allowed, and storing equipment or supplies is prohibited.

All of the Santa Fe NF Wilderness Areas report that they are managed to an acceptable 'minimum' stewardship level. Many considerations and measures are required to meet this minimum level. For example, the Forest Plan must address the natural role of fire, provide objectives and guidelines for the full range of responses, and incorporate appropriate items from the 'Wilderness Checklist for Fire Management Plans,' which was accomplished in May of 2008. An Invasive Species Environmental Impact Statement was finalized in 2011, and management actions in high priority areas were evaluated in 2012 and determined to be successful. A Wilderness Air Quality Plan was signed in 2009, and in 2010 a sensitive receptor was placed for monitoring and coordination with adjacent agencies. The Wilderness and Education Plan was originally completed in 2007, with updates annually since then, including a 2013 evaluation to determine effectiveness of the activities in building understanding and changing behaviors. 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. Volunteer organizations such as *NM Volunteers for the Outdoors* provide important trail maintenance assistance, under FS direction, to prevent erosion and sign installation.

- **Chama River Canyon Wilderness** (figure 56) – The Chama River Canyon Wilderness encompasses 50,300 acres (2,900 acres on the Carson NF). Congress designated the land a wilderness area in 1978. In 1986, the Rio Chama River, which flows through and is part of the wilderness, was given additional designation as a wild and scenic river.

[9] Forest Service acreage figures do not include inholdings unless explicitly stated.

Figure 56. Chama River Canyon (Wilderness and Wild and Scenic River)

The Wild and Scenic Rio Chama runs through 6 miles of the wilderness. Water levels reflect releases from the upstream El Vado Lake Dam, but you can usually float the river, with portages, all the way from the Colorado border to the Rio Grande through the Chama River Canyon. While no management plan exists for the Wilderness, the WSR has a completed plan that is available at www.rivers.gov.

Backpackers can hike along portions of the Chama River, and then pitch their tents in a secluded wooded campsite above one of the canyon's high-water beaches. 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.

Between 70 and 80 different bird varieties can be found in the Chama River Canyon. Raptors, hawks, and owls perch along the canyon walls and surrounding trees. Trout often flourish in the river, and onshore residents include mule deer, black bears, elk, coyotes, and mountain lions.

Wilderness-specific regulations include a 15-person (or stock) party size limit, and a requirement for human waste to be buried at least 200 feet beyond the river edge. Water quality remains high with these protections in place. Because it is more remote, it receives less use. The Rio Chama WSR, the most accessible portion of the wilderness, is addressed below.

- **San Pedro Parks Wilderness** (figure 57) – 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 July 1964.

Although the elevation averages 10,000 feet above sea level, 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 compete for space with small stands of aspen. San Gregorio Reservoir, a small irrigation reservoir predating the establishment of the San Pedro Parks Wilderness, is the largest body of water. Clear streams wander through the forest openings and are usually abundant with trout. There is frequent afternoon rainfall in July and August. This rainfall enables the meadows to flourish with bluegrass, oat grass, sedge, rush, and Rocky Mountain iris, only to be covered with snow in November.

The Continental Divide National Scenic Trail crosses through the San Pedro Parks Wilderness from Cuba, New Mexico, to the Carson NF. Its route follows along the Los Pinos, Vacas, Penas Negras and Rio Capulin trails. Campsites with abundant water appeal to backpackers. Trails receiving the heaviest use are the Vacas Trail to San Pedro Park (10.69 miles) and the Palomas Trail (3.63 miles), which joins the Vacas Trail. Trail maintenance is needed on both Cuba and Coyote Ranger Districts, although substantial maintenance did occur in 2014. Fall brings hunters seeking elk, deer, bear, and grouse.

Wilderness-specific regulations include a 15 stock or person party size limit and a no-camping or campfires zone surrounding San Gregorio Reservoir. For the most part, these regulations appear to effectively protect the social experience and biological resources of this area. The first mile between the trailhead and the San Gregorio reservoir experiences weekend overcrowding, and trailhead parking can be congested. This trail section, however, is short enough to be well-maintained. The more distant trails are beginning to see some negative resource effects from low trails funding.

Because even Wilderness use amounts appear to increase with proximity to population centers, additional designated areas that are at a distance from those centers would be unlikely to help alleviate use in popular locations that are simply most easily accessed.

Figure 57. San Pedro Parks Wilderness

- **Dome Wilderness** – The United States Congress designated the Dome Wilderness in 1980 and it now has a total of 5,200 acres. The Dome Fire in the 1990s burned the majority of the wilderness. Then in 2011, the Las Conchas Fire reburned the wilderness almost completely.

  The Dome Wilderness is bordered by the Bandelier Wilderness to the east. There are primitive canyon lands and prehistoric ruins in the Wilderness, as well as an abundance of wildflowers and strawberries in spring. Elevations peak at 8,200 feet, then drop to 5,800 feet at Sanchez Canyon.

The Saint Peters Dome Trail (6 miles) gives access to this wilderness, starting on the north end near the Dome Lookout and losing elevation as it runs south past canyon walls and through stands of large pines, then across Sanchez Creek, a fishless stream that endures periods of extremely low water. The Capulin Trail (2 miles) also begins in the northern portion of the area. The Capulin Trail ends at the Bandelier National Monument boundary.

The trail system entering the area also provides access into the west side of Bandelier Wilderness (National Park Service) with several trailheads located along Forest Road 289. To protect resources and an experience of solitude, no more than 15 people or riding and pack stock are allowed in any visiting party.

- **Pecos Wilderness** (figure 58) – 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 written in 1968 (USDA Forest Service 1968).

  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.

  On the western side, steep canyons drain toward the Rio Grande. In contrast, to the east lies the relatively gentle upper Pecos River Valley, an area of broad flat mesas and grassy meadows.

Figure 58. Pecos Baldy Lake, Pecos Wilderness

Fifteen lakes offer fishing, as do 150-plus miles of sparkling streams, where rainbow trout, brown trout, and the New Mexico state fish, the Rio Grande cutthroat trout can all be found. The high country elevations range from 8,400 feet to 13,103 feet atop South Truchas Peak, the state's second highest point.

The scenery varies from 100-foot-drop waterfalls and crumbled talus slopes to dramatic rock cliffs, towering peaks, and wildflower meadows best caught in July and August. Engelmann spruce, corkbark fir, ponderosa pine, Douglas-fir, white fir, limber pine, bristlecone pine, and aspen are the predominant timber species. Equally diverse is the wildlife, including elk, deer, bear, turkey, and one of America's healthiest herds of Rocky Mountain bighorn sheep.

To protect the wild sheep, the Pecos Wilderness does not allow domestic sheep or goats, which can carry contagious disease. This requirement has sustained the wild sheep population at numbers high enough that this herd supplies reintroduction efforts elsewhere. Additional resource and social protections in place include a 15 person or livestock maximum and a requirement that campfires be at least 200 feet from any lakeshore. A temporary moratorium on new outfitter-guide permits for the Pecos and San Pedro Parks Wilderness Areas was instituted in 2001 pending a capacity analysis and recommendations on better distribution of kinds and amounts of outfitted activities to correct perceived decreasing resource and social conditions occurring. The analysis requirement was later removed as the conflict appeared more to concern the imbalance between people wanting to run new businesses there and existing businesses not operating up to capacity. Permits are again analyzed on a case-by-case basis with regard for resource and management needs.

Wilderness Inventory, Evaluation, Analysis, and Recommendation

Pursuant to the planning directives, the Santa Fe NF will conduct a potential wilderness inventory and evaluation process as part of forest plan revision. The first two steps, the wilderness inventory and evaluation, are expected to begin between the release of the assessment and the release of the Draft Plan and Environmental Impact Statement. The wilderness recommendation process has a sequence of steps: identification and inventory, evaluation, analysis, and decision whether to recommend particular areas for designation. Each step includes opportunities for intergovernmental coordination and tribal consultation, public participation, and collaboration. Maps, analysis, and other documentation developed through each step will be made available to the public. (USDA Forest Service 2015). Any recommendation may then be acted upon by Congress, which is the only entity that can designate wilderness.

Input Received at Technical Meeting

This section summarizes input, perspectives, and feedback relevant to this assessment topic and received from the public between April and July 2014. Input was gathered from a specific technical meeting, which was one of a series of 14 public meetings. No information specific to Wilderness uses, values or trends was compiled from the remaining public meetings or additional input received from submitted forms.

Discussion of wilderness brought up many topics including the lack understanding of historical importance and values of wilderness as well as participation in wilderness activities among youth. Discussion also touched on the size of wilderness areas, expanding recreational use, , the economic importance of the forest and its visitors on local communities, and community members expressed their concern over a perceived bias toward wilderness instead of multiple use.

Participants expressed specific concerns about grazing effects on wilderness including degrading springs and water quality, overgrazing and monitoring and enforcement. In addition, specialists emphasized concerns about inventoried roadless areas, loss of roads and off-road access in wilderness areas, and maintenance of those roads.

Participants also expressed concern about forest management in wilderness areas including chainsaw use, clear-cutting to open more areas for grass, and increased burning in wilderness. Some participants felt that wilderness is fairly well maintained on the Santa Fe NF. Climate change is also a concern and it was suggested that a vegetation study be done to monitor effects.

Wild and Scenic Rivers

The Wild and Scenic River Act established a system for preserving outstanding free-flowing rivers. As defined in Section 1(b) of the act: "...certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations" (1968).[10]

An evaluation of the 6 rivers listed in the Nationwide Rivers Inventory (NRI) as potentially eligible for Wild and Scenic River status was conducted as part of the last Forest Plan development process. Three of those were recommended, and later given Congressional designations as described below. In addition, Rio Guadalupe and Cañones Creek met the eligibility criteria but did not receive a recommendation at the time. Cañones Creek was considered to have an ORV for wildlife/fish in all potential segments/classifications, and both scenery and recreation ORVs in two potential segments. Rio Guadalupe was generally considered to have ORV in scenery, geology, fish/wildlife, and cultural/historic categories. Gallinas Creek did not meet the eligibility criteria (free-flowing, high water quality, and at least one Outstandingly Remarkable Value) at that time.

The current Forest Plan states the management goal for the wild and scenic rivers (WSR) as: "Manage the three rivers (Chama, East Fork Jemez, and Pecos) included in the National Wild and Scenic Rivers System to maintain or enhance the values for which they were included. Maintain the rivers' free-flowing character while providing quality water-based recreation opportunities, wildlife habitat improvement, and other resource management, consistent with the intent of the 1968 Wild and Scenic Rivers Act" (USDA Forest Service 1987). The Forest Plan also provides standards and guidelines for managing the WSRs, such as "Manage these rivers in such a manner as to protect and enhance the values for which they were classified as eligible."

The WSR segments were classified based on an eligibility study approved in the 1987 Forest Plan using these criteria from the Wild and Scenic River Act: accessibility, developments along the shoreline, presence or absence of impoundments, and water quality. The Santa Fe NF has followed existing management guidance that directs protection of the designated WSR values in accordance with the Wild and Scenic Rivers Act. By following existing management direction and implementing specific improvement projects, the Santa Fe has effectively protected and enhanced the condition of soil, vegetation and riparian areas.

Designation as a wild and scenic river does not seem to attract more visitors, because any waterway in arid New Mexico is attractive to recreationists.

- **Rio Chama Wild and Scenic River** (figure 59) – The Rio Chama is about 120 miles long, beginning in the southern San Juan Mountains of south-central Colorado, it joins the Rio Grande near Española, New Mexico. In 1978, the river was designated as a State Scenic and Pastoral River. Approximately 24.6 miles of the river were protected as a Federal Wild and Scenic River in 1988, 21.6 miles are designated as wild (11.2 BLM, 10.4 FS) and 3.0 miles are designated as scenic. In the same corridor,

[10] 16 U.S.C. 1273(2)(b) "(1) Wild river areas – those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America. (2) Scenic river areas – Those rivers of 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. (3) Recreational river areas – 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."

4 miles remain listed as a WSR Study Area, and 1.8 undesignated miles are jointly managed with the Corps of Engineers. (USDA Forest Service, USDI Bureau of Land Management et al. 1990).

This designated area begins at El Vado Lake and travels south toward the Big Eddy takeout above Abiquiu Reservoir. 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.

All commercial outfitters must have a special use permit, usually issued for the Rio Chama by the Bureau of Land Management Taos Field Office. Private boaters may float the Scenic portion of the Rio Chama (downstream from the Christ in the Desert Monastery) without a permit, but overnight float trips on the Wild portion of the Rio Chama (above the Monastery) are also required to have a permit from the Bureau of Land Management Taos Field Office. Weekend launches (Friday and Saturday) are issued by 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.

The prohibition against motorized water craft, called for in the management plan, has worked extremely well, and provides a memorable experience for recreationists drawn to the area for its wild character. Most Recreation segment developments identified in the management plan have been constructed. This segment receives a high amount of use, and both day and overnight sites need to be evaluated for resource impacts such as compaction and vegetation trampling to determine if changes in management are warranted.

The river corridor is a flyway (flight path used in bird migrations) for many bird species which depend on the water and riparian vegetation. Ducks, mergansers, Canada geese, great blue heron, raptors and neo-tropical migrator species can all be seen along the river. Large numbers of cliff swallows make their nests on the riverside cliffs. The Rio Chama Canyon provides excellent habitat for raptors. Both bald and golden eagles are found within the canyon, with several species of hawks, owls, and falcons observed occasionally during the year.

Fishing is allowed in accordance with the New Mexico Game and Fish Department regulations. Major fish species found in the Rio Chama include German brown trout, Rio Grande chub, fathead minnow, rainbow trout, longnose dace, and carp.

Float boating on the Rio Chama will continue to need to be managed by permit. Based on observation, the available permits on the Rio Chama are being filled at 100 percent. Some resource impacts are occurring due to increased area population (Albuquerque metropolitan area), but they may still be within acceptable limits.

Figure 59. Rio Chama Wild and Scenic River

- **East Fork Jemez Wild and Scenic River** - The East Fork Jemez WSR is located in Sandoval County in the Jemez Mountains of northern New Mexico, approximately 5 miles northeast of Jemez Springs. A final boundary was developed as a refinement of the interim boundary (approximately one-quarter mile to either side of the river) with adjustments made to follow legal landlines and topographic features. The final boundary was forwarded to Congress February 15, 2000 (USDA Forest Service 2002). Along with water quality and a free-flowing character, this river was designated for 6 categories of Outstandingly Remarkable Values: scenery, recreation, geologic, ecologic, fish, and wildlife. The high diversity of vegetation appears to be quite rare in the national system, and includes a Botanical Special Interest Area for the Bunchberry Dogwood as well as habitat for the giant helleborine, a New Mexico proposed 'rare' status plant. Diversity in wildlife values, with the many vegetative edges and ecotones, includes 3 notable birds, a rare bat and the federally-Threatened Jemez Mountain salamander.

  The East Fork Jemez WSR corridor lies on lands managed by the Santa Fe National Forest and is within the congressionally designated Jemez National Recreation Area (PL 103-104, 1993). Two parcels of private land are located within the WSR corridor, totaling about 67 acres. The WSR is 11 miles long with a corridor averaging 320 acres per mile. The WSR segments were classified based on the eligibility study approved in the 1987 Forest Plan using criteria from the WSR Act: accessibility, developments along the shoreline, presence or absence of impoundments, and water quality.

  The East Fork Jemez WSR begins at the boundary of the Valles Caldera National Preserve (Preserve) and extends southward. The first 2-mile segment of the WSR from the Preserve boundary to the second highway crossing of New Mexico State Highway 4 is designated as the Recreational segment. This segment is characterized by low stream gradients and easy access for recreational activities. The next 4 miles extending from the second water crossing 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 at the confluence with San Antonio Creek, is designated as the Scenic segment. The Scenic segment is characterized by a steeper gradient, including Jemez Falls itself, dropping into a narrow canyon with limited access. The stretch before

joining San Antonio Creek has numerous boulders, pools, and eddies creating some suitable fish habitat and attractive pools for swimming.

The *Respect the Rio* partnership project was developed to design and implement improvements in uplands and riparian areas across the Jemez Watershed, especially where nonpoint source water quality concerns had been noted. Visitor behavior changes, wet meadow restorations, riparian fencing to manage motor vehicle access and cattle grazing, willow plantings, culvert replacements and trail improvements, woodland thinning and weed treatments have all been possible through the partners and grants derived from this initiative. The project has also been utilized to install signs, regulations and streamside barriers along the major tributaries, Rio Guadalupe and Rio Cebolla, both included in the popular National Recreation Area and along FS Road 376. Effectiveness monitoring with NM ED is underway to quantify the water quality improvements achieved through these myriad projects. Native cutthroat trout life cycles and habitat needs have been frequently shared with various constituencies at outreach opportunities across the area, and continued efforts to remove non-native competitors such as German brown trout involve a number of partners and students.

- **Pecos Wild and Scenic River** – The Pecos WSR is located in San Miguel and Mora Counties in the Sangre de Cristo Mountains of northern New Mexico, approximately 11 miles north of the town of Pecos. The final boundary approximates a one-quarter-mile distance on each side of the river, with adjustments made to follow subdivision and legal landlines. The WSR is 20.5 miles long. The final boundary description was forwarded to Congress on March 24, 2000. (USDA Forest Service 2003).

  The wild segment 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 segment 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 that generally parallels the river throughout this segment provides easy access for recreational activities. This WSR is entirely free of impoundments that would restrict its free-flowing character, and with headwaters in the Pecos Wilderness Area, it runs clear, cold water. The Outstandingly Remarkable Values identified for this designation include scenery, recreation and cultural/historic. Dramatic landscape contrasts are provided by canyons, mountain meadows and waterfalls. Trout fishing along this river is regionally and nationally renowned. Cultural attributes derive from pre-historic artifacts, rem(USDA Forest Service 2000)nants of Spanish prospecting from the 1600's, the mountain man Beatty home, and early 20th-century acequias, cemeteries and Civilian Conservation Corps campsites.

  Current management is addressing recreation and use amounts to protect the values identified. Respect the Rio educational outreach efforts have included presentations along the Pecos corridor, as well as booths at area sporting expositions and other events. Post-fire reseeding efforts in the Dalton Canyon tributary quickly re-established native vegetation to protect water quality and trout habitat. River plan implementation included restricting camping to developed and designated dispersed sites, which has improved soil and vegetation conditions along the river. The river plan has also provided evaluation factors for new or coordinated (NMGF) recreation areas that support existing trends for large family gatherings outside the wilderness. Local and regional populations are on the increase, however, and a declining workforce may be less capable of keeping up with demands for quality services, or to ensure compliance with protective measures.

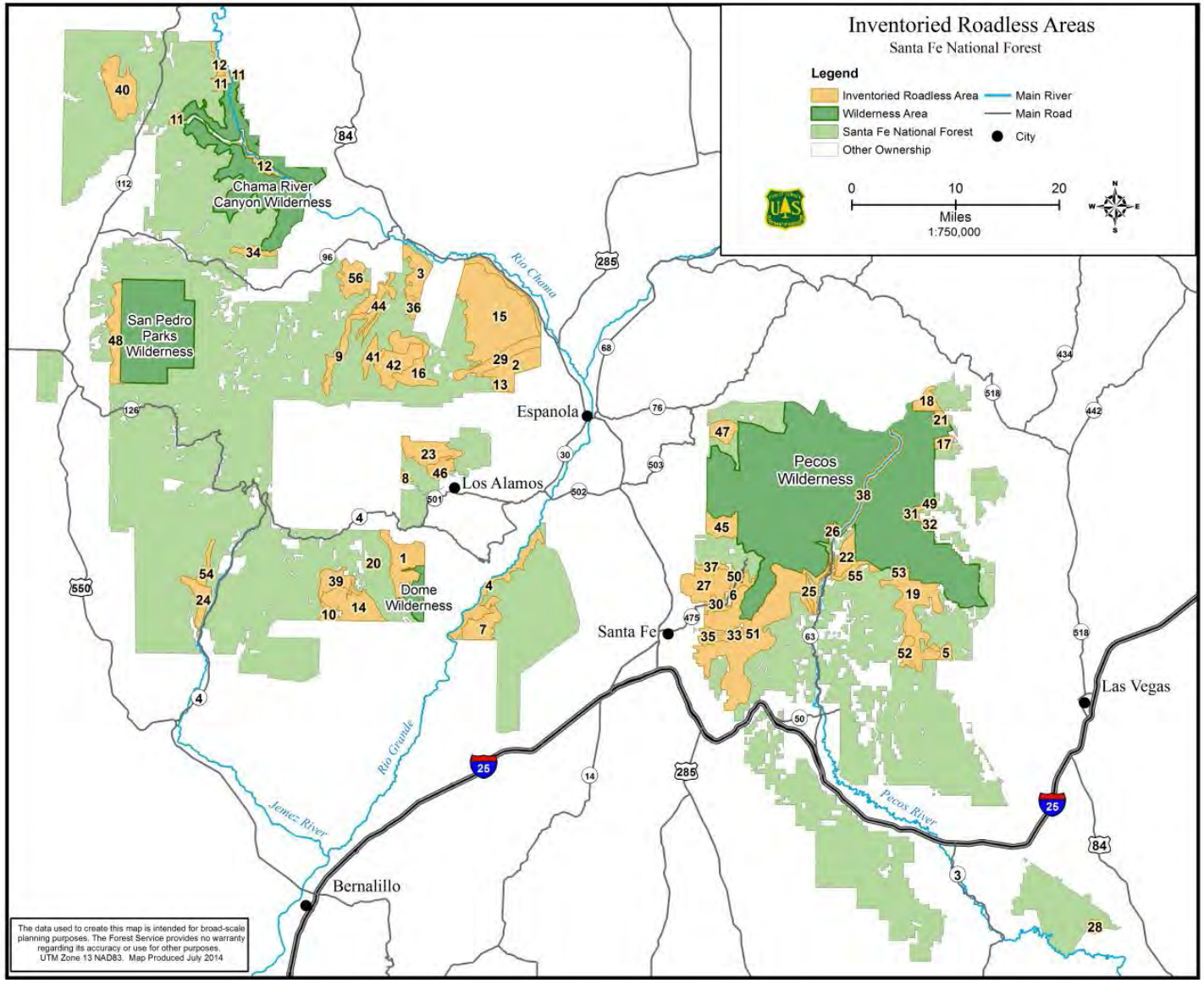
Inventoried Roadless Areas

In 2000, the Forest Service completed an inventory of NFS lands for each forest and grassland that had been inventoried for planning purposes as roadless. 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 RARE II inventory (USDA Forest Service 2000). These polygons became identified as inventoried roadless areas (IRAs) in the 2001 Roadless Area Conservation Rule. Road construction, reconstruction and timber harvest activities in these polygons were hereafter limited to sustain the social and ecological roadless characteristics of each area. These activities were selected because they occur on forests and grasslands throughout the Nation, have the greatest likelihood of altering landscapes, cause significant landscape fragmentation, and result in immediate, long-term loss of roadless characteristics (USDA Forest Service 2000).

During the plan revision phase, potentially suitable wilderness areas will be inventoried and evaluated using criteria consistent with the 2012 Planning Rule; IRAs will be considered in that inventory and evaluation; however, IRA boundaries are not being reconsidered via the plan revision process.

There are 55 IRAs on the Forest (figure 60). Refer to the map key for area names and acreage; note that number 43 is not depicted because it is on private land. The largest IRA is the Thompson Peak IRA with 32,979 acres. The smallest IRA is the Sparks Creek IRA with 80 acres. IRAs are found on every district of the Forest.



Source: USFS 2000 Roadless Area Conservation FEIS

Figure 60. Inventoried roadless areas of the Santa Fe NF

Map Key	IRA Name	Acres
1	Alamo Canyon	8,635
2	Arroyo de la Presa	6,174
3	Arroyo de los Frijoles	5,275
4	Arroyo Montoso	6,281
5	Bear Mountain	1,385
6	Black Canyon	1,920
7	Caja	5,301
8	Canada Bonito RNA	487
9	Canones Creek	3,936
10	Cerro La Jara	1,121
11	Chama Wilderness	1,294
12	Chama WS River	4,167
13	Clara Peak	787
14	Deerhead Peak	8,257
15	El Invierno	29,912
16	El Lagunito	6,796
17	Enchanted Lakes	1,275
18	Falls	2,475
19	Gallinas	13,198
20	Ghost Town	218
21	Grace Tract	998
22	Grass Mountain	3,251
23	Guaje Canyon	6,100
24	Holiday Mesa	3,648
25	Holy Ghost	2,350
26	Jacks Creek	739
27	Juan de Gabaldon Grant	8,018
28	Ladrones Mesa RNA	700
29	Lemitas	8,125
30	Little Tesuque	814
31	Lost Lake	469
32	Maestas	474
33	McClure Reservoir	375
34	Mesa Alta	1,867
35	Nichols Reservoir	1,517
36	Oso Vallecitos	1,115
37	Pacheco Canyon	1,011
38	Pecos WS River	5,392
39	Peralta Ridge	4,025
40	Pollywog	8,555
41	Polvadera	2,486
42	Polvadera Peak	6,288
43	Private Land	54
44	Pueblo Mesa	3,499
45	Rancho Viejo	3,824
46	Rendija	2,175
47	Rio Medio	2,842
48	San Pedro Parks	5,823
49	Sparks Creek	80
50	Tesuque Creek	809
51	Thompson Peak	32,979
52	Valle Del Toro	1,860
53	Wesner Spring	597
54	West Mesa	1,704
55	Willow Creek	1,476
56	Youngsville	6,119

Research Natural Areas

Research natural areas (RNAs) are administratively designated by the Regional Forester and the Research Station Director, 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 change. 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, they are managed primarily for their natural ecological processes, and in some cases, to help protect rare or threatened species (Network 2014).

There are two established RNAs on the Santa Fe and one proposed.

- **Cañada Bonito Proposed Research Natural Area** – The Cañada Bonito Proposed RNA comprises approximately 300 acres in the Jemez Mountains of north-central New Mexico. The area was originally proposed in 1988, and will remain so until designated or released for multiple use management by the Regional Forester and Research Station Director. The proposed RNA is located in the Española RD, Santa Fe NF, in Los Alamos County.

  Cañada Bonito research natural area is an example of an outstanding high-elevation (9,200 to 9,700 feet or 2,800 to 2,960 meters) Thurber fescue (*Festuca thurberi*) community at or very near its climax expression. Thurber fescue meadows are dominant on south-facing slopes. On upper slopes and ridge tops are patches or mosaics of aspen, providing abrupt contrast to the fescue meadows. Steeper north-facing slopes within or adjoining this research natural area have closed forests of Engelmann spruce (*Picea engelmannii*) and corkbark fir (*Abies lasiocarpa* var. *arizonica*) (USDA Forest Service 1988).

  The proposed Cañada Bonito RNA provides the best, and possibly the only, opportunity for maintenance of a Thurber fescue meadow within the Southwestern Region. Examples of this important high-elevation ecosystem type are in very short supply, with most acreage already within grazing allotments, and/or suffering from major erosion problems or heavy public use. This has not been grazed by permitted domestic livestock since at least 1940, when the area was withdrawn as a defense facility. The proposed RNA is one of few remaining Thurber fescue sites that have not yet

been committed to domestic livestock use in the recent past. Consideration of this area for RNA designation will be part of the Plan revision effort.

- **Monument Canyon Research Natural Area** – The Monument Canyon RNA comprises approximately 640 acres on the Jemez RD. The area is on 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." 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 (USDA Forest Service 1932).

  The existing Forest Plan establishes management direction in Management Area M for the two established RNAs.

- **Mesita de los Ladrones Research Natural Area** – The Mesita de los Ladrones RNA comprises approximately 500 acres of one-seed juniper (*Juniperus monosperma*) savannah in north-central New Mexico. The RNA is located in the Las Vegas RD, in San Miguel County, and is all acquired NFS land.

  Juniper savannah has been recognized as a significant open woodland community for protection and study in the RNA program (USFS Regional Guide 1983). Difficulties in locating a suitable example of this ecosystem stem from the forage value of the accompanying grass understory. Vegetation composition in most juniper savannah has been substantially modified by grazing, and in many cases the landscape has been intentionally altered (as by chaining or firewood harvesting) with the aim of favoring forage production. The Santa Fe NF suggested Mesita de los Ladrones as a potential suitable representative due to its minimal grazing use history (USDA Forest Service 1991).

Designated Critical Habitat for Federally Threatened and Endangered Species

Section 4 of the Endangered Species Act (1973)(Act; 16 U.S.C. Sec. 1531 et seq.) requires the U.S. Fish and Wildlife Service (Service) to identify and protect all lands, water, and air necessary to recover an endangered species. This is known as critical habitat. Critical habitat includes areas that have been determined to be needed for life processes for a species. It includes: space for individual and population growth and for normal behavior; cover or shelter; food, water, air, light, minerals, or other nutritional or physiological requirements; sites for breeding and rearing offspring; and habitats that are protected from disturbances or are representative of the historical geographical and ecological distributions of a species. Section 7 of the Endangered Species Act requires Federal agencies to ensure that actions they authorize, fund, or carry out are not likely to destroy or adversely modify designated critical habitat. The following species have designated or proposed critical habitat either on or within close proximity to the Santa Fe NF. Please see Chapter 1, the Ecological Assessment, for more information on special management and/or restricted uses in these areas.

- **Mexican Spotted Owl** – In 2004, the Service designated 8.6 million acres of Federal lands as critical habitat for the federally threatened Mexican spotted owl (*Strix occidentalis lucida*) in Arizona, Colorado, New Mexico, and Utah (USFWS 2004) (69 FR 53182).[11] A total 34,355 acres of

[11] The Endangered Species Act (the Act) is designed to protect critically imperiled species from extinction as a consequence of economic growth and development. The US Fish and Wildlife Service and the National Oceanographic and Atmospheric Administration (NOAA) have primary responsibility to regulate endangered and threatened wildlife and plants in the United States. The document citation (69 FR 53182) refers to publication of the

designated critical habitat (protected activity centers) exists on the Santa Fe NF. This encompasses habitat that has been determined to contain primary constituent elements including mixed conifer and pine-oak forest types, canyons and cliffs, and riparian areas that are required for survival by the Mexican spotted owl.

- **New Mexico Meadow Jumping Mouse** – The Service has proposed critical habitat for the New Mexico meadow jumping mouse (*Zapus Canadensis luteus)*, but it has not been finalized as of yet (May 2015). In June 2013, they proposed to designate approximately 193.1 miles in eight units as critical habitat for the New Mexico meadow jumping mouse in the states of Colorado, New Mexico, and Arizona. On the Santa Fe NF, 4 small closure areas along the Jemez River have been implemented, protecting this habitat from human activities. (USFWS 2013).
- **Jemez Mountain Salamander** – In 2013, the Service designated 90,716 acres of land as critical habitat for the federally threatened Jemez Mountain salamander (*Plethodon neomexicanus)*. The habitat designation is broken up into two units. Both units are within the geographical area occupied by the salamander and contain elements of essential physical or biological features. The physical or biological features require special management or protection from large-scale, stand-replacing wildfire; actions that would disturb salamander habitat by warming and drying the ground; actions that reduce the availability of aboveground cover objects including downed logs; or actions that would compact or disturb the soil or otherwise interfere with the capacity of salamanders to move between subterranean habitat and aboveground habitat (USFWS 2013).

  Unit 1 consists of 42,445 acres in Rio Arriba and Sandoval Counties, New Mexico, in the western portion of the Jemez Mountains. In Unit 1, 41,466 acres are federally managed, with 26,531 acres on Santa Fe NF lands and 14,935 acres on Valles Caldera National Preserve lands; 73 acres are New Mexico Department of Game and Fish lands; and 906 acres are private lands. This unit is located in the western portion of the distribution of the Jemez Mountains salamander and includes Redondo Peak, which is on the Valles Caldera National Preserve.

  Unit 2 consists of 48,271 acres in Los Alamos and Sandoval Counties, New Mexico, in the eastern, southern, and southeastern potions of the Jemez Mountains. In Unit 2, 46,375 acres are federally managed, with 30,366 acres on Santa Fe NF lands, 8,811 acres on Valles Caldera National Preserve lands, and 7,198 acres on National Park Service lands (Bandelier National Monument). The remaining 1,897 acres in Unit 2 are on private lands.

National Scenic Trails

National Scenic Trails, as with other recreation forest uses, is declining nationally as shown by the NVUM. Trail maintenance is suffering due to a lack of forest resources. The Santa Fe NF relies heavily on volunteers and youth crews to maintain trails; however, that is not always enough. In the last five years we have had no paid trail employees. National Scenic Trails are designated by the Regional Forester.

- The **Continental Divide National Scenic Trail** (CDNST) was designated by an Act of Congress in 1978, running 3,100 miles between Mexico and Canada. The Forest Service's Region 2 has the administrative lead overall, while in New Mexico, the BLM maintains public information online. On the Santa Fe NF, the trail passes through 25.7 miles of the Coyote and Cuba Ranger Districts, passing on to the Carson NF on the north. In 2005, the Santa Fe National Forest, Cuba RD (FS), and the Department of Interior Bureau of Land Management (BLM), Rio Puerco Field Office, initiated a joint

final rule designating critical habitat for the Mexican spotted owl, by volume (69) and page number (53182) in the Federal Register. For information about listing threatened or endangered species, and/or the designation of critical habitat for the Chirichaua leopard frog and Zuni Bluehead Sucker, visit: https://www.federalregister.gov/articles/. Enter the Federal Register document citations in the "Search Articles" field near the top, right.

planning effort for the relocation of a section of the CDNST to ensure consistency with the original vision of the trail. The relocation of the trail encompasses portions of the Cuba RD and BLM, in Sandoval and Arriba counties, between La Ventana Mesa (BLM) and the San Pedro Parks Wilderness (FS) (figure 54). The trail between Ojo de Los Indios and La Ventana Mesa on BLM land, and through most of the Santa Fe and Carson National Forests is already established.

The Santa Fe NF, Cuba RD, and the BLM, Rio Puerco field Office, propose locating approximately 30 miles of trails both constructed and designated on BLM, NFS, and private lands. Approximately 17 miles of trails are proposed to be constructed on BLM-administered lands, 5 miles on NFS lands and 1 mile on private lands; between the trailhead at the San Pedro Parks Wilderness, on Santa Fe NF, to the existing CDNST on BLM public lands. Another approximately 7 miles of existing trails in the San Pedro Parks Wilderness would be designated as part of the CDNST. (http://www.fs.fed.us/nepa/nepa_project_exp.php?project=31283).

The CDT is still a segmented trail. Two segments that need to be joined are located on the Santa Fe NF in the Cuba Ranger District. We are working jointly with the BLM to complete the NEPA analysis on this joining segment. It is anticipated that after the trail is complete and trail users know they can go from Mexico to Canada on the trail and amenities are available, the trail use will increase. Currently, trail use is low, and establishing maintenance partners would better protect the trail infrastructure in the face of declining Forest Service trails budgets.

- **Cañones National Recreation Trail** is 6 miles long, begins at Cerro Pavo Trailhead on the Coyote Ranger District and ends where it meets with Trail 102. This trail offers spectacular views of the Cañones Canyon walls. The canyon provides habitat for numerous types of wildlife. Cañones Creek Trail is considered to be a medium to arduous trail. The trail is open for hiking, fishing, and equestrian or other non-motorized uses.
- **Winsor National Recreation Trail** is 22 miles long. It begins at end of County Road 72A in Tesuque and ends at Winsor Creek Campground. Within the Española District, the trail is divided into two sections. The lower elevation trail from the Tesuque Trail Head to Aspen Basin is outside of the Pecos Wilderness. The next section from Aspen Basin to Spirit Lake is within the Pecos Wilderness. The trail is open for hiking, backpacking, mountain biking, (only the lower trail outside of the Wilderness) and horseback riding.

Other Forest Service Designated Areas

- **Jemez National Recreation Area** (JNRA) – The JNRA comprises 57,650 acres, which includes approximately 9,350 acres of private lands that are not subject to direction in the Forest Plan. The NFS lands within the JNRA are located within the Jemez RD of the Santa Fe NF. The management plan for the JNRA was written in 2002, and incorporated into the Santa Fe NF Forest Plan in January 2003 (USDA Forest Service 2002).

  The JNRA is located in north-central New Mexico, within the Jemez Mountains of Sandoval County. State Highways 4 and 126 are access roads into the area, and form a somewhat circular transportation corridor through the doughnut-shaped JNRA. State Highway 4 is a State Scenic and Historic Byway and proposed Federal Scenic Byway. The western boundary of the JNRA follows the Rio Guadalupe corridor, the southeastern portion consists of the Jemez River corridor and San Diego Canyon, and the northeastern portion follows the southern edge of the Valles Caldera National Preserve (figure 61).

  Elevations range from around 5,800 feet above sea level along the lower Jemez River near Cañon to over 10,100 feet at Los Griegos (just north of Cerro Pelado). The 11,254-foot-high peak of Redondo lies to the north of the JNRA boundary on the Valles Caldera National Preserve. Precipitation

averages about 20 inches a year, mostly from heavy summer rains and winter snowstorms. Two main river corridors flow through the area, the Rio Guadalupe and the Jemez Rivers.

It is estimated that nearly 1.6 million people visit the JNRA each year. The Rio Guadalupe and Jemez River corridors receive the most recreational use within the JNRA, and the area as a whole receives a very high level of visitation relative to its size. Recreational opportunities include an assortment of dispersed and developed activities. Camping, wildlife and scenery viewing, 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. 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. The JNRA provides more than outstanding scenic features and recreation opportunities. From a natural resource standpoint, the JNRA contains habitat for many wildlife and plant species, including some listed as threatened, endangered, or sensitive. The values listed in the federal designation include recreational, ecological, cultural, religious and wildlife resources.

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 JNRA. Traditional Native American and northern New Mexico communities rely on resources within the area. Being able 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.

Management area X in the current plan establishes direction for the JNRA, with additional direction for the Monument Canyon RNA in Management Area M, and for the East Fork Jemez WSR in Management Area F, as well as in the established river management plan. Many projects described in the JNRA management plan to provide quality recreation opportunities in these busy corridors have been implemented, and regulations combined with visitor contact efforts and law enforcement presence continue to protect both resources and visitor safety. For example, the Jemez Cave was temporarily closed to provide natural and cultural resource protections, and a closure has been implemented to protect New Mexico Meadow Jumping Mouse habitat. Many actions identified as desirable, however, have been beyond the existing and expected financial and staff capacity. Roads, for example, have come under increasing review as budgets decrease, and a national requirement to identify roads for potential decommissioning will provide data in late 2015. Partners are increasingly key to sustaining the highly desirable experiences in this area in a way that might best protect the varied resources and opportunities into the future.

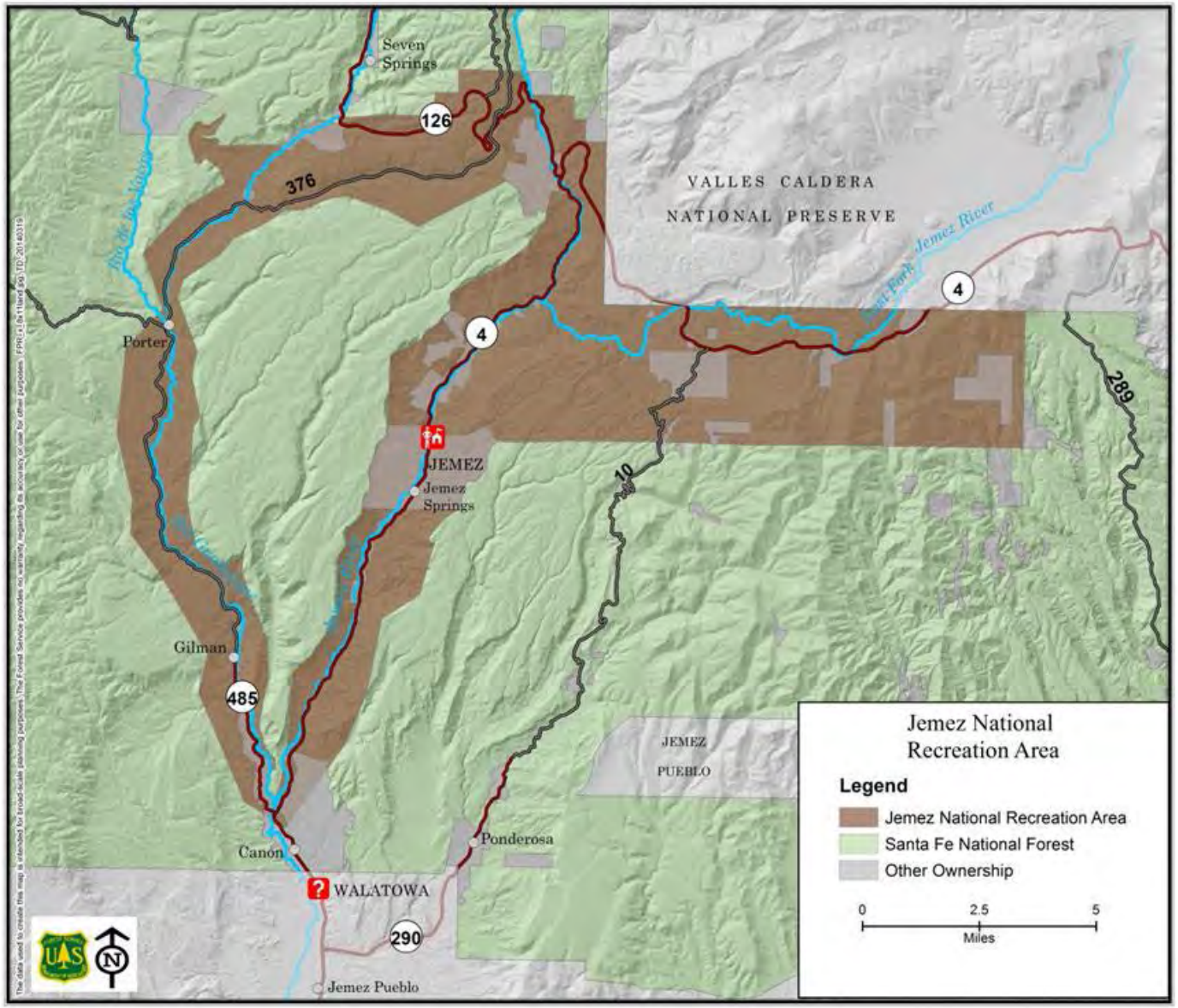


Figure 61. Jemez National Recreation Area

- **Santa Fe Watershed** – The Santa Fe River Watershed is 182,400 acres and is a sub-basin of the Rio Grande Watershed with its headwaters below Lake Peak at 12,408 feet within the Sangre de Cristo range. The Santa Fe Municipal Watershed consists of 17,200 acres within the upper Santa Fe River Watershed and is located in the public lands of the Santa Fe National Forest, part of which is designated as the Pecos Wilderness. The Santa Fe River Watershed is closed to the public pursuant to a 1932 order from the Secretary of Agriculture and through an updated Special Prohibition by the Forest Supervisor in 1991 (USDA Forest Service 1991, USDA 1996). The closure is for the protection of public health and safety of the people of Santa Fe who use the water in the Santa Fe River Watershed for drinking and domestic purposes (USDA 1996). Manager-led hikes into this area have increased in recent years, giving people a clearer understanding of the management activities being undertaken to help the watershed maintain its ecological processes so as to continue providing valuable water resources for the community.

Scenic Byways

Eight national scenic byways are within the Santa Fe NF area of influence (figure 54). The National Scenic Byways Program is administered by the U.S. Department of Transportation, Federal Highway Administration. It was established to help recognize, preserve and enhance selected roads throughout the nation. The U.S. Secretary of Transportation recognizes these designated roads based on one or more intrinsic qualities — archaeological, cultural, historic, natural, recreational, or scenic (DOT 1995).

- **Route 66 pre-1937 alignment National Scenic Byway** is sometimes called “The Mother Road.” The Secretary of Transportation designated it as a national scenic byway in October 2009. Only Arizona, Illinois, New Mexico, and Oklahoma have designated Route 66 as a national scenic byway. The entire route is 2,448 miles long, and runs from Chicago to Los Angeles. However, the length of the designated national scenic byway is 1,409 miles, with a 604-mile-long segment crossing New Mexico (America’s Byways, National Scenic Byways Online 2013). Coming into Santa Fe, the historic route runs parallel to Interstate 25 (I-25). The route travels through the Pecos/Las Vegas RD, traveling close to the Pecos River at various points. Finally, the historic route goes south on Highway 84. This byway also carries a historic state designation. The Historic Route 66 National Scenic Byway Corridor Management Plan (Tidwell and Rosoff 2009) guides the management of this byway.
- **El Camino Real National Scenic Byway** was designated in September 2005. It is 299 miles long and runs from El Paso, Texas, through New Mexico, nearly to the Colorado border. It follows the Rio Grande and the I-25 corridor. El Camino Real also carries a New Mexico State designation, and is also designated El Camino Real de Tierra Adentro National Historic Trail (2000).

  Stretching 1,150 miles from Mexico City to Santa Fe, the highway was for three centuries the Southwest’s main conduit for traders, settlers, and social change. The route of the Camino is now paralleled by modern highways—the Pan-American Highway of Mexico, Interstate 10 from El Paso to Las Cruces, and I-25 from Las Cruces to Santa Fe. Sites along the way include the Pueblo of San Felipe, El Rancho de las Golondrinas, and the city of Santa Fe. (New Mexico Highway and Transportation Department 1998).
- **Jemez Mountain Trail** National Scenic Byway is 163 miles long and passes geological formations, ancient Indian ruins, and an Indian pueblo. The area is rich in logging, mining, and ranching heritage (figure 62).

  Roughly 65 miles of this lengthy trail are located in the Santa Fe NF. Beginning north of Albuquerque in the village of San Ysidro at the junction of New Mexico 44 and New Mexico 4, this trail winds through the Jemez Mountains.

Along the route are the towns of Jemez Pueblo, Jemez Springs, and Cuba, among others. There are also great stop-offs at Soda Dam (a natural dam formed by thousands of years of minerals from a natural spring), Seven Springs, and the ancient cliff dwellings at Bandelier National Monument.

Figure 62. Jemez Mountain Trail Scenic Byway

- **Puye Cliffs Scenic Byway** is a pleasant drive through an area of low hills blanketed by piñon, juniper and blue grama grass. The rolling hills start to flatten out after a few miles of driving, and the road continues to climb. Puye Cliffs is visible in the distance, and the Jemez Mountains appear on the horizon. Piñon-juniper gives way to ponderosa pine at the base of the mesa on which Puye Cliffs are carved. The portion of the road that is open to the public ends at the cliff dwellings. This scenic byway is accessible only by tours offered by the Santa Clara Pueblo. (New Mexico Tourism Department 2014).
- **Santa Fe National Forest Scenic Byway (**figure 63**)**. This nationally recognized strip of highway starts in the historic downtown plaza in Santa Fe, follows New Mexico Highway 475, and ends 16 miles later at the Santa Fe Ski Area. Spring and summer wildflowers dot the uphill road cuts and slopes below the road. The drive is most scenic in the autumn when the aspen colors are in full effect. The Santa Fe National Forest Scenic Byway has an Interpretive Master Plan available to help guide managers make this available and useful resource to visitors (USDA Forest Service no date).

  There are many great stops on the way. Vista Grande Overlook, near the top of the byway, has spectacular views of the Rio Grande Valley between the Jemez Mountains to the west and the Sangre de Cristo Mountains. The cities of Santa Fe, Los Alamos, White Rock, and on clear days, even

Albuquerque are visible from this vista. Big Tesuque and Aspen Vista both have great views of the fall foliage. There are also a number of campgrounds and picnic areas along the way.

Figure 63. Santa Fe National Forest Scenic Byway

- **Santa Fe Trail National Scenic Byway.** In 1821, the Santa Fe Trail became America's first great international commercial highway, and for nearly 60 years thereafter was one of the nation's great routes of adventure and western expansion. Mindful of this, the Santa Fe Trail Association was created in 1986 to help protect and preserve it. The U.S. Congress likewise recognized the significance of the Trail to American history by proclaiming it a National Historic Trail in 1987 (Santa Fe Trail Association).
- **The High Road to Taos Scenic Byway**. The High Road to Taos takes the traveler through an authentic remnant of Old Spain, still evident in the religion, architecture, topography, history, and people along the route. This byway begins by taking U.S.285/84 north from Santa Fe and turning east on N.M. 503 to the Pueblo of Nambe. Occupied since about 1300, this Tewa pueblo was first described by Castaño de Sosa in 1591 as a square structure, two stories high with a central plaza (New Mexico Tourism Department).
- **Turquoise Trail** National Scenic Byway encompasses 15,000 square miles in the heart of central New Mexico, linking Albuquerque and Santa Fe. The drive is approximately 50 miles along Highway 14 (NM Scenic & Historic Byways book). Travelers can see breathtaking views from atop Sandia Crest, then drive back into history through the mining towns of Golden, Madrid, and Cerrillos (Turquoise Trail Association).

Adjacent Designated Areas, National Monuments, and National Parks

There are 13 designated areas adjacent to the Santa Fe NF (figure 64), discussed alphabetically below.

- **Abiquiu Lake Recreation Area.** Abiquiu Lake is a U.S. Army Corps of Engineers-managed lake, with recreation areas and a campground. The lake is a 5,200-surface-acre reservoir that provides excellent fishing and recreation opportunities for northern New Mexico. The area includes a panoramic view of the Cerro Pedernal (Flint Mountain on the Coyote Ranger District) from the dam and piñon, juniper, and sage among colorful rock formations. Reptile fossils 200 million years old have been found in the area (US Army Corps of Engineers 2014). This area is just downstream of the Rio Chama WSR.

- **Bandelier National Monument.** The National Park Service manages Bandelier National Monument, which protects over 33,000 acres of rugged but beautiful canyon and mesa country. Evidence of a human presence here goes back over 11,000 years. Petroglyphs, dwellings carved into the soft rock cliffs, and standing masonry walls pay tribute to the early days of a culture that still survives in the surrounding communities. (US National Park Service). This area shares a boundary with the Dome Wilderness on the Jemez District.
- **Cochiti Lake Recreation Area**. This area is just south of lands managed by the Española District on the Caja del Rio Plateau. Cochiti Lake is a U.S. Army Corps of Engineers-managed lake located in Sandoval County, New Mexico, and within the boundaries of the Pueblo de Cochiti Nation on the Rio Grande about 50 miles upstream from Albuquerque. Cochiti Dam is one of the four Corps of Engineers projects for flood and sediment control on the Rio Grande, operating in conjunction with Abiquiu, Galisteo, and Jemez Canyon Dams.

  Cochiti Lake offers two public recreation areas: the Cochiti Recreation Area on the west side of the lake and the Tetilla Peak Recreation on the east side. Each recreation area has a boat ramp for launching vessels. A visitor center is open to the public near the park headquarters. Scenic overlooks are on both sides of the lake. Tetilla Peak Recreation Area is open April to October, while Cochiti is open year-round. Cochiti Lake is a No-Wake lake (boats are restricted to trolling speeds) (US Army Corps of Engineers).
- **Fenton Lake State Park** became a State Park in July 1984 through an agreement with the landowner, the New Mexico Department of Game and Fish. The State Park Department has developed and maintained Fenton Lake State Park to protect its natural resources and to provide an enjoyable recreation experience (New Mexico State Parks Department 2002). The Jemez NRA surrounds this state park opportunity.

  The primary recreational activities at Fenton Lake State Park are fishing, boating, camping, hiking and picnicking. In the winter months, activities include ice fishing, cross-country skiing, and camping. Hunting is not allowed within the park. The park has a land area of 700 acres and is open year-round with 40 campsites available on a first-come, first-serve basis. Six of these campsites have electric and water for recreational vehicles. The campground is located downstream of the dam on the southwest side of the lake. During winter months, only six campsites are available for camping, and the remaining sites are closed to maintain the cross-country ski trail.

  The lake is stocked with rainbow trout. German brown trout are also in the lake and reproduce naturally in the lake and in the surrounding streams. The lake has 35 surface acres, which is maintained during the spring, summer, and fall. During the winter months, the lake level is dropped 2 feet to allow for ice expansion.

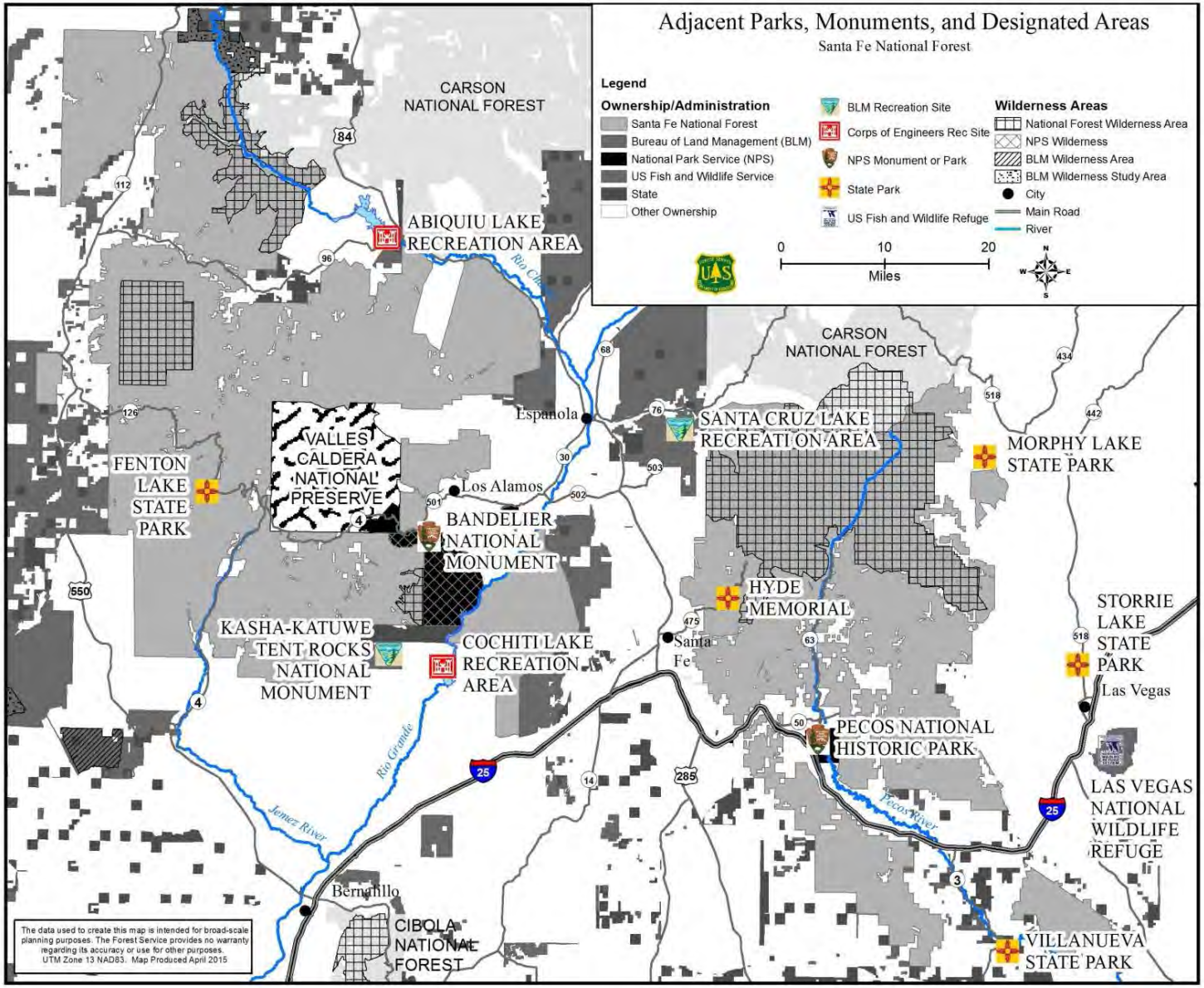


Figure 64. Designated areas adjacent to the Santa Fe NF

The park has several day-use areas. The Lake Fork day-use area access on the east side of the lake is a winding, hilly road and is not recommended for motor homes or trailers. It is closed to all motor vehicles from November through March, but open to cross-country skiers and snowshoers. On the west side of the lake in the more developed area, there are seven wheelchair-accessible fishing piers and a moderate-sized boat ramp. Fenton Lake is closed to sailboats, sailboards and all gasoline powerboats, but open to canoes, rowboats, including those with electric trolling motors and inflatable boats. Swimming is prohibited, but anglers may use float tubes.

- **Hyde Memorial Park** is located in north-central New Mexico, 8 miles northeast of downtown Santa Fe. Hyde Memorial Park is one of New Mexico's oldest state parks, and with elevations of up to 9,400 feet, it is also the highest. Found within the middle of the Santa Fe NF on the Española District, Hyde Memorial Park's 350 acres offer visitors the opportunity to view abundant wildlife and take in stunning views of the Sangre de Cristo Mountains, the southernmost part of the Rocky Mountains. The observant and cautious hiker may see mule deer, coyotes, foxes and the occasional black bear or mountain lion. Stellar jays, nuthatches, and northern flickers are just a few of the birds encountered along the 4.5 miles of hiking trails throughout the park. The Little Tesuque Creek runs through the park. Also running through the park is the Santa Fe National Forest Scenic Byway. Because of its proximity to the city of Santa Fe, the Santa Fe NF, and the Santa Fe Ski Area, Hyde Memorial Park is often used as a base camp for area visitors.

  Hyde Memorial Park offers a multitude of recreational opportunities. Camping, birding, wildlife viewing, picnicking, and hiking are among the favorites throughout the year. In the winter, the park is a popular destination for sledding, cross-country skiing, snowshoeing, and outdoor winter camping. In the fall, a drive along the scenic byway provides viewers with a beautiful array of fall colors and picturesque scenes of the Rocky Mountains (New Mexico State Parks Department 2003).

- **Kasha-Katuwe Tent Rocks National Monument**. The Kasha-Katuwe Tent Rocks National Monument is a remarkable outdoor laboratory, offering an opportunity to observe, study, and experience the geologic processes that shape natural landscapes. The national monument, on the Pajarito Plateau in north-central New Mexico, includes a national recreation trail and ranges from 5,570 feet to 6,760 feet above sea level.

  The cone-shaped tent rock formations are the products of volcanic eruptions that occurred 6 to 7 million years ago and left pumice, ash, and tuff deposits over 1,000 feet thick. Tremendous explosions from the Jemez volcanic field spewed pyroclasts (rock fragments), while searing hot gases blasted down slopes in an incandescent avalanche called a "pyroclastic flow." In close inspections of the arroyos, visitors will discover small, rounded, translucent obsidian (volcanic glass, known as "Apache Tears") fragments created by rapid cooling.

  Precariously perched on many of the tapering hoodoos are boulder caps that protect the softer pumice and tuff below. Some tents have lost their hard, resistant caprocks and are disintegrating. While fairly uniform in shape, the tent rock formations vary in height from a few feet up to 90 feet.

  As the result of uniform layering of volcanic material, bands of gray are interspersed with beige and pink-colored rock along the cliff face. Over time, wind and water cut into these deposits, creating canyons and arroyos, scooping holes in the rock, and contouring the ends of small, inward ravines into smooth semi-circles (DOI).

- **Las Vegas National Wildlife Refuge**. The high plains refuge is surrounded on three sides by steep, timbered canyons but within the habitat there is short and tall-grass prairie, timbered sandstone canyons, piñon-juniper woodlands, wetlands, ponds, lakes, and riparian areas.

Above the timbered canyons, the refuge encircles more than 40 small ponds that provide tubers, seeds, and browse for waterfowl. In addition to the ponds, a number of springs discharge to the surface and support a variety of species, including several native fish like the Rio Grande chub, longnose dace, white sucker, and fathead minnow. These ponds are critical to birds migrating along the Central Flyway as they depend on the refuge as a place to rest and refuel during their long journey.

The 8,672-acre refuge, along the Gallinas River which is sourced on the Santa Fe NF, represents one of the few sizeable wetland areas remaining in New Mexico. It is open to the public for wildlife-dependent recreation, including wildlife watching, hiking, hunting, educational and interpretive programs and special events. The refuge is managed by the U.S. Fish and Wildlife Service.

Nesting on the refuge are nearly one-third of the documented bird species found on the refuge, including long-billed curlews, avocet, Canada geese, mallard, northern pintail, blue-winged and cinnamon teal, and gadwall and ruddy ducks.

The sandhill cranes arrive in the fall as they migrate to their winter home. Bald eagles, northern harriers, and American kestrels are frequently sighted soaring above the refuge scanning the grasslands for prey or attracted to the hundreds of ducks and geese on the refuge's open waters. Migrating shorebirds like long-billed dowitchers and sandpipers probe the mudflats in early fall and spring. In the woodlands, wild turkeys wander in search of a meal, and on the prairies, Rocky Mountain elk blend into the grasses, home to badgers and ground squirrels (US Fish and Wildlife Service).

- **Morphy Lake State Park** occupies a small natural basin on the east slope of the Sangre de Cristo Mountains. The altitude of the lake is approximately 8,000 feet above sea level. To the west toward the lake watershed, the skyline ridge topples nearly 12,000 feet in elevation. The lake water levels are naturally recharged from annual precipitation and seasonal runoff from snow melting within the Sangre de Cristo Mountains. The lake still provides irrigation for farming and ranching within the community of Ledoux. The lake is managed by the State Parks Department.

  The primary recreational activities at Morphy Lake State Park are boating, (electric motors and/or oars only), fishing, hiking, camping and picnicking. The park is open seasonally from April 1through November 1. During winter months, adverse weather conditions prompt the closure of the park to eliminate damage to roads and ensure public safety. Winter conditions cause road access in and around Morphy Lake to be dangerous. The park has a hiking trail that encircles the lake and boasts a wide variety of wildlife including, deer, elk, bear, turkeys, coyotes, muskrat, squirrels and chipmunks.

  The lake's primary attraction is the incredible trout fishing. The New Mexico Department of Game and Fish stocks the lake regularly with rainbow trout. In addition, the natural stream flowing into the lake allows for recruitment of other game fish like the Rio Grande cutthroat trout and the brown trout. Fish measuring up to 23 inches and weighing several pounds have been caught at the lake, although the average length of most fish caught ranges between 8 and 14 inches (New Mexico State Parks Department no date).

- **Northern Rio Grande National Heritage Area** encompasses Rio Arriba, Santa Fe, and Taos Counties. Within the heritage area boundaries are many significant historic sites and a cultural landscape that reflects long settlement of the region. These include Taos Pueblo-a World Heritage Site-and other American Indian and Spanish Colonial places designated as National Historic Landmarks, listed in the National Register of Historic Places, and/or the New Mexico State Register

of Cultural Properties. This area is managed by the National Park Service and there is currently no management plan (National Park Service).

Toward the end of the Ice Age, families of hunters came to the Northern Rio Grande high country and found huge mammoths and other animals to scavenge and smaller animals to hunt.

The Rio Grande rolled on as climate moderated and temperatures rose. Over the course of thousands of years, the landscape changed as water wore down the steep mountain slopes. The great dissected whole came to host herds of elk, mule deer, even bison and pronghorn antelope as the waters filled with trout that fed raptors and other animals. Groups of families of hunters and gatherers returned to different sites at different times to hunt, gather, and then farm.

As farming became more important, villages grew larger and more complex. Over hundreds of years, the landscape near the rivers was blanketed with fields of corn, beans, squash, cotton, and other crops.

Then the first Spanish explorer came to the Northern Rio Grande. His return to Mexico City opened the way for dozens of explorers, hundreds of settlers, and livestock. The seeds of wheat and shoots of grapevines also arrived along with a complex of irrigation techniques that forever changed the daily activities and cultural practices of native villagers.

Eventually, the area passed from Spain to Mexico after it won independence, and became part of America in the mid 1800's. Yet the old traditions continue today, unbroken, from farming with acequia irrigation on Tribal lands and Spanish land grants to fiestas, feast days, and religious observations in native languages and 18th century Spanish.

The reason for the Rio Grande National Heritage Area is to conserve and protect these traditions.

- **Pecos National Historic Park** is located in San Miguel and Santa Fe Counties, approximately 15 to 20 miles southeast of Santa Fe. It is situated in lands in the Pecos River Valley, and in the foothills of the Sangre de Cristo Mountains, and ranges in elevation from about 6,700 to 7,500 feet.

  The park was established by Public Law 89-54, June 28, 1965 (1965)(79 Stat.195). Pecos National Monument was expanded and renamed "Pecos National Historical Park" by Public Law 101-313, June 27, 1990 (1990)(104 Stat. 278), with the purpose of recognizing and preserving "…the multi-theme history, including the cultural interaction among diverse groups of people, of the Pecos area and its 'gateway' role between the Great Plains and the Rio Grande Valley, and to provide for the preservation and interpretation of the cultural and natural resources of the Forked Lightning Ranch …" and "…to enhance and preserve the existing Pecos National Monument and related nationally significant resources for the benefit and enjoyment of present and future generations…" Public Law 101-536, November 8, 1990 (104 Stat. 2368), known as the "Pecos National Historical Park Expansion Act of 1990" (1990)(appended), added key sites of the Civil War Battle of Glorieta to Pecos National Historical Park, as the Glorieta Unit.

  The park's significance lies in its multi-theme human history: cultural interactions among diverse cultural groups; its "gateway" role between the Great Plains and the Rio Grande Valley; early settlement and agricultural land use; and its diverse natural and cultural resources. The "gateway" consists of a broad pass through the Upper Pecos Basin and Sangre de Cristo Mountains, which allowed communication between the Great Plains on the east and the fertile valleys of the Rio Grande on the west. Land use was directly associated with the Pecos River, which created a small floodplain

that offered the opportunity for moderate agricultural activity, produced a stimulus for prehistoric and historic trade, and shaped settlement patterns for the region.

- **Santa Cruz Lake Recreation Area**. Thirty miles north of Santa Fe, the snow-fed waters of the Rio del Medio and the Rio Frijoles begin a 2,000-mile journey and a 7,000-foot descent to the Gulf of Mexico. For a time they gather at Santa Cruz Lake at the base of the Sangre de Cristo Mountains near Chimayo, behind the 125-foot Santa Cruz Dam.

  Santa Cruz Lake Recreation Area is located on public land managed by the BLM. The Santa Cruz Irrigation District regulates water releases for agricultural use in the Santa Cruz Valley. The lake normally contains water year-round and may vary in depth as much as 30 feet.

  Local terrain is rugged, rolling foothills with wide open mesas and chiseled steep canyons. Elevation at the lake is 6,285 feet rising to 6,600 feet at the Overlook Campground. The eastern shoreline is fringed with juniper and piñon pine, cottonwood, and a filigree of mountain mahogany. A large buttress of granite dominates the west side (DOI 2014).

- **Storrie Lake State Park** is located 4 miles north of Las Vegas, New Mexico, via State Road 518. Storrie Lake State Park is situated between two great geographical areas. To the east of the lake is the Great Plains, and to the west is the southernmost range of the Rocky Mountains, the Sangre de Cristo Mountains. Lake elevation is approximately 6,601 feet above sea level. The lake's water level is replenished through annual precipitation and seasonal run off from snow melting in the Gallinas Canyon watershed within the Sangre de Cristo Mountains.

  Storrie Lake provides irrigation water to the McAllister area for farming purposes. This causes water levels to drastically fluctuate at times. The primary recreational activities at Storrie Lake State Park include: camping and picnicking, fishing, windsurfing, and boating. The park is open year-round; however, due to extremely cold temperatures, the water is turned off and the comfort station is closed during the winter season.

  The Storrie Lake Water Users Association assumed management in 1944, and currently manages the use of Storrie Lake for irrigation and other agricultural related purposes. In addition, it was identified that Storrie Lake had great potential as a recreation and tourist attraction and has established itself as a popular destination. In the future, the staff at Storrie Lake State Park will continue to work with all stakeholders to cooperatively manage lake levels and benefit all interests regarding the lake (New Mexico State Parks Department 2004).

- **Valles Caldera National Preserve**. In 2000, President Clinton signed the Valles Caldera Preservation Act acquiring an 89,000-acre parcel of land in northern New Mexico (figure 64), while creating a large experiment in public land management. The landscape had been long known as the Valles Caldera, a Spanish name and geologic term describing the vast, grass valleys (valles) contained within a volcanic caldera. The tract of land had also been known as the Baca Location No.1 and the Baca Ranch; the latter refers to its management as a private ranch for more than a century. The President's signature renamed the landscape to the Valles Caldera National Preserve and declared it a unit of the National Forest System. The act also created the Valles Caldera Trust, a wholly owned government corporation, to oversee an experimental management regime. Management of the Valles Caldera has been moved the National Park Service as part of a defense spending bill signed into law by President Obama in December 2014.
- **Villanueva State Park** is located on N.M. Highway 3, which runs north to south between I-25 and I-40. The turn-off from I-25 is 40 miles southeast of Santa Fe and 23 miles southwest of Las Vegas.

Villanueva State Park is situated along a half-mile reach of the Pecos River in a picturesque canyon. The canyon walls extend 500 feet above the river to an elevation of approximately 6,000 feet. One wall is a steep rock cliff; the other is a more gradual slope, wooded with juniper and piñon trees. The fishing available in the Pecos River, which runs through the park for one-half mile, attracts visitors to Villanueva State Park. The park also offers attractive hiking trails. The river is stocked with rainbow trout during the months of October through April, and, on occasion, fishermen may try for German brown trout. Canoeing and rafting are popular sports during the Pecos River's high flow months of May and June. Bird watching and wildflower viewing have also become popular activities for many visitors (New Mexico State Parks Department no date).

Other Proposals for Designated Areas

Further evaluation during the Plan revision process for potential wilderness and suitable wild and scenic rivers will include multiple opportunities for intergovernmental and public input and comment. The current Forest Plan includes direction (p. 50) under Recreation, Visual and Cultural Resources to evaluate the following locations for possible contributions as Special Interest Areas: Cañones Creek, Pajarito Canyon, and Oaks Mesa Soda Dam. For potential addition to the National Wilderness Preservation System, the Plan (p. 149) lists additions to the Pecos Wilderness, with a total of 2,138 acres, at the Enchanted Lakes and Grace Tracts. The Forest Plan, following the previous eligibility study which resulted in designation of the Forest's current 3 National Wild and Scenic Rivers, specifically mentions Rio Guadalupe and Cañones Creek for reconsideration during the next planning cycle.

Management Area L (p. 146) directs protection of the Canadian Dogwood plant community as a Special Interest Area, and Amendment 10, providing direction for the Jemez WSR, currently protects "the bunchberry dogwood (formerly Canadian dogwood) plant community as a Botanical Special Interest Area" with the following: *Protect the bunchberry dogwood and giant helleborine (formerly chatterbox orchid) from being trampled, damaged or removed.* Management Area N in the current plan covers specific locations with "essential habitat for threatened and endangered species. They occur throughout the Forest in a variety of habitat types. For the most part, these are small areas of land isolated from high development areas and are predominantly still in a natural condition." Management direction is provided on pages 152-154. These areas include Ice Caves, Paso del Norte, Horn Mesa, Rio Cebolla, Guadalupe Mesa, Las Barrancas, and Parjarito, with a total of 19,275 acres.

In August of 2015, the Santa Fe NF officially received a request from the All Pueblo Council of Governors for designation of the Jemez Mountains as a Traditional Cultural Property. This was in response to a geothermal leasing and development project proposal, and cites the need to protect all of the associated resources in the Jemez Mountains area from leasing and mining activities and their potential impacts. (All Pueblo Council of Governors 2015).

The Santa Fe NF is not aware of any other published documents or county, state, city, or tribal plans that identify the need or potential need for additional designated areas specifically on the plan area, other than those mentioned above (e.g. critical Northern New Mexico Jumping Mouse habitat, Cañada Bonito Proposed RNA). The Forest has received detailed correspondence from a non-government organization, the Wilderness Society, describing the potential need and opportunities to recommend additional designated areas, particularly for wilderness designation or special management areas. From an ecological perspective, the authors make the case that the Santa Fe's undeveloped areas are important for conservation of habitats and connectivity, biodiversity, and for climate change adaptation. The authors of the correspondence argue that a potential need and opportunity exists to designate additional areas to sustain biodiversity on the Santa Fe NF. In terms of socio-economics, the Wilderness Society cites several

papers that address national, regional, and state public preferences for additional wilderness designation, claim a neutral-to-positive relationship between the presence and extent of wilderness and the performance of local economies, and predict that outdoor nature-based recreation will continue to grow in the future in New Mexico and the Region. The Recreation staff on the Santa Fe NF has also received comments from members of the public that portions of the Mora River on the Pecos/Las Vegas Ranger District, near the Pecos Wilderness, should be designated as a Wild and Scenic River.

The Santa Fe NF is located between the Carson NF to the north, with which it shares a boundary in multiple locations, and the Cibola NF to the south. Collectively these lands, along with BLM, NPS, State Trust and Tribal Lands and potentially some private lands, maintain important ecological corridors for wildlife, plants, and water. Consideration of corridor connections may be included in the ongoing discussion of need for potential special designations.

Ecosystem Services

Four designated wilderness areas, 3 designated wild and scenic rivers, 2 RNAs and an additional proposed RNA, 2 designated and a proposed critical habitat area, 54 IRAs, 3 national recreation trails, 5 designated caves, and a busy National Recreation Area must all be managed to additional national standards. Depending on the type of designation, these areas may be managed primarily for human recreation interests, or to provide for unhindered ecosystem processes with only low-technology recreation and management that will allow for the long-term unfolding of ecological changes, providing a critical education benefit as system baselines. The qualities of these areas that led to their designations serve as additional attractions and provide needed economic income, especially for smaller communities. Some designated areas promote the preservation of cultural traditions, including historical features, that contributes to social wellbeing. Current gaps in management capacity include wilderness areas without required management plans and wild and scenic rivers without legally-established corridor boundaries. The existing Forest Plan specifies protective measures for the identified special features or characteristics of RNAs, critical habitat areas, national trails, caves or IRAs, although monitoring schedules described in the current Forest Plan may not be feasible under current management allocations. Undeveloped areas that might receive additional protections through a special designation could provide important supporting and regulatory ecosystem services for conservation of habitats and connectivity, biodiversity, and climate change adaptation, as well as the associated cultural or provisioning services that derive from those healthy systems.

Designations managed by agencies and stewardship organizations outside the Forest Service include 8 scenic byways and 13 adjacent parks, monuments or other designation types. These can contribute to the cumulative value of the various ecosystem services provided by the Santa Fe NF, and with appropriate coordination, may be able to relieve some of the expected social, recreational and ecological needs.

Chapter 7. Infrastructure

Along with the trees, wildlife, and natural environment, every national forest has things that people have built. The most obvious are things that we can see, like roads and buildings. Just as important, though, are things that we can't see, like water systems and waste disposal systems. Even though we can't see some of the facilities, we use them, like all the other constructed features on the forest. This chapter is about the constructed features on the forest.

The Forest Service divides constructed features into two broad categories: roads and facilities. Our engineering organization and our funding match these categories. This chapter will match these categories. After an explanation of these categories, the chapter will explain how roads and facilities affect the resources on the forest, and the trends in constructed features and their effect on the forest.

It is practically impossible for any forest to operate without roads. Roads allow everyone to get to the forest and to get around on the forest. The buildings on the forest, whether they be ranger stations, cabins, or water systems, allow people to use the forest. When we put roads and buildings together, we have what we need to use the forest.

Roads

Regardless of what you want to do on the forest, you need to use roads. A trip to a wilderness area requires you to use a road. Firewood cutting, cattle grazing, logging, Christmas tree cutting, all of these require roads. Indeed, it would be difficult to do anything on the forest without using roads. The following sections describe the ranger districts and lists the main roads for access and use.

Coyote Ranger District

The Coyote Ranger District is located in the northwestern part of the forest. Parts of the district border on the Carson National Forest. The district includes all of the Chama River Canyon Wilderness and part of the San Pedro Parks Wilderness. The district has approximately 1,440 miles of road, including 132 miles of passenger car roads.

The public can access the district from U.S. Highway 84 on the east and U.S. Highway 550 on the west. New Mexico Highway 96 is an east-west road that divides the district approximately in half.

Cuba Ranger District

The Cuba Ranger District is on the west side of the Santa Fe NF. The northwestern part of the district borders on the Jicarilla Apache Indian Reservation and includes an area with oil and natural gas production. The district includes part of the San Pedro Parks Wilderness. The Chaparral Girl Scout camp is located on the district. The district has approximately 1,410 miles of road, including approximately 104 miles of passenger car roads.

The public can access the Cuba Ranger District from U.S. Highway 550 and along New Mexico 126. The main forest roads on the district include National Forest System road (NFSR) 103, a route between Cuba and Coyote, and NFSR 20, a main access route to the Girl Scout camp.

Jemez Ranger District

The Jemez Ranger District is on the west side of the forest in the Jemez Mountains. The district includes the Jemez National Recreation Area and the Dome Wilderness. The district has approximately 1,270 miles

of road and this includes 79 miles of passenger car roads. Because of the national recreation area, the district includes many campgrounds, fishing access areas, and picnic areas.

The public can access the district primarily by using New Mexico Highways 4 and 126. The major forest roads on the district are NFSR 376, the most heavily travelled road on the forest, and NFSR 10.

Pecos/Las Vegas Ranger District

The Pecos/Las Vegas Ranger District is on the east side of the forest. Parts of the district border on the Carson NF. The district includes part of the Pecos Wilderness. The district has approximately 1,820 miles of road that includes approximately 40 miles of passenger car roads. The district has recreation residences in the Pecos Canyon and in Gallinas Canyon near Las Vegas.

The public accesses the district using Interstate 25 (I-25) and a number of state highways including New Mexico Highways 3, 34, 53, and 63. Major forest roads on the district include NFSR 555, 263, 123, and 122.

Española Ranger District

The Española Ranger District is centrally located in the forest, mostly northeast and northwest of the Valles Caldera National Preserve, and includes the areas of the forest near Santa Fe. The district includes the Santa Fe Ski Area and part of the Pecos Wilderness. The district has popular campgrounds, picnic areas, and trailheads along the ski area road. The district has approximately 940 miles of road including 58 miles of passenger car roads.

The public accesses the district from a number of major New Mexico Highways including 185, 84, 76, and 502. Major forest roads on the district include NFSR 101, 102, 144, and 24.

Road System Condition and Maintenance

Approximately 6,900 miles of roads serve the Santa Fe National Forest. This includes approximately 180 miles of roads that our database shows as private jurisdiction, meaning that the Forest Service road crosses private property.

The Forest Service uses the term *maintenance level* to describe the service provided by, and maintenance required for, a road. We assign a maintenance level to a road on the basis of the vehicle type that we expect to use the road, and intended use of the road. A road designed for passenger cars would be different that a road for logging trucks. The maintenance level also gives users an indication of the level of comfort to expect while driving on the road.

The Forest Service has five maintenance levels: 1 through 5. A maintenance level 1 road requires the least amount of maintenance and gives the user the lowest comfort level; these are managed as open only for administrative purposes, typically fire management or vegetation improvement projects. A maintenance level 5 road provides the greatest user comfort, but also requires the most maintenance. Level 3 and 4 roads are suitable for passenger cars and level 1 and 2 roads are suitable only for high-clearance vehicles. Road miles by maintenance level differ across the forest by district, and the Santa Fe National Forest has no maintenance level 5 roads. Table 36 shows the number of road miles by maintenance level for each district.

Table 36. Road maintenance level miles

Ranger District	Level 1	Level 2	Level 3	Level 4	Total Miles
Coyote	370	940	130	2	1,440
Cuba	170	1,140	100	4	1,410
Jemez	650	540	70	9	1,270
Pecos-Las Vegas	117	1,670	30	10	1,820
Española	370	515	55	3	940

Table 37 shows how road maintenance costs vary by the maintenance level of the road and level of improvement that is needed. These costs are based on the current Northern New Mexico Road Maintenance contract. The work consists of reconditioning ditches, shoulders, roadbeds, and gravel surfaces. Culvert pipe replacement as needed is a large expense, from $30 to $60 per linear foot of pipe, and would be required at times to maintain adequate drainage from the roadway. Roadside brushing is also often necessary along all roads to remove vegetation from drainage structures and ditches, and to improve driving sight distance. Heavily damaged roads with surface and roadways that are eroded and gullied can cost as much as $50,000 per mile to repair. Road maintenance costs for maintenance level 3 and 4 roads include the need for gravel or asphalt replacement and repair.

Table 37. Road maintenance costs by maintenance level

Maintenance Level*	Miles	Estimated Maintenance Cost/Mile	Estimated Total Annual Maintenance Cost
1	1,600	$100	$168,000
2	4,800	$2,178	$10,500,000
3	390	$8,500	$3,270,000
4	28	$11,500	$322,000
Total	**6,900**		**$14,300,000**

It is important to remember that the forest has never received enough money to maintain all the roads on the forest, and probably never will. Indeed, there is no reason to maintain all the roads on the forest. Road maintenance budgets have declined steadily over the last decade. The road maintenance budget to maintain all Santa Fe NF NFS roads has dropped from $2.1 million in 2004 to $874,000 in 2014, a 58 percent decrease.

The declining road maintenance budgets have caused a large backlog of *deferred maintenance* needs across the Forest. Deferred maintenance is maintenance that was not performed when it was needed or when it was scheduled, and it was put off or delayed into the future. Comparing the FY 2014 budget of $874,000 to the estimated total annual maintenance cost shown in table 37, the deferred maintenance backlog could be as high as $13.4 million.

Road maintenance schedules are developed for and approved by each district on the Forest. These schedules are developed and based on road maintenance program priorities and on performance targets assigned by the regional office, and are limited by the amount of resources in any year.

Table 38. Maintenance targets for level 2 through level 4 roads in miles and percentage of total roads

	FY 2012	FY 2013	FY 2014
Passenger car roads	202 (46%)	131 (32%)	246 (60%)
High-clearance vehicle roads	74 (2%)	85 (2%)	184 (4%)

Roads maintained as shown above are considered to be in good condition, meaning that the drainage has been adequately maintained, the condition of the road surface allows use by high-clearance vehicles on level 2 roads or passenger cars on level 3and 4 roads, and roadside brushing has been done.

Emphasis is placed on roads maintained for passenger car use. Users have a greater expectation that hazards will be identified or mitigated on these roads. Damaged sections of road, including deficient bridges where continued use is determined to be unsafe, are closed until the hazard can be corrected or mitigated.

Forest roads that are not maintained regularly can adversely affect the surrounding environment through degradation of wildlife habitat, vegetation or soil productivity, water quality, and disturbance to archeological sites. These effects are explained in other chapters.

A geographic information system spatial analysis was performed by overlaying existing forest roads with soil interpretations from the Terrestrial Ecosystem Survey of the Santa Fe National Forest. The analysis shows that the erosion hazard across the forest is roughly half moderate and half severe. Erosion hazard refers to the relative susceptibility to sheet and rill erosion upon the removal of all vegetation and litter. A moderate rating means that predicted potential soil loss rates will result in a reduction of site productivity if left unchecked, and reasonable and economically feasible mitigation measures may be required to minimize soil loss rates. A severe rating means that predicted potential soil loss has a high probability of reducing site productivity, and reasonable and economically feasible measures are required to minimize soil loss.

This analysis provides mileages of existing roads within the erosion hazard categories of slight, moderate, and severe. Of particular interest are the level 1 and 2 roads because they normally have no road surface armoring, and as such are the most susceptible to road surface erosion. Also, only 2 to 4 percent of level 2 roads are maintained in any year. Of the 5,720 miles of level 1 and 2 roads analyzed, 99 percent are located within areas of severe and moderate erosion hazard.

Field observation and independent road condition surveys reveal that level 1 and 2 roads in these severe and moderate erosion hazard soils do degrade dramatically when drainage maintenance is not adequate. Because of resulting gullying and channelization of the roadway, estimates to repair and stabilize these roads can cost in excess of $50,000 per mile.

According to the Forest Service database, 315 miles of Forest Service roads that once served the Forest have been *decommissioned*. We decommission roads by ensuring that motor vehicles can no longer use the road. Some roads that were not correctly decommissioned are likely causing resource damage and should be treated to mitigate the damage. Other roads have decommissioned themselves as trees and other vegetation have grown over the road.

Bridges

The Forest Service database lists 54 road bridges on the Santa Fe NF. Four of these bridges in Bland Canyon are not useable or destroyed because of a recent fire and subsequent floods, and floods completely destroyed one bridge in Cochiti Canyon. These bridges will not be rebuilt. Another bridge

near Paliza Campground is not used because the road has been abandoned, although the bridge is still in place.

The remaining bridges, except for one in Gallinas Canyon, are in good condition. The one bridge in Gallinas Canyon was damaged by flooding in 2013, and the bridge will be repaired the fall of 2015. Federal law requires us to inspect all bridges every other year and serious deficiencies are corrected.

Trends Affecting Transportation System Condition and Development

One trend affecting the condition of the transportation system is the progressive decline in appropriated funding for road maintenance. The road maintenance budget for the forest has gone from $2.1 million in FY 2004 to $0.85 million in FY 2013. This trend is not expected to change in the future. As a result, difficult decisions will have to be made to bring the maintenance needs of the transportation system in line with available funding and to ensure this balance is maintained. This will also require an effort to increase the use of cooperative forest road agreements with state, county, or local governments, interagency agreements with other Federal agencies, and road use permits with private land owners and tribal authorities to allow other entities to provide maintenance services on forest lands or money to supplement future funding.

Another concerning trend is an increase in wildfires and ensuing floods on the forest. Table 39 shows the size and severity of wildfires has increased in recent years.

Table 39. Acres burned in forest fires

Years	Acres Burned
1990s	40,700
2000s	116,200
2010 to 2013	240,100

In a severely burned area of the forest, all live vegetation is eliminated as well as downed woody material, litter, and needles that would normally absorb or slow the movement of water. The soil itself is scorched to the point that it repels water. The combination of these conditions increases runoff in these areas, focusing water in large amounts in existing drainages. These post-fire flows result in plugged culverts, flow over road surfaces, rill and gully erosion of cut and fill slopes, erosion and deposition along road surfaces and relief ditches, and threaten human safety. Bridges trap large woody debris, forcing the water channels to spill over and blow out bridge approaches while also damaging the bridge superstructure itself. In September 2013, both Gallinas and Holy Ghost Canyons were flooded in one major event. Repairs to roads and bridges are scheduled for the summer of 2015, costing over $1 million.

Damage to the Forest transportation system caused by fires and ensuing floods results in expenses above the annual road maintenance budget, thereby reducing the amount of money available for standard road maintenance. Many damaged areas require annual repair for several years until the drainages have revegetated and stabilized. Some damage qualifies for funding from the Federal Highway Administration, but only on level 3 and 4 roads.

Sustainability of the Transportation System

The transportation system maintenance program as it exists is not sustainable given the size of the system and level of resources currently available to maintain it. All roads deteriorate over time and beginning shortly after they are built as a result of environmental factors like wind, rain, snow, sun, temperature swing, and vehicles travelling over them. Travel analysis has helped to reduce the size of the

transportation system by identifying roads that are not needed and are therefore candidates for closure or decommissioning. If there is a long-term need for a road but no immediate need, the road would likely be closed but kept on the transportation system; otherwise, it would be a candidate for decommissioning. Even if roads are closed, they will continue to deteriorate at some level due to the elements.

The funds that we receive for road maintenance are prioritized by Forest Service directives and regional annual budget program priorities. As has been illustrated here, the funds only go so far, and then the majority of needed transportation system maintenance is left undone. Also, the longer maintenance is left undone, the more costly the maintenance becomes. For example, gullying and channelization of roadways worsen over time, requiring more time, equipment and resources to repair or maintain.

Facilities Assessment

All the buildings on the Santa Fe NF fall in the category of facilities. But “facilities” includes more than just buildings, facilities includes water systems, waste disposal systems, and just about anything that isn’t a road. This section discusses buildings.

The Forest Service has two categories of buildings: (1) recreation, and (2) fire, administrative, and other. For this discussion, the categories—to simplify matters—are recreation and administrative. Table 40 shows information about leased buildings.

Table 40. Size and lease expiration dates for leased buildings

Leased Buildings and Space	Square Feet	Lease Expiration
Cuba District Office	6,000	November 2014
Walatowa Visitor Center	800	March 2016
Santa Fe Supervisor’s Office	23,000	September 2016
Española District Office	5,300	February 2019

Of the 258 buildings that the Santa Fe NF uses, the Forest Service owns all but four. Table 40 shows the size and lease expiration date for the leased buildings. The Forest Service leases a portion of the Walatowa Visitor Center; this is a recreation building. The other leased buildings are administrative buildings.

The condition of the buildings on the Forest varies depending on things like age, original construction, maintenance, and location. To standardize the method throughout the agency, we use a measure called *facility condition index*. We calculate the index from deferred maintenance costs and replacement value, and we use the index to rate the building, either good, fair, or poor. Table 41 shows a summary of the building conditions on the forest.

Table 41. Buildings and ratings on the Forest

Category	Number of Buildings	Rating	Deferred Maintenance
Administr**ative**	40	Good	
Administrative	22	Fair	$3.94 million
Administrative	75	Poor	
Recreation	65	Good	
Recreation	20	Fair	$0.99 million
Recreation	36	Poor	

Because of shrinking budgets, it is impossible to maintain the buildings to the highest standard. Indeed, as Table 41 shows, we have deferred maintenance needs of around $5 million for buildings on the forest. As a result, we have to choose the maintenance work that we do each year, and allow much maintenance to slip into the deferred category.

This trend is likely to continue. As more maintenance slips by the wayside, we must carefully choose the maintenance work that we do. How do we choose the work? First, we respond to emergencies. Emergencies do not happen on a regular basis, but recently, for example, the fire suppression sprinkler system at the Coyote Ranger Station malfunctioned during a weekend and flooded the building. Obviously, this immediately went to the top of the maintenance list, but at the same time, other maintenance needs slipped.

While the first maintenance priority is emergency repair, there are critical maintenance needs that must be met, too. We must consider public safety and employee health and safety, and our ability to carry out the Forest Service's mission. Finally, the last priority is non-critical need, for example, compliance with codes and standards.

As budgets shrink, it is apparent that only higher priority maintenance work will be completed.

Telecommunication Sites

The Santa Fe NF has 18 communication sites scattered around the forest. These sites are locations for radio equipment for police, fire, medical, and other public service radio systems, including commercial broadcast and cellular telephone. The type of equipment at each site depends on the users at the site and can include radio repeaters, FM broadcast transmitters, microwave relay systems, and cell phone towers. Some sites have Forest Service radios and buildings. Some sites have only commercial buildings and equipment, and others have a combination. Table 42 shows the communication sites.

Table 42. Telecommunication sites and condition

Name of Site	Condition Index
Cerro Pelado Lookout	Good
Deadman Lookout	Good
Elk Mountain	Good
Virgin Mesa	Good
Black Mountain Microwave	Good
Wolf Draw (commercial with Forest Service equipment)	Fair
Eureka Mesa	Fair
Tesuque Peak	Fair
Encino Lookout	Poor
Cerro Pelon (no Forest Service equipment)	Poor
Barillas Lookout	Poor
Dome Lookout (no Forest Service equipment)	Poor
Red Top Lookout	Poor
Peralta Ridge (commercial)	Unrated
Rowe Mesa (commercial)	Unrated
Cuba Mesa (commercial)	Unrated
Mesa Alta (commercial)	Unrated
Lobata Mexa (commercial)	Unrated

The equipment and sites have been in place for many years. We don't anticipate changes, except perhaps, an increase in cell phone equipment on the forest.

Drinking Water Systems

Because the Santa Fe NF has campgrounds, picnic areas, and administrative sites, we have drinking water systems at many of these places. These systems have wells, some type of water treatment system, and a distribution system. Like a municipal water system, the Forest Service systems must meet Federal and State drinking water standards. Table 43 shows information about the drinking water systems on the Forest.

Table 43. Name, status, and condition of drinking water systems

Name	Status	Condition Index
Holy Ghost Campground #1	Active	Good
Holy Ghost Campground #2	Active	Good
Holy Ghost Campground #3	Active	Good
Holy Ghost Campground #4	Active	Good
Black Canyon Campground	Active	Good
Clear Creek Campground	Active	Good
Rio Las Vacas Campground	Active	Good
Cowles Campground	Active	Good
El Porvenir Campground	Active	Good
EV Long Campground	Active	Good
Jack's Creek Campground	Active	Good
Battleship Picnic Area	Active	Good
San Antonio Campground	Active	Good
Coyote Administrative Site	Active	Good
Field Tract Campground	Active	Good
Vista Linda Campground	Active	Fair
Panchuela Administrative Site	Active	Poor

Because we must meet drinking water standards, we regularly test the systems. This will continue. Because of shrinking budgets we are not likely to build new campgrounds and new systems. We will, however, need to maintain and update the systems as necessary to keep them operational.

Dams

There are several dams on the Santa Fe NF, but the Forest Service owns only one of them. The rest of the dams are on forest land by authority of a special permit. Table 44 lists the dams on and near the Forest and their hazard ratings.

Table 44. Dams, ownership, and hazard rating

Name	Ownership	Hazard Rating
Truchas Lake Dam	Forest Service owned (wilderness)	Low
San Gregorio Lake Dam	Nacimiento Irrigation District	Low
Los Alamos Dam	Under permit with Los Alamos Co.	High
Fenton Lake Dam	State of New Mexico	High
Nichols Reservoir Dam	City of Santa Fe	High
McClure Reservoir Dam	City of Santa Fe	High
Abiquiu Reservoir Dam	Corp of Engineers	High

Fenton Lake dam is on state property, but part of the lake is on forest land. Nichols and McClure reservoirs are mostly on private property, but parts of the lakes and dams are on forest land.

The hazard rating on the dam is an indication of the amount of damage that could happen if the dam failed.

It is unlikely that the number of dams will either increase or decrease any time soon. Dams are expensive undertakings and require long lead times. Dams on the forest will continue to operate, and of course, be maintained.

Trends Affecting Facilities Condition and Development

One trend affecting facility development is the level of Capital Investment Program funds in Region 3. The Jemez District Office has been on the top of the Region 3 investment list for 3 years now, and no funds are available to replace the buildings. The Jemez Administration Site is undersized for the current staff, one building is in structurally poor condition, and safety issues are present due to lack of space and storage (electrical and egress issues). Other options to deal with this situation may include leasing a facility or collocating with another agency or agencies.

Another trend is using Indefinite Delivery Indefinite Quantity contracts to perform facility maintenance. This should simplify the acquisition process, allowing the Forest to execute task orders for a variety of maintenance and repair activities rather than having to prepare and bid a separate contract for each activity. These Indefinite Delivery Indefinite Quantity contracts are generally awarded to multiple contractors, have a not-to-exceed $5 million limit, and stay in effect for 5 years. This will allow for more maintenance to be accomplished for the same amount of funding.

Although the funding for administrative building maintenance has been fairly consistent since 2008, around $464,000 per year, it has not kept up with the accumulating deferred maintenance estimated at $3.9 million. Recreation maintenance funding is addressed in the recreation specialist's report. As deferred maintenance is left undone, routine maintenance becomes costly repair or replacement of building elements. An example of this is painting the exterior of a building. If left undone, the condition of the siding deteriorates to the extent that siding may require repair or replacement, a far more expensive venture. Lack of roof maintenance may evolve into a full roof replacement, or repair or replacement of interior components due to water damage.

Sustainability of Forest Facilities

As we move on into the 21st century, and as budgets decline, sustainability becomes more important for all parts of the Forest Service, including forest facilities. The Forest Service recognizes this and has established directives to ensure and enhance the sustainability of new and existing buildings. Many of

these directives are standard engineering principles; the directives are in place to ensure that the principles are followed.

When the Forest Service follows these principles, facilities costs over the life of the facility will be lower. For example, installing solar panels and solar water heating on a building will likely cost more at construction, but over the life of the building will save money. This is money that the taxpayer does not have to pay, and it can allow money to be moved to other forest programs.

Continuing on with the example of the solar-powered buildings, there are other benefits. Reduced carbon emissions are just one. Over the life of all Forest Service buildings, carbon emission reductions can be significant.

This is a significant and serious trend in facilities construction and maintenance, but it does not end with new construction. The Forest Service can and does make significant sustainability changes in existing buildings. Retrofitting buildings with better insulation and more efficient windows and doors is a good example.

Here are the basic principles that the Forest Service must follow for new buildings, major renovations, and leased buildings:

1. Employ Integrated design principles.
2. Optimize Energy Performance and Use of Renewable Energy.
3. Protect and Conserve Water.
4. Enhance Indoor Environmental Quality.
5. Reduce Environmental Impacts of Materials.

The principles for existing buildings are similar:

1. Employ Integrated Assessment, Operation, and Management Principles.
2. Optimize Energy Performance
3. Protect and Conserve Water.
4. Enhance Indoor Environmental Quality.
5. Reduce Environmental Impacts of Materials. See Principle 5 for Program Elements for New Construction and Major Renovations.

A baseline inventory of utilities forest-wide was completed in 2011. The purpose of this effort is to document processes used to access and review Forest Service utility bills. This process allows units to monitor the consumption and cost of energy, water, and waste removal services used at our individual buildings and facilities and to minimize the potential for erroneous payments. Incorrect payments may be caused by a number of factors, including inappropriate rate structures, paying monthly minimums at idle meters, and paying utility bills for properties no longer owned by the Forest Service.

Ecosystem Services

On the SFNF, 6900 miles of system roads have provided access to both recreationists and other forest users. Off-forest improvements to highways that connect to these roads and growing local populations have contributed to an increase in use. Ownership changes on adjacent lands, unresolved legal issues, new off-forest right-of-way regulations, and on-Forest dams not owned by the Forest Service all complicate

management and increase costs. The largest ecosystem drivers impacting forest access are extreme wildfires and floods, continually adding to the already-massive deferred maintenance backlog on roads and administrative facilities.

These factors have combined with sharply decreased budgets to create a large backlog in deferred maintenance on roads and recreational/administrative facilities. The forest is engaging its public stakeholders through working agreements, but a critical and growing gap in maintenance capacity for facilities and roads still exists. The Forest's lack of a clear strategy and minimal legal capacity to work with changes on adjacent lands contribute to conflicts for landowners and recreationists.

Input Received from Public Meetings

This section summarizes input, perspectives, and feedback relevant to this assessment topic and received from the public between April and July 2014. Input was gathered from 14 public meetings as well as forms available at all Santa Fe NF offices and online.

Infrastructure was an important topic of discussion, at many of the meetings. Most of this conversation focused on roads. Access by road is perceived to be important for recreation harvesting wood, and thinning projects, for example. Some expressed the desire to leave roads open but unmaintained.

Some participants are also concerned about trail maintenance. Dilapidated infrastructure, erosion, and general lack of maintenance are seen as preventing access to the Forest. Between road closures and lack of road maintenance, overall there are fewer roads.

On the other hand, some participants pointed out that improved road structures bring in more people to parts of the Forest.

Finally, some participants discussed an increased negligence of power lines and maintenance, and a lack of communication with the power authorities.

Chapter 8. Assessing Land Status and Ownership, Use, and Access Patterns

The purpose of this chapter is to assess the land tenure of private and publicly owned lands in and adjacent to the Santa Fe NF. There are a number of definitions for land tenure, however, a simple definition would be the way in which people have access to and use the land and its associated natural resources. A more detailed definition would be the political, economic, social, and legal structure that determines how individuals own and access land and its resources such as trees, minerals, pasture, and water; and who can hold and use these resources for how long and under what conditions and restrictions.

The land tenure issues associated with the Santa Fe NF are unique, complex, and controversial; and they present some of the most diverse perspectives faced by any forest in the National Forest System. A great many books and commentary have been written about the land tenure issues of Northern New Mexico. Because the Forest Plan Revision direction requires a rapid assessment, it is suggested that this expansive library of information be independently accessed for a complete history and explanation. Most issues in this chapter will only be briefly reviewed.

Similarly, real estate data which would typically be charted, graphed, and tabled, will not be detailed in this chapter. Real estate professionals typically collect actual market data to realistically predict future trends. Unfortunately, the analysis of current market data would not provide a realistic conclusion or indication of trends because of the significant economic fluctuations that have occurred in recent years. Demographic or sales data prior to about 2008 would reflect a vibrant economy with significant appreciation in real estate value and sales activity. In contrast, over the past 6 years, the general economy has suffered one of the worst economic periods in modern history, which has caused substantial depreciation in property values and very few sales transactions. Since reliance on real estate data gathered since 2008 would suggest an overly pessimistic and negative forecast, that information is used minimally here as it doesn't necessarily predict future trends.

Before the individual components of land status, ownership, use, and access can be assessed, there are three fundamental overarching drivers/stressors which should be identified and explained. While these fundamentals appear to be only macro-economic in scale, there is a direct link to the Santa Fe NF demonstrated by landowners who seek to alter our management of national forest to satisfy their perceived needs on adjoining private lands.

These consequences must be understood in order to adequately assess current and future trends that affect public expectations for how adjoining national forest lands will be made available for their use.

These drivers/stressors are:

- Fire and the Wildland-Urban Interface
- Baby Boomer Demographics
- Forest Service Capacity to Address Issues

Fire and the Wildland-urban Interface

Wildland-urban interface (WUI) areas have been defined as a line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland conditions. Another definition describes WUI as private forestlands that are within 500 meters of public forestlands. According to a report on fire and the WUI (International Code Council 2008), "well over a dozen definitions of WUI

exist, based loosely on what individual groups or organizations want to convey." The Panel recommended this simple definition: "where structures and vegetation merge in a wildfire-prone environment."

In a Forest Service Pacific Northwest Research Station report, titled "National Forest on the Edge," authors noted that in recent studies on rural population change in America, since the 1990s, there has been a substantial trend toward increased population growth in many rural counties, especially those with Federal lands and abundant natural amenities. Population growth in rural nonmetropolitan counties containing national forests has been consistently higher than in other rural counties over each of the past three decades. Between 1990 and 2000, nonmetropolitan counties with more than 10 percent of the land in national forest grew by 18 percent – considerably higher than the growth rate in other nonmetropolitan counties (10.8 percent). The report further showed that population growth was particularly acute in counties near national forests in the southern Appalachians, northern New Mexico, southern California, and southeastern Idaho. (Stein, Alig et al. 2007).

Table 45. Santa Fe NF (SFNF) acreage contained within adjacent rural counties (USDA, FS-383, 2014)

	Sandoval	Santa Fe	Los Alamos	Mora	Rio Arriba	San Miguel
Total Acreage	2,376,960	1,223,040	69,760	1,237,120	3,751,040	3,018,240
SFNF Acreage	417,977	234,171	28,675	84,747	530,049	336,477
Percent SFNF	18%	20%	42%	7%	15%	12%

The local development growth is significant as well: (Research and Polling Inc. 2014)

- From 2000 to 2010, Sandoval County was the fastest growing county in the state, growing by 46 percent. It has grown by another 3.8 percent from 2010 to 2013 (3rd fastest).
- Among the 10 fastest growing counties from 2010 to 2013, two are in the Albuquerque Metro area (Bernalillo and Sandoval counties), one is in the North Central region (Santa Fe County)

Two easily grasped examples of WUI consequences on the Santa Fe NF are the Cerro Grande and Las Conchas wildfires. The Cerro Grande fire began on May 4, 2000, as an out-of-control prescribed burn. This 42,873-acre fire caused the evacuation of approximately 18,000 people, and destroyed 260 residences as well as facilities and equipment at the Department of Energy's Los Alamos National Laboratory (LANL).

Eleven years later, the Las Conchas Fire began on June 26, 2011, when a gust of wind blew a 75-foot-tall aspen into a power line. From that point of origin began what was then the largest wildfire in New Mexico history. During the first 14 hours, the fire moved eastward, consuming more than 43,000 acres of forest and destroying dozens of homes. The speed of the fire's spread was astonishing—averaging an acre of forest burned every 1.17 seconds for 14 straight hours. The fire continued to grow over the next five weeks, and was eventually contained by firefighters on August 1 at 156,593 acres (245 square miles). The proximity of neighborhood subdivisions and the utility infrastructure necessary to support them caused what would normally be a bad wildfire to turn into a catastrophic loss of property value for these private landowners.

An audit report from the USDA Office of Inspector General, entitled **"Evaluation of Forest Service's Processes to Obtain and Grant Rights-of-Way and Easements,"** (USDA Office of Inspector General 2012), from March of 2012, raised concerns associated with private development impacts on NFS lands, exacerbating the WUI problem**:**

> "The change in land use has potential environmental impacts on the nation's forests and grasslands that include increased wildfires, damage to natural ecosystems, and threats to public safety. By the year 2030, Forest Service anticipates a 40 percent increase in the WUI fire-prone areas of the western Rocky Mountains. The agency is compelled to suppress fires aggressively when private property is at risk. In FY 2000, wildland fire suppression costs were budgeted at $858 million, while in FY 2009, the budget was increased to $2.3 billion. Therefore, without a strategy on how to address the changing land impacts, Forest Service remains unprepared to address the significant effects caused by development adjacent to or intermingled with national forest land."

The OIG concluded that:

> "Overall, the change in use of land could alter forest lands' ecological, social, and economic resources and increase their management costs. Without an implemented strategy and an understanding of the scope and costs, the conversion of forest land to residential and commercial use represents a challenge that may jeopardize Forest Service's ability to provide stewardship for the forests' ecosystem services."

As recognized by the OIG, the way we currently evaluate and authorize use of national forest lands works to encourage and even exacerbate the WUI problem. There are numerous examples of road access and utility corridor authorizations on the Santa Fe NF which demonstrate this.

Stressors in this area of land management are numerous. For example, property owners within this rapidly expanding area of merging conflict often make demands for access and utility infrastructure across NFS lands. Greater housing density increases encroachment and trespass potential, transforming the appearance of public lands into privately claimed backyards. Adjoining WUI neighborhoods increase the likelihood of illegal private road building and user-created off highway vehicle trails. When wildfires threaten large scale destruction of private property, millions are spent defending these private lands, and additional new pressure is placed on Santa Fe NF management to accommodate the rebuilding process after damage occurs.

Regulation of private lands is the responsibility of State and local governments through the use of tools like subdivision regulations and zoning restrictions. They are not the responsibility of the Forest Service. However, management of National Forest lands as they are used to develop private lands is our responsibility.

Baby Boomer Demographics

The Baby Boomers are a socio-economic group which has had a disproportionate demographic impact since the beginning of the post-World War II era. This group represented a significant, temporary increase in the country's birth rate, from a period roughly between 1946 and 1964. This population bubble continues to present a variety of demographic opportunities and challenges. For perspective, the oldest Baby Boomers reached the common retirement age of 67 in 2013.

This large portion of the population has reached the age where retirement, estate planning, death, and estate distribution decisions are causing changes to private land ownership that can result in negative consequences on adjoining NFS lands. In order to address these changes, landowners are subdividing large tracts of land either to settle estates, or maximize investment returns on long held private holdings. Casual or informal access understandings which have been in place for generations are suddenly inadequate for modern real estate markets. Old special use authorizations relied upon by families for decades are subjected to new environmental and development scrutiny by both the Forest Service and the private real estate market, which includes title companies and mortgage lenders. New buyers have new

plans and expectations, and want to make use of National Forest to realize those expectations in ways which magnify the WUI and fragmentation issues described above.

This demographic bubble causes significant added pressure on management of adjoining Santa Fe NF lands, and the trend is likely to continue for at least the next 10 to 15 years. There is increased focus, pressure, and demand by this demographic group on the Forest Service's Lands and Boundary Management program as real estate ownership, utilization, and development become more complicated.

Internal Forest Service Capacity to Meet Public Expectations

The fundamental internal influence on our ability to manage issues such as land status, ownership, access, and use and occupancy is that the workload on the Santa Fe NF far exceeds available resources.

Two other OIG Audits (**Evaluation of Forest Service's Processes to Obtain and Grant Rights-of-Way and Easements**, (USDA Office of Inspector General 2012), and the **Forest Service Administration of Special Use Program,** (USDA Office of Inspector General 2011)) summarized the capacity problem this way:

> "Forest Service's Lands and Realty Program has the fundamental responsibility to protect forest land and resources." "However, according to Forest Service officials and local forest staff, there is a lack of staffing and expertise for the Lands and Realty Program to review, approve, and monitor these (Special Use) applications, especially in light of rising public demand.
>
> Today there is little expertise left in the Lands and Realty Program staff. Because staffing and funding constraints limit the effectiveness of Forest Service's stewardship mission, Forest Service's strategy and assessments should consider and address these issues to ensure its viability."

These findings and the agency response provides valuable insight into the challenges the agency faces with regards to keeping pace with the workload and complexity of the Lands program. This is a national problem that has trickled down to directly impact the Santa Fe NF. The Santa Fe NF Lands and Boundary Management program mirrors this national trend of struggling to address significant trespass and encroachment problems, respond to requests for authorization to use or occupy NFS lands, and implement its landownership adjustment program.

Land Status and Ownership

External Ownership Influences

A number of external influences affect our management of NFS lands, including jurisdictional changes such as administrative transfers to the National Park Service and legislated disposal of NFS lands in the settlement of Pueblo title claims such those involving lands transferred to Santo Domingo (Kewa) Pueblo and Pueblo de San Ildefonso. Unlike other Forests in the Region, we do not receive a lot of pressure to dispose of NFS lands for expansion of local community public service infrastructure like fire stations or schools, or to provide for more private land for subdivision development.

The one exception to this would be Los Alamos County, which has a unique historical basis. The entire county was initially carved out of the Santa Fe NF by the Department of the Army for the Manhattan Project. Much of what was originally withdrawn has been relinquished back to the Forest Service and other Federal agencies, leaving behind a finite amount of land to serve the needs of Los Alamos County citizens. As Los Alamos National Laboratory has expanded over the years, so has the need for housing and its associated public infrastructure like water wells and recreational facilities. In the past, we have exchanged out NFS lands to facilitate subdivision expansion, and we are currently disposing of water

system lands to Los Alamos County under the authorization of the Pueblo de San Ildefonso Settlement Act.

Internal Ownership Influences

The main internal influences on Forest Service land ownership are acquisition of private lands and disposal of Federal lands. Acquisition and disposal are typically driven by Land Ownership Adjustment Plans, which are intended to identify lands desirable for acquisition into the National Forest System, and candidates for disposal for various reasons. Acquisition goals include consolidating ownership for improved management, elimination of boundary lines, and preservation of natural resources—particularly from development pressures. Parcels identified for disposal are typically those that have become difficult to manage because surrounding ownership conditions have changed or the lands no longer serve a useful function. These are often former administrative sites.

Land acquisition in New Mexico is generally limited to tracts within the existing proclaimed national forest boundary; congressional approval is necessary for acquisitions outside the proclaimed boundary. This coupled with the current private/public/tribal land ownership pattern means there probably are not a lot of major purchase projects left in the area. There are definitely opportunities to fill in ownership with specific purchases.

The only currently active disposal action on the Santa Fe NF is the sale of lands to Los Alamos County, which were part of the legislated Pueblo de San Ildefonso Claims Settlement Act of 2005. These lands contain governmental infrastructure like potable water systems important to Los Alamos County. Currently, there are no plans for future disposals.

Economics of Local Real Estate Ownership

Owning land in and around national forests is obviously considered desirable for the simple reasons that it is pretty to look at, offers a pleasant experience, and can be fun to recreate on. Desirable land becomes expensive land. Desirable and expensive land can create tension, in particular between those who have historical ties to the area (i.e., “locals”), and those who are relatively new to the area or don’t live in the area at all. These tensions can occasionally evolve into more than mistrust, especially when those new to an area are perceived as imposing unwanted changes and demands upon people with more historic ties to the areas.

In communities around the Santa Fe NF, there is often a substantial disparity in available disposable income among landowners in the planning area. This is best demonstrated by homes and property used for primary residential purposes versus property that is used for second home and/or recreational purposes.

Decisions made on the Santa Fe NF can have significant negative economic impact on local landowners who may be “property rich, but cash poor.” Attempts to manage NFS lands for resource protection, particularly recreational uses of NFS lands, can impose significant social and economic hardships on local landowners. Conversely, because an important segment of recreational property owners within the Forest’s area of influence come from out of state, the way we manage the Forest can have economic consequences reaching far from our boundaries.

Marketable and Insurable Title

Many private properties in and adjacent to the Santa Fe NF have significant problems with marketable and/or insurable title. The landowners are often “land rich but cash poor.” Vague property boundaries between private land and the Forest are expensive to survey and confirm. Historically, access was

informally established, with or without involvement of Forest Service managers. This informally established access does not satisfy “legal access” requirements by current standards for marketing and insuring title. Often this is compounded by a lack of legally established access across other adjoining private lands, which may have title problems of their own. Historically, the Forest has responded to access problems by authorizing multiple roads to inholdings, increasing fragmentation and damage to natural resources on public land. Encroachments with ownership problems don’t get resolved, and time only exacerbates the complexity. Fairly routine issues become intractable to solve and create very difficult, tangled ownership scenarios that can render properties essentially unmarketable. The result is often a frustrated set of landowners and increased workload of Santa Fe NF staff to clarify or resolve the issue.

These situations are not unusual and are particularly acute in the northern New Mexico region. The economic effects of an unmarketable title can include: the prevention of equitable estate settlement and the legal passing of land on to rightful heirs, the discouragement of new business investment, and the reduced ability to assess and collect property taxes on an equitable basis, which hurts a community’s ability to collect revenue for reinvestment in infrastructure.

A substantial effort was made to identify and address the causes, effects, and potential solutions to land ownership problems described above with the publication “Land Title Study” (White 1971). This reference is almost 45 years old now and the statistical data are severely dated. However, the historical context, effects, and conclusions remain useful and valid.

The imposition of tighter standards for marketable, insurable title is an outside influence over which anyone owning or managing real estate in northern New Mexico has little control. These requirements for marketable and insurable title have evolved and been imposed by the market as necessary for the standardization of real estate mortgages, and have taken on significantly greater importance since the original Forest Plan was implemented. The direct result is an increased workload for lands and boundary management staff on the Forest.

Fragmentation

Fragmentation is another stressor on the management of lands. As is typical nationwide, the greatest factors in how private lands are owned and used and the demands they place on adjoining NFS lands, are the availability of private lands within the Forest’s boundaries (number of inholdings) and the amount of disposable income associated with those private landowners in the planning area. The Santa Fe NF is not a highly consolidated Forest from the standpoint of land ownership. The Forest experienced a great deal of settlement pressure and many private inholdings were created during the Homestead patent eras. There are about 350 private land inholdings within the administrative boundary, totaling nearly 136,000 acres. These inholdings are in turn often heavily subdivided into smaller parcels creating literally thousands of individual parcels of private land (see figure 65).

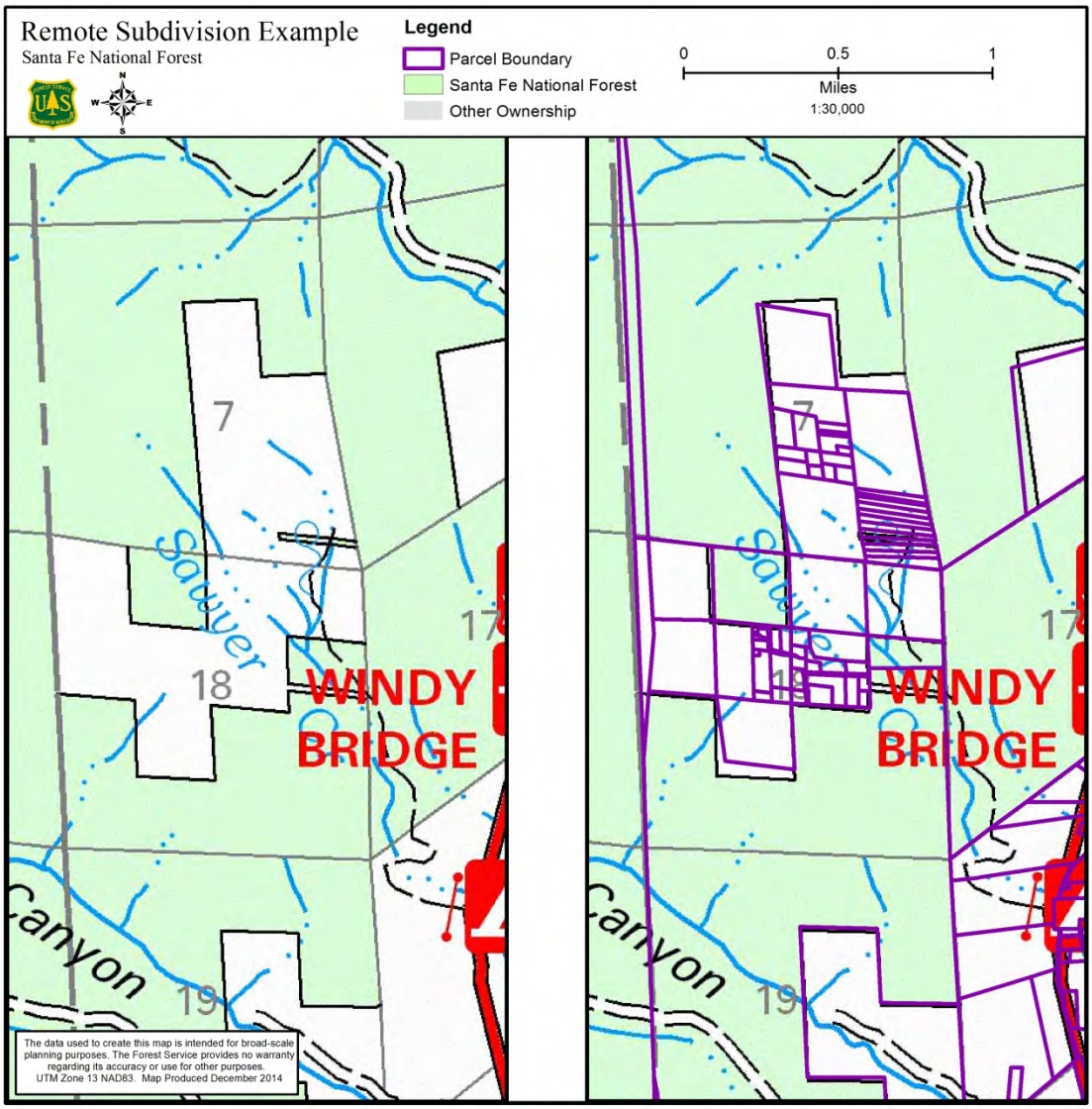


Figure 65. Example of fragmentation on private land

In figure 65, the image on the left illustrates a large block of 500 acres of private land, with no indication as to its land status. One would typically imagine the ownership to be made up of a few large acreage ranches. The image on the right demonstrates the extent of private ownership, with many of the subdivided parcels existing as a result of the State's family subdivision exemption. There are approximately 80 subdivided parcels of land as shown, and we know of additional subdivision that is occurring as this report is written. This remote, mountainous property has severe access problems, both across National Forest System lands, as well as internally across neighboring private parcels.

Private lands on the Pecos/Las Vegas District currently seem to experience the greatest visible pressure from these problems, but experience shows that this is more of a reflection of the demographics of the particular landowners, as well subdivision loopholes contained within State and County regulations. The real estate market on this district appears to be at a different evolutionary point in time as compared to the other districts. More of the private inholdings within this district appear to be owned and maintained as purely recreational properties by out-of-state owners. Admittedly, this is purely anecdotal data, based on

the ownership makeup of those making special use authorization inquiries. The other districts seem to have still retained a proportionally larger amount of acreage in local ownership. This is likely due to the proximity and ease of interstate access (I-25 and I-40) from out-of-state major metropolitan areas located in more eastern states like Texas.

Planning and zoning requirements and procedures are widely divergent among the five counties within our immediate planning area; enough so as to be difficult to briefly summarize. The New Mexico Subdivision Act governs subdivision activity outside of municipal boundaries. It further grants counties the power to adopt county subdivision regulations, to approve subdivision plats, and to enforce provisions of the Act. Unfortunately, there have been a number of loopholes associated with the Act, which have been exploited over the years by developers. This has had a particularly significant impact on rural counties who lacked, and in some cases continue to lack, subdivision ordinances. San Miguel and Mora Counties are examples of counties grappling with the challenges associated with adopting and enforcing how subdivisions are created. There is a direct effect on the Forest, in that many of our most complex WUI and access challenges originate on the Pecos/Las Vegas District which is encompassed within these two counties.

One of these loopholes, which continue to have significant WUI impacts on the Santa Fe NF, is what is known informally as the family subdivision exemption. These family subdivision exemptions are intended to facilitate and preserve historic methods of transferring land to family heirs as people pass away and estates are settled. However, this exemption enables landowners to subdivide large parcels of land and convey them to immediate family members, without local county approval, bypassing typical subdivision standards and requirements. The result of this type of activity can be seen in the Remote Subdivision Example shown above. Counties are working to adopt tighter regulations, but this legacy of loopholes remains a constant source of new WUI problems and demands for access.

Access Across Santa Fe NF Lands

As previously stated, OIG officials have raised concerns associated with private development impacts on NFS lands. The way we currently evaluate and authorize use of national forest lands works to encourage and even exacerbate the Wildland-Urban Interface problem. There are numerous examples of road access and utility corridor authorizations on the Santa Fe NF which demonstrate this. Our priorities as currently established, as well as our limited funding and expertise will only exacerbate this problem.

The Forest Service has a statutory obligation to provide access to private land within the National Forest boundary.

> §1323. (a) Notwithstanding any other provision of law, and subject to such terms and conditions as the Secretary of Agriculture may prescribe, the Secretary shall provide such access to non-federally owned land within the boundaries of the National Forest System as the Secretary deems adequate to secure to the owner the reasonable use and enjoyment thereof: Provided, That such owner comply with rules and regulations applicable to ingress and egress to or from the National Forest System. (Section 1323(a) of the Alaska National Interest Lands Conservation Act of 1980 (P.L. 96-487, 16 U.S.C. 3210) (Congress 1980)).

ANILCA is a critically important statutory right of access favoring private landowners. Owners of private inholdings on the Santa Fe NF know of this law and routinely attempt to apply it to their individual circumstances. They often perceive it as an unconstrained right, giving them immediate, unfettered access. However, the issue has been repeatedly adjudicated up to the U.S. Supreme Court, and the Forest Service’s ability to regulate that manner in which that statutory right is authorized is often overlooked, creating a major point of conflict between the Santa Fe NF and owners of private inholdings

In essence, while the Forest Service is required to provide access, this requirement is not unqualified. Within Forest boundaries, the Forest Service is legally obligated to allow physical access to private property that is identified as an inholding. Inholdings are identified as those lands located within proclaimed national forest boundaries that are wholly surrounded and landlocked by Forest Service lands. The Forest Service is not required to physically construct it or to absorb the construction cost. The manner in which access is provided to a private land inholding is a discretionary decision for Line Officers, and is based upon individual facts and circumstances. ANILCA does not require that the Forest Service authorize access in a manner that would degrade natural resources. For example, if a property has historically been accessed via a riparian area and that manner of access causes resource damage, an alternate means of access and location can be allowed instead.

The demographic pressure and resulting fragmentation of private lands has created demand on the FS to accommodate these access requests. The market pressure created by virtue of State and local subdivision exemptions, means that access roads across Santa Fe NF lands are demanded by private landowners, yet these roads are often substandard in nature, due to maintenance challenges, curves, grade, and accessibility by school buses and emergency response vehicles.

While the Forest Service is required to authorize access to inholdings, a similar requirement does not exist for authorizing power to private lands. The ever-expanding reach of power distribution lines is closely aligned with the similarly expanding WUI. In addition to providing service to existing primary home sites and recreational properties, we are receiving requests for extension into new areas which have the potential to dramatically alter the landscape with proliferation of WUI. Developers of recreational and rural home sites typically demand that power be extended to their properties. However, the proliferation of above-ground distribution lines, which are maintained by small rural electrical cooperatives, has left us with a landscape compromised by significant wildfire threats from downed power lines. These rural coops are suffering maintenance challenges with aging infrastructure, increasing right-of-way costs, and rate structures driven by local economic conditions. The result has been several significant wildland fires caused by downed trees hitting power lines, resulting in extensive damage, controversy, and legal/financial challenges.

Although regulation of private lands is not the responsibility of the Forest Service, we are responsible for managing NFS lands as they are used to develop private lands. We have reasonable and justifiable natural resource-related motivations for requiring mitigation measures, such as reducing visual impacts and minimizing forest fires (by burying power lines), and more aggressive requirements associated with roads used for subdivision purposes. Subdivisions created under the family subdivision exemption often create difficult or unmanageable demands on local governments. If local governments are unable to support unregulated growth by maintaining these road systems, then access across NFS lands could be delayed until the local governments are prepared to handle the growth. And in turn, the Santa Fe NF could more proactively engage local governments to ensure that the access authorizations we issue do not conflict with the counties' subdivision plans or intent.

In one of their audits, the OIG stated "We recognize the Forest Service has little or no direct control over what happens on privately-owned lands adjacent or near to the NFS; that is why we believe that any workable strategy should concentrate on mitigating the impact *on NFS lands* when development occurs on adjacent privately-owned land." We can meet our ANILCA-based requirements for authorizing access, but also manage the rate of WUI expansion in coordination with County governments. Failure to recognize and act on these trends will have significant implications for the management and conservation of public land resources, ecological services and products, and social and cultural amenities on the Santa Fe NF.

Access to Santa Fe NF Lands

Right now, there are unknown thousands of acres of Santa Fe NF that are effectively inaccessible by the public. In many cases, the only access to Federal land is across private property. Many access opportunities have been lost across private lands due to historic landownership patterns, changing private ownership conditions, and a lack of established, legally defensible access across private lands.

Inadequate access to public lands impacts a wide range of outdoor recreation activities, including hunting, hiking, camping, viewing scenery and wildlife, horseback riding, fishing, wilderness area use, and mountain biking. Public surveys suggest that private land blocking access to public lands is one of the biggest problems facing hunters. In turn, this can have a significant negative effect on our local outdoor recreation economy, which is critically important to small businesses in and around the towns on the Santa Fe NF.

Historically, many landowners have been willing to provide access to public hunters and recreationists across their private lands. Personal relationships were established, and respect for private property was demonstrated. Unfortunately, this traditional access has diminished as changing patterns of landownership have eroded the personal relationships between landowners, hunters, and recreationists. Landowners now often perceive urban/suburban recreationists as trespassers who are disrespectful of their private property rights, or sometimes lack an understanding of simple courtesies like closing gates and not scaring livestock. The fear expressed by landowners is warranted. Their property can be subjected to theft or vandalism; their pets and livestock can be harassed or killed. Just outside of Santa Fe, on Santa Fe NF and BLM lands, local ranchers have experienced this repeatedly on the Caja del Rio in recent years.

At the same time, changing patterns in land ownership are also resulting in the replacement of traditional farming and ranching families with new and sometimes absentee landowners. Unfortunately, some people have attempted to lay a personal claim on the public's lands and waters. In some cases, these individuals will selectively buy small parcels of private land that serve as bottlenecks, with one road that accesses thousands of acres of public land. By illegally closing these roads, they can erode public access. These are real cases that are happening every day. An example of this can be found in Tesuque, where a single family has illegally closed access to an area of the Santa Fe NF that has been traditionally used for day hikes by locals for generations. In other cases, such as along one stretch of the Pecos River, outfitters who enjoy the privilege of making money off of public wildlife are blocking the public out of these areas. They're privatizing public fish and wildlife on public land.

People want to use their public lands and are becoming sensitive to restrictions on that ability. In response to this growing problem, hunters, anglers and other outdoor recreationists have raised their access concerns to members of Congress, who have sought ways to address the issue. However, an important component of proposed solutions that is overlooked, are the very factors being raised in this assessment. Our internal capacity to address easement acquisition and defend title to National Forest System lands has been greatly diminished. Legal solutions like this require application of significant time and expertise, if they are to succeed. Competing demands resulting from fragmentation of private lands and the pressure to authorize access and utilities severely limits our ability address what is becoming a serious and important issue.

Future Growth and Subdivision

Growth and subdivision impacts an area of influence for the Santa Fe NF that extends beyond the 5-county areas to also include the greater Albuquerque area, including Bernalillo County. Within this greater planning area are small to medium-sized communities such as Jemez Springs, Española, and Pecos, as well as the three significant population centers of Albuquerque, Rio Rancho, and Santa Fe. The small to

medium-sized communities are typically in or adjacent to the Forest and their impacts on management of the Forest are most easily understood as WUI issues.

Population estimates as of July 1, 2012, taken from the U.S. Census Bureau, demonstrate that three of the four largest cities in New Mexico are within easy travel proximity to the Santa Fe NF, and all three contribute significantly to such issues as recreational pressure, economic impacts, and public access in and to NFS lands.

Santa Fe is the fourth largest city in New Mexico and has the most obvious population center impact on the Forest. Santa Fe is the oldest capital city in the United States and the oldest city in the state, with a population of approximately 70,000 people (in 2012).

Rio Rancho, one of the State's newest cities, is located roughly 45 miles south of Santa Fe. During the analysis period for the previous Forest Plan, the city was not a significant demographic factor; according to the U.S. Census, the city's population in 1980 was only about 10,000 people. But its rapid population growth has now eclipsed that of Santa Fe's, with a population of roughly 90,000 people (in 2012).

And finally, Albuquerque, with a population of roughly 555,000 people in 2012, is by far the largest population center in the state and is located just a few miles south of Rio Rancho. Future growth of these cities is difficult to predict with current economic conditions, but those areas west of the Rio Grande River—Albuquerque and Rio Rancho in particular—represent the greatest likely sources of population growth in coming years, primarily because they contain the last large, unimproved tracts of land in the Albuquerque Metro area. The balance of Albuquerque is essentially hemmed in on three sides by the Cibola National Forest and pueblo reservation lands on the north, east, and south. These west-side communities will continue to have an evolving recreational impact on the Forest, particularly on the Jemez and Cuba Districts. Future growth will depend on the State's (currently slow) rate of recovery from the effects of the Great Recession.

Another limiting factor will certainly be the availability of water for domestic and commercial purposes. Since implementation of the current Forest Plan, all three population centers have attempted to address future water needs. Albuquerque and Santa Fe have both sought to capitalize on the San Juan/Chama water rights they own, by constructing water diversion projects into the Rio Grande River. Infrastructure for Santa Fe's Buckman Diversion Project is actually situated in part on NFS lands. Rio Rancho does not own any San Juan/Chama water rights, and gets all of its water via the pumping of groundwater. This factor has caused Rio Rancho and Sandoval County to explore pumping brackish water from deep aquifers under the Rio Puerco and processing it through desalinization plants.

Under New Mexico's Subdivision Act, both large and small subdivisions are supposed to be able to demonstrate water sufficient in quantity to fulfill the maximum annual water requirements of the subdivision, including water for indoor and outdoor domestic uses. In general, if the availability of water for large municipalities becomes limited, it is likely that recreational pressure and WUI impacts will be diminish, or at least grow at a slower rate. Similarly, if water necessary for small (regulated) subdivisions on inholdings within the Forest becomes less available, there will likely be a slow-down in the conversion and fragmentation of raw land. Regardless of the source, the availability of water could alter future growth patterns.

A significant change since the 1987 Forest Plan was the widening and improvement of State Highway #550, which provides a primary route of access to the Forest from the Rio Rancho/Albuquerque area. Another major influence is the continuing paving and improvement of State Highway#126, which provides important internal access on the Cuba and Jemez Districts. As ease of access to and within the Santa Fe NF improves, property values for rural parcels of land will likely increase due to enhanced

desirability. This will encourage further subdivision and development of once vacant rural property, further exacerbating the WUI problem.

Santa Fe will see future growth too, although it is limited by adjacent Federal lands and strong anti-growth sentiment of some citizens. In comparison to surrounding areas, raw land near Santa Fe tends to start out at a higher price per acre, due in part to the market effects associated with its tourism focused economy. This cost per acre factor equates with more challenging economic growth and development, when compared with population centers to the south. This means that the Santa Fe NF is likely to see less creation of new WUI interface in the immediate vicinity of the city, and instead new WUI interface will likely occur in other locations. Nevertheless, that development associated with Santa Fe will probably be at the higher end of the real estate market, which brings its own unique demands and expectations from adjoining landowners.

Land Status and Boundary Management

Title Claims

The magnitude and complexity of the title claims challenge on the Santa Fe NF is truly unique and is difficult to quantify. Old internal notes have stated that if the agency were somehow able to satisfy every claim made on NFS lands, we would have to give away the Forest two to three times over. These claims range in size from landscape-sized pueblo and land grant claims to individual claims only a few acres in size.

The pueblo and land grant claims in particular have complex cultural and economic components that make them particularly challenging to comprehend. Many documents, studies, and books have been written which describe the issues surrounding these claims. Typically, they can only be resolved through a Federal court decision or congressional legislation. Regardless of how the issues are seen, they are a complex mixture of facts, legal interpretations, and perceptions of fairness, traditions, culture, and emotion.

Two valuable reports which characterize the Spanish and Mexican Land Grant Title Claim problem are the “Treaty of Guadalupe Hidalgo, Findings and Possible Options Regarding Longstanding Community Land Grant Claims in New Mexico” (Sawtelle, Kasdan et al. 2004), and the “Report to the New Mexico Attorney General – A Response to the GAO’s 2004 Report – Treaty of Guadalupe Hidalgo: Findings and Possible Options Regarding Longstanding Community Land Grant Claims in New Mexico” (King 2008). These reports demonstrate just how complicated and controversial the topic of title claims is. Two governmental entities—one Federal, one State, both entrusted to fairly represent the citizens they work for—reached dramatically different interpretations and conclusions on the same subjects.

Smaller more individualized claims often involve long-term unauthorized occupancy and are justified through oral history, but usually lack definitive documentation. This leaves the Forest with few if any tools to resolve problems, which in turn requires someone to take legal action against the United States in order to gain resolution. This is typically not economically feasible for most private landowners, and the common result is a perceived stalemate in reaching a conclusion, and a reinforced bitterness toward the Agency.

Encroachments in General

The Santa Fe NF estimates the size of the encroachment problem between NFS and private lands at about one encroachment for every linear mile of boundary on the Forest. The Santa Fe NF has approximately 2,000 miles of linear boundary between NFS and private lands. Therefore, it can be assumed we have

about 2,000 encroachment problems, many of which are unknown and unidentified. As development within WUI expands, and Forest resources continue to decline, encroachment problems will only grow and become more difficult to manage.

Other Boundary Issues

The Forest has a backlog of incomplete boundary surveys for our congressionally designated areas such as Wilderness areas and Wild and Scenic River Corridors. This lack of precisely identified boundaries impacts management decisions and enforcement actions. Imprecise boundary location has resulted in the Forest mistakenly implementing projects on private lands. Law enforcement officers on the Santa Fe NF have been put in the position of having to defend their jurisdiction, when faced with unexpected boundary questions. This can jeopardize enforcement actions necessary to protect resources such as congressionally designated areas, and Travel Management regulations. There has been interest in the Forest completing these boundary surveys, but there are complications to doing so. Interpretation of congressional intent can be challenging, particularly when geographical features are used to delineate the boundaries. These features can shift (like rivers), move (like roads), erode or slide (elevations), all of which make completing these surveys lengthy endeavors for Forest Service survey teams.

Use and Occupancy of National Forest Lands

The direct and indirect value and influence of NFS lands for delivering goods and services is critically important to the public at local, regional, national, and even international levels. Utility corridors accommodate high pressure natural gas pipelines for industrial, commercial, and domestic purposes; high-powered transmission lines for interstate transfer of electricity; as well as distribution lines for power delivery to local homes and businesses. Communication sites accommodate rapidly evolving wireless technology, while at the same time providing critical radio communication for safety and security needs.

An evolving situation affecting local utility companies has the potential to indirectly and directly affect management of NFS lands. Currently, local utility companies are being forced into negotiating right-of-way terms and conditions that require compensation in excess of market value. This is beginning to cause increased demand for alternative routes across NFS lands. This trend may increase and expand in the near future. The Bureau of Indian Affairs is proposing revisions to their regulations (Code of Federal Regulation Title 25, Part 169), which would expand the ability of tribes and pueblos to request compensation in excess of market value for all forms of linear rights-of-way for both new applications as well as reauthorization of existing uses. If adopted as currently proposed, the new regulations would apply to all applicants and entities, including State and local governments, as well as other Federal agencies, for all forms of rights-of-way.

Power Transmission Lines

Currently, only one 345kV power transmission line of significance crosses the Santa Fe NF. This is along the SH#96 east-to-west corridor on the Cuba and Coyote Districts. The rest of the power transmission lines are smaller 115kV lines. Over the past few decades, we have had an additional major corridor proposed several times, in several ways. The primary obstacle to the proposal has been a requirement to receive authorization from the New Mexico Public Regulatory Commission. Originally referred to as the “Ojo Line Extension,” the initial proposal was for a 345kV line, extending between an existing 345kV line northward to 345kV line that crosses the Forest. The current terminus of the 345kV line is at the Norton Substation, just outside of Santa Fe on BLM land east of the Caja del Rio mesa. At present, it is unknown what, if any, future plans may exist, but the number of past proposals indicates the Forest should further investigate future potential.

Oil and Natural Gas Transmission Pipelines

In this portion of the assessment, these pipelines are being discussed separately from those necessary to move unprocessed mineral resources from oil and gas production facilities authorized on or near NFS lands, which are addressed in chapter 9.

We have no knowledge of any newly proposed pipelines across Santa Fe NF lands. We have one existing high pressure natural gas transmission line which leads from the Cuba, New Mexico, area, south and east to Los Alamos, New Mexico. This line is old and needs significant ongoing repair and replacement.

Communication Sites

The current Forest Plan was amended in February of 1990, to identify 11 communication sites as being compatible for low power administrative, government, and/or commercial electronic use. There is only one site (Peralta Ridge) currently identified as suitable for high power commercial installations—which are typically high power radio and television broadcast. Another site (Pajarito Peak) is identified and established for exclusive use by the Department of Energy/Los Alamos National Laboratory. According to this plan amendment, any new sites must be recommended to the Regional Forester for approval, requiring another Forest Plan amendment for any expansion on the Forest for either administrative or commercial use.

Since 1990, radio and wireless technology has evolved at an extraordinary rate. In that time no new studies have been done to determine if new communication sites should be added to the Forest. Further, we have low power sites identified for commercial use which may only be suitable for administrative use. Low power sites are defined as being limited to a maximum radio power output of 500 watts of Effective Radiated Power, usually preventing the transmission of powerful FM radio and television broadcasts. Other low power sites have senior users (like the Federal Aviation Administration), which have very little room for interference and limit otherwise compatible uses.

Because of the rapid pace of technological advancement, the high economic value that communication sites represent, the finite number of both low and high power sites, and the significant gap in time since any analysis was conducted, a thorough analysis should be undertaken to see how to best serve administrative and commercial needs, while also protecting natural resource objectives. Industry should be included in this analysis, and it is likely that the expertise necessary to perform the analysis is not available on the Forest and may need to be outsourced or contracted. Some topics like Homeland Security-based requirements and the inherently high risk nature of tower management have never been considered. In other instances, the old Forest Plan still encourages or requires user associations, which do not exist on the Santa Fe NF and have met with limited success nationwide.

Local and Regional Land Use

Regional Context

As part of the assessment process, the interdisciplinary team identified and evaluated the plans of the counties and other governmental entities, including Land Grants and tribes and pueblos (see Natural Heritage Area section), adjacent to the Santa Fe NF (figure 34, page 136). The following section examines the context of the counties from a planning perspective.

The counties on the southern end of the Santa Fe NF include the most populous and fastest growing areas of the region—the growth and development associated with the Albuquerque metropolitan area is a significant influence on the southern part of the Santa Fe NF region. Sandoval County, in particular, has had significant growth. Santa Fe County’s growth rate is lower but the population is already the region’s

highest. Mora, San Miguel and Rio Arriba Counties retain their predominantly rural economy and character, and Los Alamos County, location of the Los Alamos National Laboratory provides a unique economic driver in the center of the region. For more information on the demographics for this area please refer to Chapter 3 of this volume.

There is a wide range of different planning and land use strategies in the adjacent counties. The impact of the Santa Fe NF varies throughout the region, with the variation related to the proportion of the county that is NFS land, as well as the different relationships of county economies to areas in Federal ownership. Table 14 on page 67 provides a snapshot of the land ownership breakdown by public, private, and tribal entities for each county within the Santa Fe NF region.

Relative population of areas surrounding the Santa Fe NF is variable and contributes to the diversity of the area (figure 66, below).

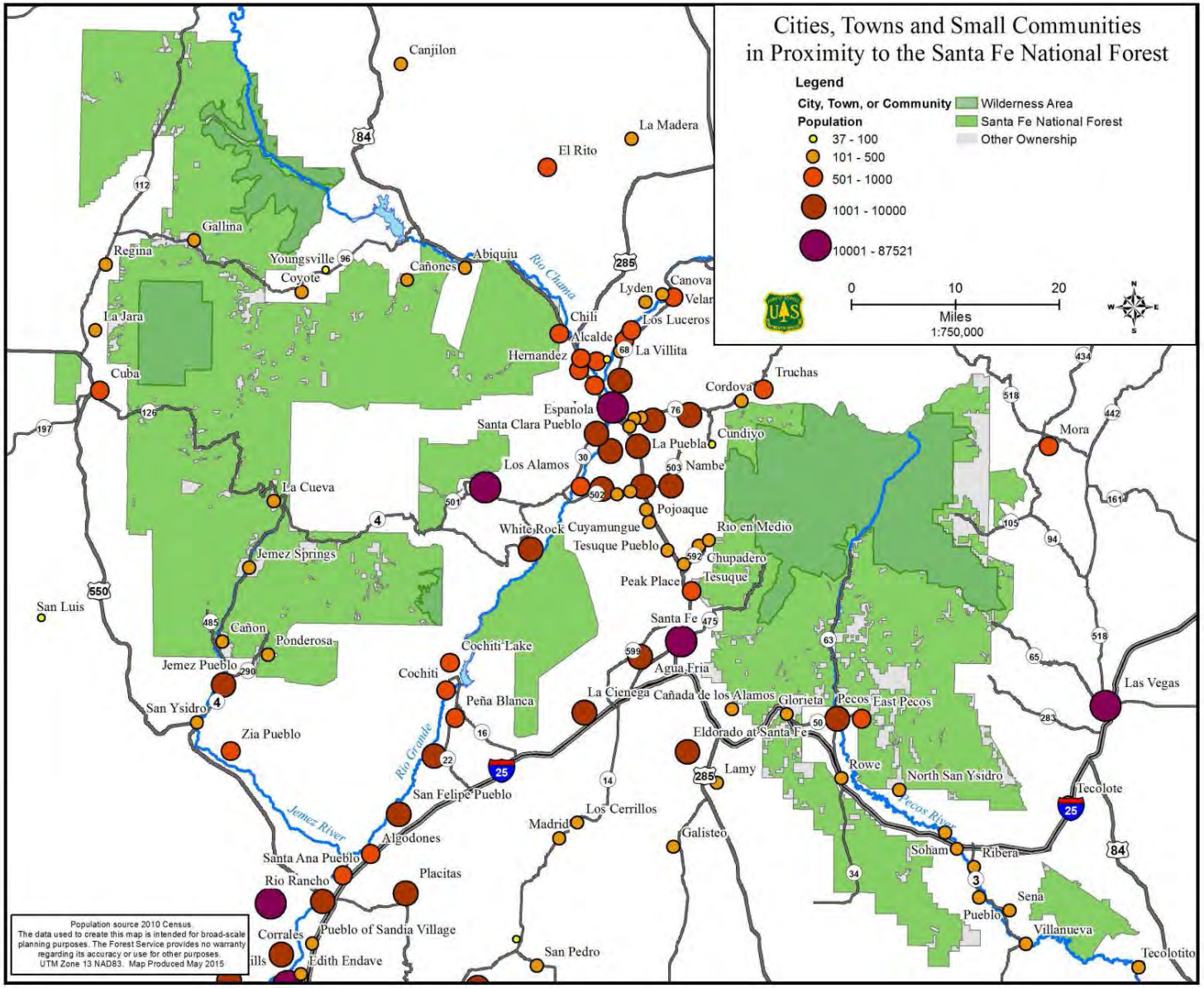


Figure 66. Relative population of cities, towns and small communities near the Santa Fe NF

Sandoval County

Sandoval is the fastest growing county in the region. The high growth areas are in the southeastern area of the county, adjacent to Bernalillo County and in the Albuquerque metropolitan area. Approximately 471,000 acres of the Santa Fe NF are located in the northern, rural portion of the County.[12]

The Sandoval County Comprehensive Plan, approved in 2002, recognizes the need for active communication with the Santa Fe NF on a variety of land management issues. The County is developing specific area plans to augment countywide planning direction; two of these border the Forest. A new plan is anticipated to be completed in mid-2015 for the Rio Rancho Estates area in the southern end of the county. An area plan has already been completed for the Jemez Valley, adjacent to the Santa Fe NF.

Jemez Valley Area Plan

The Jemez Valley Area Plan (JVAP) was developed in 2007. The Jemez Valley is located on the edge of the Valles Caldera National Preserve and has a diverse landscape that includes hot springs and scenic mountainous topography. In 1997, the Jemez Valley corridor received National Scenic Byway Status (known as the Jemez Mountain Trail National Scenic Byway) from the Federal Highway Administration in recognition of its unique scenic value. (Sandoval County 2007).

The JVAP is some of the most relevant of Sandoval's planning policies to the Santa Fe NF. The JVAP includes an analysis of existing conditions and general direction for land use in the area. A key sustainability concern was for the continuation of the local school district, with population growth expected primarily in the second home/retiree category. Creating local jobs was emphasized as a way to retain younger, year-round families, and the county looks to the resources of the national forest as a clear connection to this goal. Plan policies also include protections for irrigated lands and for scenic quality.

Other major land management issues in Sandoval County related to Santa Fe NF:

ATV park/network in proximity to Rio Rancho

Interest in ATV/ORV opportunities on the Santa Fe NF was extensively discussed during Travel Management planning (2012 decision). Sandoval County staff is interested in coordinated planning for an ATV park/network in an area closer to Rio Rancho on Sandoval County land. (July 31, 2014 meeting between Sandoval County and Forest Service planning staff).

Southwest Jemez Landscape Restoration Project

The Forest Service, Valles Caldera Trust (now disbanded), New Mexico Forest and Watershed Restoration Institute, and The Nature Conservancy have partnered to lead a collaborative planning process to develop a cross-jurisdictional landscape-scale forest restoration strategy. Adjacent land managers have joined in as key collaborators in developing this strategy, including Pueblo of Jemez, Pueblo of Santa Clara, Bandelier National Monument, and Los Alamos National Lab. There are over 30 other key collaborators including government agencies, conservation and wildlife groups, ecological research scientists, and individuals interested in restoring these lands.

The 210,000-acre project area comprises the upper Jemez River. Largely located in Sandoval County, it includes 89,000 acres within the Valles Caldera National Preserve, 110,000 acres within the Santa Fe NF, and 14,000 acres on nearby State, private, and Jemez Pueblo lands (figure 67). Local wood products industry jobs are one of the expected results of this collaboration.

[12] Forest Plan Revision Team provided a presentation to the Sandoval County Commission on July 31, 2014. In addition, a meeting with the County's planning staff was held on July 31, to discuss the County's land use plans and issues.

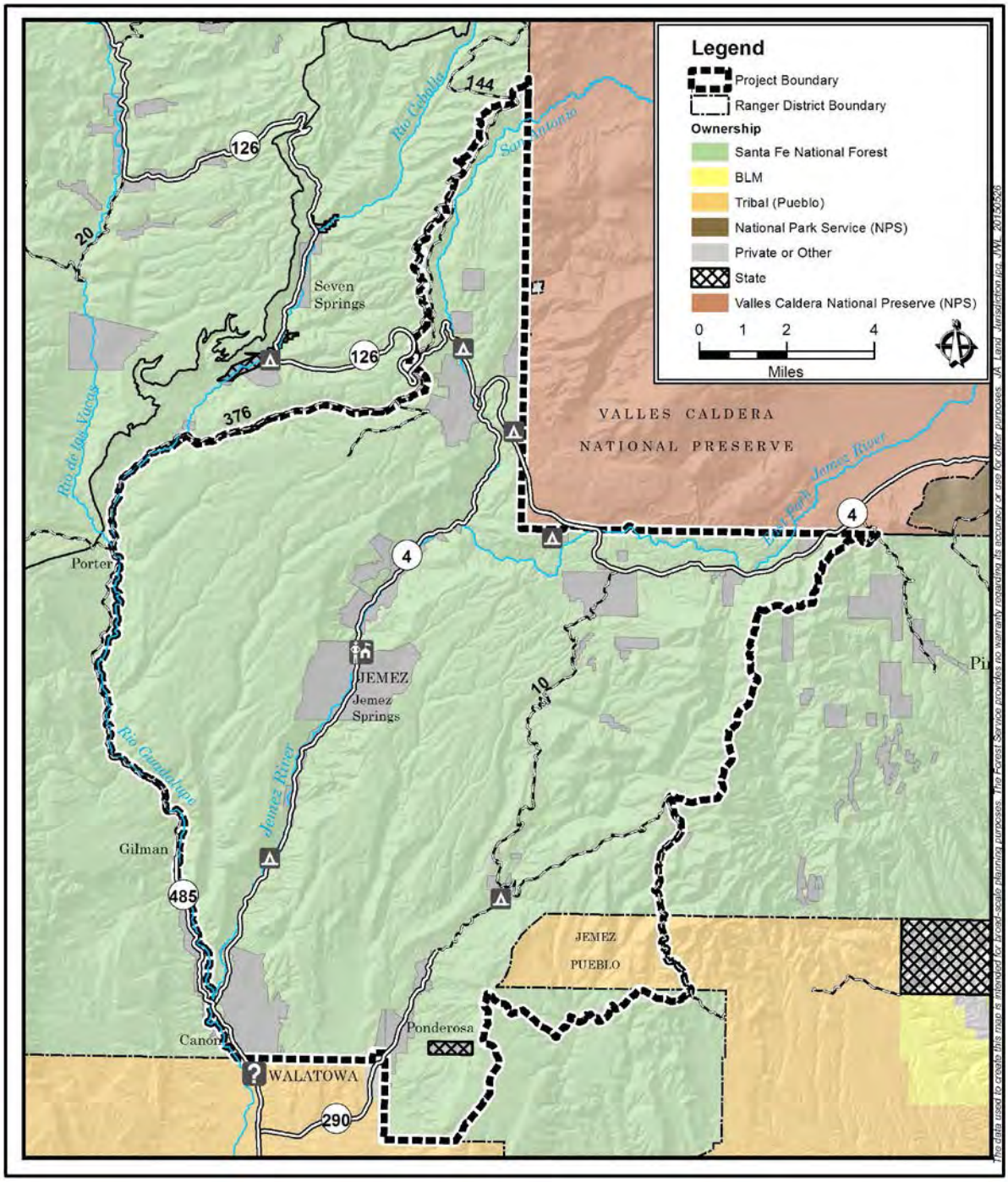


Figure 67. Location and extent of the Southwest Jemez Restoration Project, showing the land ownerships involved

Santa Fe County

Santa Fe County includes the major population centers of the Santa Fe NF region—the city and environs of Santa Fe as well as a portion of Española.

The 2010 Sustainable Growth Management Plan (SGMP) is a comprehensive revision and update of the Santa Fe County Growth Management Plan (General Plan) adopted in 1999 (Santa Fe County 1999).

Santa Fe County delineated four growth management areas (GMAs) as part of the planning process (figure 68). NFS lands comprise 25 to 30 percent of the El Norte and El Centro GMAs (table 46).

Table 46. Population growth rates in Santa Fe County by growth management area

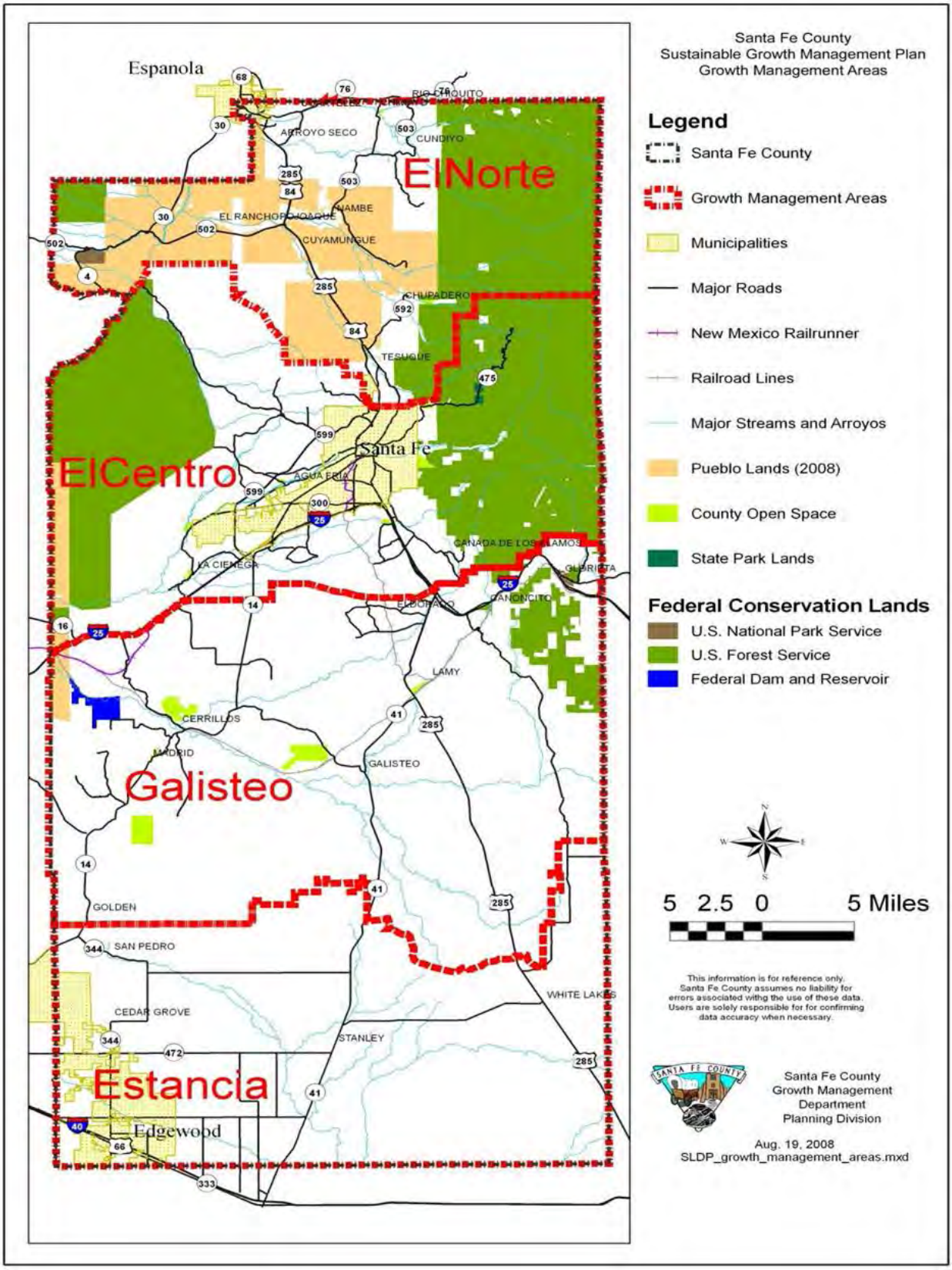
	2000	2005	2010	2015	2020	2025	2030	Change (2010-2030)	Percent Change (2010-2030)
El Norte	16,778	17,516	18,254	19,047	19,876	20,739	21,495	3,241	17.8%
El Centro	14,933	18,465	21,341	25,413	29,592	33,908	37,730	16,389	76.8%
Galisteo	12,522	13,942	14,640	15,805	17,022	18,278	19,387	4,747	32.4%
Estancia	9,121	9,566	10,023	10,554	11,110	11,686	12,190	2,167	21.6%
Total Incorporated	76,572	82,042	87,615	93,182	98,914	104,845	110,074	22,459	25.6%
Total Unincorporated	53,354	59,489	64,258	70,819	77,600	84,611	90,802	26,544	41.3%
Total County	129,926	141,531	151,873	164,001	176,514	189,456	200,876	49,003	32.3%

Source: Economic Profile System-Human Dimensions Toolkit (EPS-HDT; headwaterseconomics.org /eps-hdt, September 2014).

Two important land use issues noted in the SGMP relate directly to population trends and dynamics and their effects on area ecosystems:

Land Use Key Issue # 1. *Population growth and increasing competition for diminishing natural resources.* Santa Fe County is reaching a critical point with regard to population growth and land consumption and there is a need to direct future growth to appropriate areas which can be served in a sustainable manner (SGMP p. 27).

Land Use Key Issue # 11. *Lack of coordinated regional land use planning.* There is no forum or established organization for veritable regional land use planning. There are seven adjacent counties that share or experience many of the same land use problems. The counties working together could address many of the issues and create solutions (SGMP p. 28).



Source: Santa Fe County Sustainable Growth Management Plan, 2008.

Figure 68. Santa Fe County growth management areas

The County's plan also notes the economic value of tourism. Ecotourism, considered tourism activities that consciously reduce their environmental impact, is the fastest growing segment of a $699 billion dollar tourism industry. Because of favorable climate and abundant outdoor recreation opportunities, ecotourism is recognized in the SGMP as a fast growing and important economic development component for the County in the near future, provided that it "fits" with environmental and community constraints (SGMP p. 66).

A plan goal (SGMP p. 114) is to coordinate with private landowners, public and private entities, and Federal land managers in the County to identify and map open space corridors and areas. Policies and strategies are outlined to establish interconnected regional trails systems and opportunities across different ownerships.

San Miguel County[13]

San Miguel County retains its largely rural economy and character and has experienced very little growth pressure. The San Miguel County Comprehensive Plan, adopted in 2004, describes high value for its rural heritage, economy, and setting, and includes multiple policies designed to protect those values. The land use policies most relevant to the Santa Fe NF relate to land development near open space and scenic corridors.

Federal and State Protected Open Space and Scenic Corridors:

These lands have scenic, recreational, environmental, and cultural values that San Miguel County will protect by approving only low-impact residential and small-scale commercial uses adjacent to them, and by requiring that substantial, naturally landscaped setbacks and buffers be maintained on private lands adjacent to these protected lands and scenic corridors. (San Miguel County 2004).

Other Land Management Issues:

There is ongoing consideration of an ordinance limiting oil and gas development to areas west of I-25.

Watershed protection is of particular concern in the Pecos, Las Vegas, Upper Pecos Wilderness, and Gallinas watersheds. County fire officials expressed interest in coordinating on community fire planning and thinning projects.

County Commissioners have expressed strong interest in continuing involvement in the Santa Fe NF planning process, noting particular interest in the wilderness inventory and evaluation stage. The County continues to support community use of Santa Fe NF lands for fuelwood and range.

Mora County[14]

Mora County has the smallest population of all the counties in the Santa Fe NF region (4,800) and lost about 6 percent of its population between 2000 and 2012. The County's comprehensive plan was first developed in 1994, revised in 2009, and is strongly focused on preserving its mixed-agricultural economy and traditional culture. The county values 'stability through diversity' and

[13] Forest Plan Revision Team requested a meeting with San Miguel County's planning staff that was held on August 4, 2014, to discuss the County's land use plans and issues. The Forest Plan Revision Team provided a presentation to the County Commission on September 9, 2014.

[14] Information regarding Mora County planning policies is taken from the current plan and does not reflect information that may be gathered directly from County planners in the future. County staff were unable to meet with Forest Service representatives during the July/August meeting timeframe.

the plan recognizes that diversity even at the level of individual household economics (Mora County 2009).

The plan notes that "[t]here 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."

Two specific goals are most relevant to the Santa Fe NF. Goal 7, "We will achieve a sustainable forest ecosystem," includes policies and strategies designed to create stronger collaborative efforts at learning effective ways to utilize the resources and ecosystems of public lands and to monitor impacts to assure ecosystem integrity is protected for the long term. The Mora Research Center, the Mora Forestry Center, the Soil and Water Conservation District, and State Forestry are all included as valuable contributors to partnerships with the Santa Fe NF. Goal 21, "County government should foster open and effective channels of communication" includes policy charging county representatives with taking the lead on establishing vital links with Federal agencies.

Los Alamos County

Los Alamos is geographically the smallest county in the Santa Fe NF region, but has the largest proportion of their county in Santa Fe NF. Its economy has long been dominated by the Los Alamos National Lab, resulting in unique community dynamics and population characteristics. After experiencing reductions in personnel at Los Alamos National Lab in the 1990s, the County has been focused on diversifying its economy while retaining its strong focus on the lab.

The county's plan was developed in 1987, and a plan update is anticipated in the next year or two (Los Alamos County 1987). Key county land use goals and interests were provided by county staff.[15] The largest land use issue relates to economic diversification. Enhancing the recreation potential for Los Alamos County is important, and two strategies are under consideration with the County: year-round development (non-FS) partnership at Ski Hill and a mountain bike trail system (35 miles) to be coordinated with the Santa Fe NF. These recreation resources are noted as a potential anchor that would support economic expansion of the recreation sector.

Finally, fuels management is an ongoing concern with Los Alamos County, particularly in the wake of the Las Conchas fire of 2011 and Cerro Grande fire of 2000, which threatened the city of Los Alamos and impacted a large portion of county land. Further, watershed planning is anticipated as a shared concern and activity.

Rio Arriba County[16]

Rio Arriba County is the largest county in New Mexico—at 5,895 square miles, it comprises 5 percent of the state's land, and by population it is the third largest after Santa Fe and Sandoval Counties. Unlike Santa Fe and Sandoval, however, Rio Arriba is predominantly rural in character and its comprehensive plan reflects the County's commitment to its traditional agricultural heritage. The County's plan reflects the focus placed on the value of people's relationship to the land as a defining element of the economy and culture.

[15] The Forest Plan Revision team met with Los Alamos County staff on August 6, 2014, to discuss County planning direction.

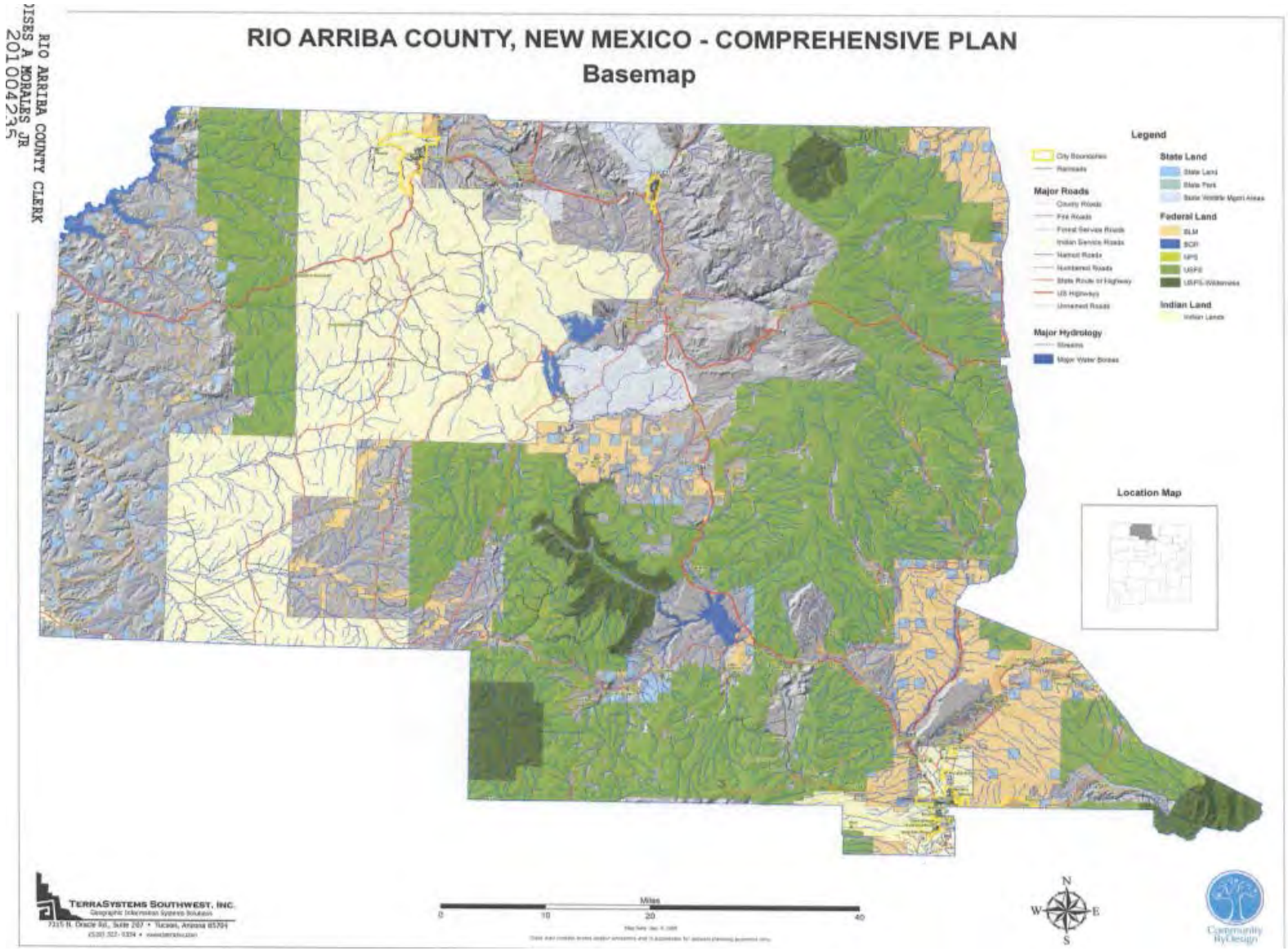
[16] The Forest Plan Revision team met with the Chairman of the County Commission, the County Attorney, the Planning Director and staff and staff from the County Administrators office on August 6, 2014, to discuss Rio Arriba County's plan policies and the Santa Fe NF plan revision process.

Over 78 percent of Rio Arriba County is held in public ownership by Federal, State, local or tribal entities, posing unique planning issues (figure 69).

Of the 22 percent of Rio Arriba County land base not in Federal ownership, 5 percent is irrigable agricultural land. There are 271 acequia associations and 80 incorporated towns/villages, and many communities rely on mutual domestic water supply. The County's terrain varies from mountainous to desert, and communication across this large rural landscape can be challenging as broadband access varies considerably throughout the County (Rio Arriba County 2009).

County planning staff notes that community planning addresses growth management and focuses on protecting the agricultural-oriented economy and culture. The county's comprehensive plan was first developed in 1995 (Rio Arriba County 2009). An initial issue was the closure of nine landfills and development of a regulated landfill. The new landfill has costs and the county continues to refine the management system to ensure financial sustainability

In addition, growth management/economic development is challenging because the county has management authority over only a small amount of the county land and a commitment to open space, and county planning has focused on ensuring compatibility of land uses. There is no industrial land base, in part because of water issues. The U.S. Army Corps of Engineers has a great deal of impact on water resources but from the county's perspective, there has not been adequate planning that addresses county needs, including flood mitigation. Energy development (oil and gas) is occurring in the western portion of the county and as it moves east, county staff expressed concerns about water quality impacts. The land management environment is complex with many split estates.



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Source: Rio Arriba County Comprehensive Plan

Figure 69. Ownership pattern in Rio Arriba County

The county is active in the planning arena, and over 30 planning initiatives are under way. County officials and staff provided a contextual overview of county goals and concerns at a meeting on August 6, 2014, and the following key points were provided:

- The County is challenged by a limited land base. Land grant losses have influenced how people relate to the Federal Government. Even the changing nomenclature of place has had an effect on the relationship of people to land.
- Rio Arriba County includes historically self-sustaining communities that rely on agriculture. There is a great deal of traditional knowledge that could be of significant value to the Forest Service.
- A healthy ecology is an indisputable goal for all.
- Educating people throughout the region about the cultural past and present is needed to help balance recreation and restoration goals.
- Opportunity to improve human relationships to the landscape:
    - Grazing can be a productive part of restoration needed after heavy impacts from 1990's logging boom. Restoration strategies in the forests need to consider aquifer recharge.
    - Traditional economies related to the national forests need to be carefully considered; grazing communities are based on a kinship system.
    - Agricultural opportunities are limited at present; while often part-time, traditional agriculture bolsters the relationship of people to the land—a key forest planning goal.
- Need to develop access for the local beef market. No facilities are available.
- Impacts to all lands from fracking are of concern.
- Other opportunities for engagement:
    - Elk management to reduce impacts to grazing permittees
    - Restoration to reduce fire risk and protect water quality
    - Improving dialogue
    - Opportunities to strengthen work with schools to increase sustainability of small communities
    - Strengthening relationships with acequia associations; for example, NEPA review of repair projects is a significant hindrance in some cases.

The current comprehensive plan was adopted in 2008 (amended in 2010), and plan policies that may relate to the Santa Fe NF include the following:

Goal 1: "Connection between working relationship between land and water" includes a strategy for collaboration on restoring and managing agricultural lands.

Goal 3: "Encourage property owners located in Critical Management Areas to be designated and mapped in this plan to manage, reclaim, and enhance these areas." Strategies include interagency and private landowner collaborations to map and effectively protect Critical Management Areas (CMAs) for rare plants.

Goal 4: “Protect region’s water supply and quality by maintaining natural function of the land and pursuing funding for watershed studies” includes a strategy to educate responsible parties (including the FS) about CMA protective standards.

Goal 5: “Work with private property owners, Federal and State agencies to restore existing rangeland and encourage management of wildlife.” Reclaiming and restoring rangelands and wildlife habitat, including unused roads, and improving management of elk and wild horse populations are specific strategies.

Land Grants

The description and history related to New Mexican land grants is provided in the Context and Historical Occupation and Use section of chapter 1. Some land grants are now recognized as units of local government by the State of New Mexico and have the authority to plan and zone lands within the land grant boundary.

Spanish and Mexican community land grants-mercedes that are governed by the General Provision found in §49-1-1 NMSA 1978 have the authority to zone their common lands provided that they develop a comprehensive plan that is approved by the Department of Finance and Administration Local Government Division. Zoning authority allows the land grant-merced to establish the appropriate land use for the development of the common lands apart from any land use restrictions established by the county or local municipal government (http://www.nmlandgrantcouncil.org/resources/governance-resources/guidebook/planning-zoning/).[17]

The San Joaquin De Chama Land Grant has developed a comprehensive management plan covering the management of: riparian habitat, threatened and endangered species, agriculture, camping, fishing, boating, mining, grazing, cultural resources, logging, and fire suppression. The land discussed in this plan is part of the Santa Fe NF, so the management plan does not actually govern management on these lands. Rather, it provides a starting point for discussion with the Grant Association about their desire for management.

The Northern Rio Grande National Heritage Area

In 2006, legislation establishing the Northern Rio Grande National Heritage Area (NHA) was signed into law. This NHA includes Rio Arriba, Taos, and Santa Fe Counties (approximately 10,000 acres). Within the heritage area, boundaries are many significant historic sites and a cultural landscape that reflects long settlement of the region. These include the Taos Pueblo—a World Heritage Site—and other American Indian and Spanish Colonial places designated as National Historic Landmarks, listed in the National Register of Historic Places, and/or the New Mexico State Register of Cultural Properties (http://www.riograndenha.com).

Congress recognizes NHAs (a National Park Service program) as places where natural, cultural, and historic resources combine to form a cohesive, nationally important landscape. NHAs take a large-landscape approach that includes active communities, a multidisciplinary emphasis, and community-based coordination to support historic preservation, natural resource conservation, recreation, heritage tourism, and educational projects. Each NHA is supported by a non-profit organization that supports community driven initiatives that connect local citizens to the preservation and planning process. Since

[17] The New Mexico Land Grant Council is an agency of state government administratively attached to the New Mexico Department of Finance and Administration. It was founded in 2009 by statute and provides support to 24 land grants-mercedes in New Mexico recognized as units of government (political subdivisions of the state). It also serves as a liaison between mercedes and other state agencies and the Federal Government. The Council consists of five members appointed by the Governor.

the inception of the NHA program in 1984, Congress has recognized 49 heritage areas (http://www.nps.gov/norg).

The Northern Rio Grande NHA was recognized for its quilt of living cultures and traditions, including the Jicarilla Apache Nation, eight Northern Indian Pueblos, descendants of Spanish Colonial settlers, and more recent arrivals from various heritages. The NHA comprises a unique mosaic of Native American and Spanish Colonial architecture, languages, traditions, and land use set in remarkable scenic and cultural landscapes (http://www.fourcornersgeotourism.com).

The Northern Rio Grande National Heritage Area, Inc., a non-profit corporation chartered in the State of New Mexico, serves as the local coordinating body for the heritage area. It guides heritage area activities and is charged with carrying out the purposes of the authorizing legislation, including preparation and implementation of a comprehensive management plan in consultation with affected communities, local organizations, tribal and local governments, and the general public. The Board of Directors for the management entity includes representatives of the State of New Mexico; the counties of Santa Fe, Rio Arriba and Taos; tribes and pueblos within the heritage area; the cities of Santa Fe, Española and Taos; and members of the general public.

Input Received at Public Meetings

This section summarizes input, perspectives, and feedback relevant to this assessment topic and received from the public between April and July 2014. Input was gathered from 14 public meetings as well as forms available at all Santa Fe NF offices and online.

Status and Ownership

Some participants have recreational residences on the Forest, or a forest inholding. One participant in Las Vegas built a cabin in the area and has being going there with his family every year for decades. It provides him with a chance to recuperate from the world. The cabin is priceless to him. A participant in Rio Rancho talked about going to La Cueva every summer and building a cabin there with his father. He has memories of those times linked to certain spots in the forest.

In Mora, some participants discussed how the influx of wealthy people from out of town coming in and buying land in the area impacted them. These new landowners are perceived as being less tolerant of straying cows than local neighbors in the past.

Individuals and communities surrounded by the Santa Fe NF expressed heightened awareness and fear of impacts from fire in the Forest. Participants in Los Alamos stressed the need to thin the forest around them to prevent wildfire from encroaching into their town. One participant shared that his/her house was the only one left standing in a three-block radius after the Las Conchas Fire. Participants in several other communities, including Mora and Pecos, stressed the fear of fire on neighboring Santa Fe NF land.

The openness and availability of large chunks of open land is a key value for many participants. The idea of encroachment of communities into forest lands in terms of watersheds and safety was a general topic of discussion as well, as was increasing pressure from population growth around the forest.

Several participants stressed the importance of coordinating the forest plan with other county, State, and Federal land management agencies. A participant in Los Alamos emphasized the importance of coordinating in terms of fires and safety.

Use and Access

The Santa Fe NF shares borders with communities that need to access the forest for traditional uses. Several participants in Cuba, Abiquiu, Mora, and Pecos have observed that they now have less access to carry out these activities. Access is decreased due to restrictions on some activities (like collecting firewood), closures of roads and trails, and establishment of wilderness areas. For instance, acequia officials in Mora talked about the difficulty of going into the wilderness to maintain acequia structures for the community. One attendee in Abiquiu simply said “we cannot support new wilderness here.” A member of one of Santa Fe NF’s neighboring land grants said that “access to the forest has changed for the [land grant] heirs.”

Access is also important to recreationalists. While many participants have noticed a trend toward less access, others have observed that the forest is more open. For those seeing less access, there are particular roads and trails that have closed, or are not maintained. Lack of road and trail maintenance equates to lack of access. Overall, it seems that accessibility to the Forest and its resources varies by location and by the type of activity or use. Some participants stated that access to the Forest is good, but for others lack of access or diminishing access was the central concern.

Attendees also discussed access for the elderly and disabled. In Pecos, one participant discussed how the elderly can’t access the forest as they could before. In Rio Rancho, one of the main themes identified was the importance of access for the disabled. A parent there highlighted that she “appreciated being able to take her developmentally disabled child into the mountains where she can see the deer and the hummingbirds.”

Chapter 9. Renewable and Nonrenewable Energy and Mineral Resources

This assessment identifies and evaluates available information relevant to the plan area for renewable and non-renewable energy and mineral resources. The assessment addresses:

Whether the plan area has potential for energy sources such as: wind, solar, coal, oil, or natural gas

Summary information on existing energy transmission corridors and potential need for new corridors

The presence of nonrenewable mineral resources which include locatable mineral deposits, leasable minerals, and mineral materials

Energy and mineral resources provide ecosystem services that are important to people in both a local and, in some cases, regional or even global scale. They are important provisioning and cultural ecosystem services provided by the Santa Fe NF lands. The condition and trends of mineral and energy/fuels and their contribution to the plan area and beyond are addressed below.

The Forest Service maintains a national memorandum of understanding (MOU) with the Bureau of Land Management (BLM). In addition, the Southwest Region is part of a state-wide MOU with BLM regarding the coordination of locatable/salable mineral resource administration in concert with the State Mining and Minerals Division (USDA Forest Service and BLM 2010). The Santa Fe NF also coordinates with the New Mexico Oil Conservation Division on oil and natural gas administration, and uses the national MOU with BLM on geothermal resource administration.

The Forest Service Handbook identifies six types of relevant information included in the evaluation for this assessment:

1. Current type and extent, and general location of energy and mineral activity and energy facilities in the plan area
2. Potential of the plan area for energy and mineral activity
3. Trends that affect energy and mineral activity
4. Known abandoned mines or mining-related hazards in need of reclamation
5. Existing energy transportation corridors and the potential need for new transmission corridors
6. Contributions of energy and mineral activity in the plan area to social, economic, and ecological sustainability

Further, this assessment will include the following relevant information:

1. How energy and mineral resources provide ecosystem services
2. Assessment of geologic resources and hazards

The likelihood for energy and minerals activities within the plan area is based not only on the geologic presence of a mineral, but the type of mineral and the specific laws regulating legal access to the mineral.

For the purposes of Forest Service minerals administration there are three land statuses:

- Public Domain Lands (as defined in 43 Code of Federal Regulations (CFR) §3000.0-5 (g)) means lands, including mineral estates, which never left the ownership of the United States, lands which were obtained by the United States in exchange for public domain lands, lands which have reverted to the ownership of the United States through the operation of the public land laws and other lands specifically identified by the Congress as part of the public domain. The minerals associated with public domain lands are administered under 36 CFR §228.
- Acquired Lands (as defined in 43 CFR §3000.0-5 (h)) means lands which the United States obtained by deed through purchase or gift, or through condemnation proceedings, including lands previously disposed of under the public land laws including the mining laws. Acquired lands are not open to the location of mining claims; however, they are open to leasing and the disposal of common variety minerals under 36 CFR §228. Minerals which are subject to location on mining claims on public domain lands are subject to leasing on acquired lands.
- Split Estate occurs when the surface ownership is different than the mineral ownership.
    - The Federal government may own the surface but not the mineral estate. This generally occurs under acquired lands. If within a Proclaimed Forest, the Forest Service administers the surface, with the minerals being administered under either 36 CFR §251.15 or state law depending upon who owns the mineral estate.
    - The Federal government may own the mineral estate, but not the surface. This is commonly the case under lands disposed of under the various homestead laws. The Bureau of Land Management always administers the mineral estate in these cases, regardless of whether the lands are inholdings within a Proclaimed Forest.

For locatable minerals, access is already legally determined, or, for leasable minerals, may only be fully determined through an area-specific NEPA process. The interplay of several factors determines whether the minerals activity is discretionary or non-discretionary on the part of the Forest Service. It is essential to know the class of mineral resource and the land status of the area in order to identify whether a legal right to the mineral resource may already exist.

Before beginning the assessment, it is important to detail how all Federal minerals (which include energy resources) are administered as falling into one of three categories: locatable minerals, leasable minerals, or mineral materials. Each of these categories of minerals is administered under separate laws and regulations, and each requires a different means for the public to obtain these resources.

Three Classifications of Minerals

- **Locatable minerals** are, in general, the hardrock minerals mined and processed for metals (for example: gold, silver, copper, uranium, and some types of non-metallic minerals). Rare earth elements are also locatable minerals. These are called “locatable” because they are subject to mining claim location under U.S. mining laws.

  All public domain lands are available for locatable mineral entry under the 1872 Mining Law (as amended), unless the lands are withdrawn from mineral entry (and, in such case, they are not available for mineral activities). Withdrawn lands include: congressionally withdrawn areas, such as a wilderness, and administrative withdrawals, such as a campground area or administrative sites.

  Other than withdrawn areas, all of the lands on the Santa Fe NF are open to mining claims for locatable minerals. The public can obtain the right to locatable minerals through the BLM by staking a mining claim according to Federal rules and regulations.

- **Leasable minerals** are, in general, nonrenewable energy resources relevant to this assessment. Leasable minerals are defined by the Minerals Leasing Act of 1920, and include: coal, oil, gas, oil shale, sodium, phosphate, potassium, geothermal and, in New Mexico, sulfur.

  Leasable minerals can include what would usually be considered hardrock (locatable) minerals, if found on lands that have "acquired"[18] status. Leases to obtain leasable minerals are obtained through the BLM, with the consent of the forest to offer these mineral resources. Once a lease is issued, the Forest Service must allow resource extraction (subject to the stipulations in the lease).

- **Mineral Materials/Salable/Common Variety Minerals.** Mineral materials are also known as salable or common variety minerals. These are synonymous terms for the class of minerals that can be sold under a mineral material contract, and are common. These minerals are relatively low value per volume, for example: sand, gravel, cinders, common building stone, and flagstone. Many of the materials are used for road surfacing, boulders, and engineering construction or may be specialty resources such as soil amendments or decorative stone, including flagstone.

  These minerals are typically sold unless used internally, by another government agency, or for ceremonial uses. In these cases, they may be provided free of charge. Issuing a permit for salable types of minerals is discretionary. The plan area contains salable minerals. The demand for the materials, the relative remoteness of the area, and the local economy dictate whether there may be value as a mineral material.

The discretion of the Forest Service to allow mining operations is governed by the United States Mining Laws, including the 1872 Mining Law. The Forest Service has limited discretion regarding the development of locatable minerals on NFS lands. Specifically, the Forest Service cannot categorically deny an otherwise reasonable plan of operation for locatable minerals. *United States* v. *Weiss, 642 F.2d 296 (9th Cir. 1981)* (1981). The Forest Service may return an illegal or unreasonable plan to the claimant with the reasons for disapproval and request submission of a new plan that addresses the issue(s) of concern.

Discretion to allow use is more complex for resources such as oil, natural gas, and geothermal energy. The regulations require that decisions regarding the availability (and therefore suitability) of lands for leasing require a leasing analysis as set forth in Federal regulation (36 CFR 228.102). Court decisions have affirmed that leasing availability decisions must be made with full NEPA disclosure.

[18] *Acquired lands* (as defined in 43 Code of Federal Regulations §3000.0-5 (h)) means lands which the United States obtained by deed through purchase or gift, or through condemnation proceedings, including lands previously disposed of under the public land laws including the mining laws. Acquired lands are not open to the location of mining claims; however, they are open to leasing and the disposal of common variety minerals. Minerals which are subject to location on mining claims on public domain lands are subject to leasing on acquired lands. There are about 253,768 acres of acquired lands within the Santa Fe National Forest.

Renewable and Nonrenewable Energy Resources, Mineral Resources, and Geological Resources and Hazards

Energy Resources

Oil and Gas

Current Condition

Oil and natural gas have been produced from the Santa Fe NF since the 1940s. There are 50 producing wells on the Santa Fe NF within the San Juan Basin, and 198 leases containing 71,101 acres as of December 31, 2013 (BLM 2014). Between October 2012 and September 2013, these leases generated $3,414.00 in rental and $712,796.55 in royalties on produced product (Linden 2014). In 2012 (last complete year figures available), 103,064 barrels of oil and 679,859 thousand standard cubic feet (MCF) of gas were produced from wells located on NFS lands (Go-Tech 2015). In 2002, 90,550 barrels of oil and 959,023 MCF of natural gas were produced (Go-Tech 2015).

A Forest Plan amendment for oil and gas leasing in the San Juan Basin portion of the Forest was completed in 2012 (USFS 2015). This allowed the Forest to process the pending lease requests and will expedite offering future parcels in that area, which may increase production activities.

Forest Potential

The U.S. Geological Survey's National Oil and Gas Assessment maps three provinces with oil and gas potential which include the Santa Fe NF (figure 70).

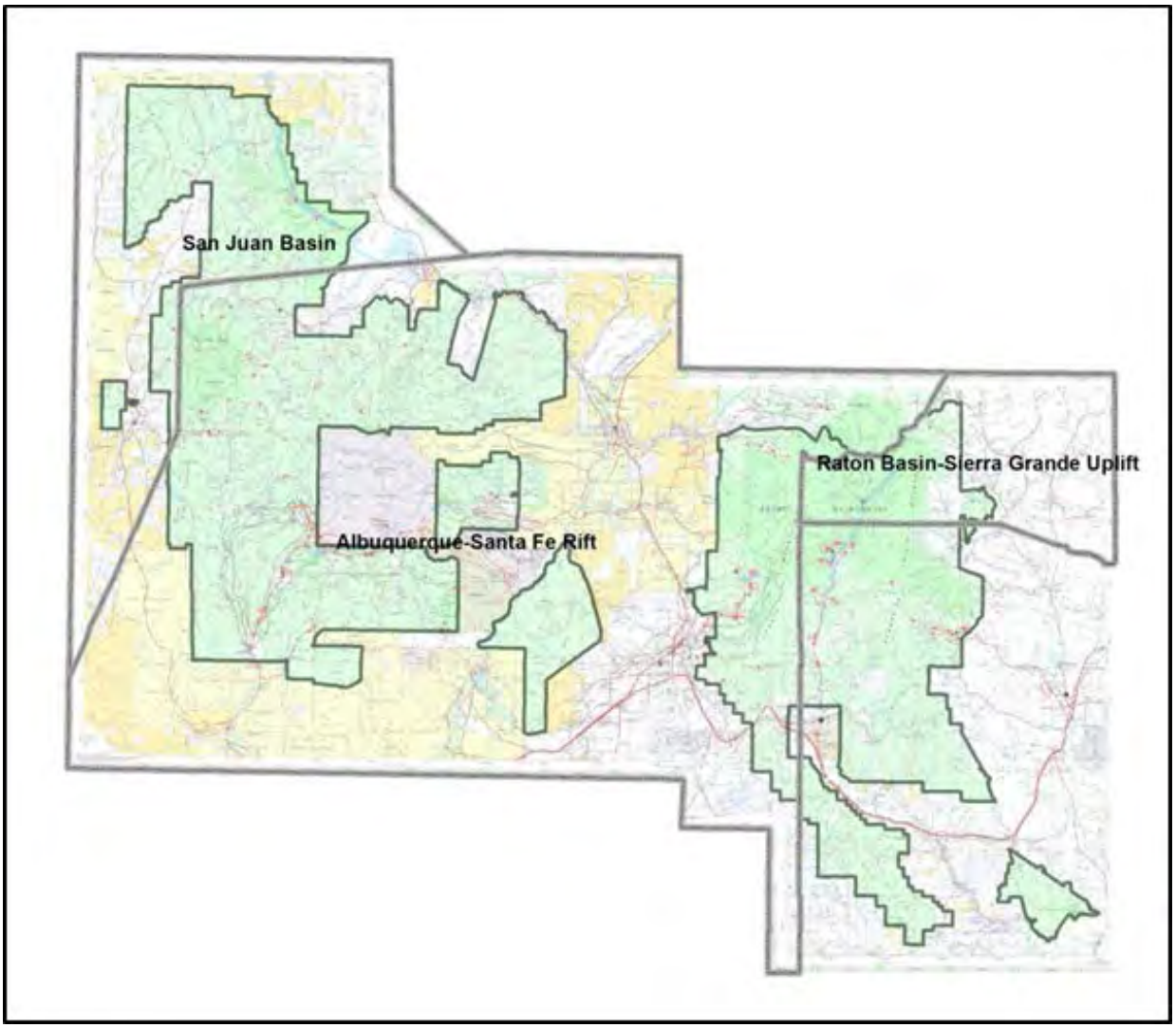

Figure 70. U.S. Geological Survey National Oil and Gas Assessment provinces on the Santa Fe NF

The San Juan Basin has the potential to continue to produce both oil and natural gas for the foreseeable future, but there is no evidence that new discoveries will significantly increase production on the Santa Fe NF (figure 70) (Huffman 1995).

Table 47. Undiscovered oil and gas resource potential for the San Juan Basin summarized from USGS San Juan Basin Assessment Team, 2013

Assessment Unit	Number of New Fields	Oil and Natural Gas Liquids (million barrels)	Natural Gas (billion cubic feet)	Percentage of AU Area on Santa Fe NF
Tertiary conventional gas	5	0.84	79.98	2.35
Mesaverde updip conventional oil	0	2.54	5.56	0.82
Mancos sandstone conventional oil and gas	5	14.29	57.57	1.62
Dakota-Greenhorn conventional oil and gas	4	3.06	13.35	1.26
Entrada sandstone conventional oil	2	2.54	5.56	0.12
Pictured Cliffs continuous Gas	NA	16.92	5,640.25	1.96
Basin Fruitland Coalbed gas	NA	0.00	19,594.74	1.96
Lewis Continuous Gas	NA	30.53	10,177.24	1.88
Mesaverde Central-Basin Continuous Gas	NA	5.27	1,316.79	2.41
Dakota-Greenhorn Continuous Gas	NA	15.72	3,928.98	1.27
Menefee Coalbed Gas	NA	0.00	663.94	0.84

NA = not assessed

The number of new fields in the Continuous Gas and Coalbed Gas AUs was not assessed because it is presumed the gas is evenly distributed throughout the area of the AU.

The Albuquerque-Santa Fe Rift province is divided into three hypothetical plays on or near the Santa Fe NF (Molenaat 1995). From south to north these are the Albuquerque Basin (1.7 percent of the mapped play is on the Santa Fe NF), the Hagan-Santa Fe Embayment (6.4 percent of the play is on the Santa Fe NF), and the Española Basin (16.7 percent of the play is on the Santa Fe NF). Molenaat (1995) indicates there are possible targets for oil and gas, but production has been limited, so undiscovered resources are speculative.

The portion of the Raton Basin-Sierra Grande Uplift province on the Santa Fe NF currently has no production, and the geology is unfavorable for future discoveries of economic resources (Keighin 1995).

Below is a list of drivers that may alter trends in oil and gas development in the Santa Fe NF:

- Production is depleting several of the San Juan Basin oil/gas fields within the Santa Fe NF, so it is unlikely that future drilling will occur within those fields.
- Price of product versus production cost is a major consideration. If the price of the product goes up, then a well with low production may be economical; if the price of the product goes down, then production costs may make a well uneconomical.
- Take-away capacity (the availability of pipelines and economics of trucking to get crude product to refineries) is a limiting factor.

Coal

There is currently no production or leases (active or pending) on the Santa Fe NF.

Forest Potential (figure 71)

The U.S. Geological Survey identifies two coal areas on the Santa Fe NF (East 2013). The northwestern part of the Forest (Cuba RD) is within the San Juan River Region, and a small area north of Pecos (Pecos RD) is in an un-named field.

Their assessment indicates the overburden ranges from 500 to 2,000 feet thick across Cuba Mesa (Cuba RD), with coal bed thickness of less than 1.2 feet on the eastern side to 3.5 feet on the northwestern corner. Along the western side of the Forest between Cuba and Regina, the overburden ranges from 0 to 1,000 feet thick, and the coal beds are less than 1.2 feet thick. In the northern part of the Cuba RD, the overburden is greater than 3,000 feet along the western edge, thinning to 0 feet; and the coal beds range from less than 1.2 feet on the north and west, thickening to over 14 feet in the southern part.

The New Mexico Bureau of Geology and Mineral Resources identified three fields on the Santa Fe NF (Tabet and Frost 1978, Hoffman 1996). The eastern tip of the La Ventana field is within the western part of the Cuba RD, the Monero field cuts the northern part of the Cuba RD along State Road 112, and the small “isolated coal outcrops in Pennsylvanian rocks” north of Pecos and west of Las Vegas.

The La Ventana field produced coal from the Menefee Formation, and was active intermittently between the 1880s and 1980s. None of the mines in the field were on Forest lands (Tabet and Frost 1978, Hoffman 1996).

The Monero field also produced coal from the Menefee Formation, and was active between 1899 until 1970. The Kern (Simmons) mine in T. 25 N., R. 1 E, sec. 21, is within this field, and appears to have been worked from 1951 through the early 1960s; although it wasn’t reclaimed until the 1980s (SFNF Undated).

The “isolated outcrops of Pennsylvanian rocks” in the Sandia Formation north of Pecos and west of Las Vegas were worked for local, domestic use in the early 1900s. Three mines are known on the Forest: the Pecos (Gould and Thomas) mine in T. 16 N., R. 12 E., sec. 5, the Cowles mine in T. 18 N., R. 12 E., sec. 28, and El Porvenir mine in T. 17 N., R. 14 E., sec. 12 and 13 (Hoffman 1996, Tabet and Frost 1978). No production figures are available for any of these mines, but production from the Pecos and Cowles mines is described as several hundred tons (McLemore 1995).

In 1984, the BLM had the mineral potential of the northern Rio Puerco Resource Area assessed (Roybal 1984). The La Ventana field was assessed as having a high coal resource potential; however, the coal in T. 19N, R. 1 W. (the Forest portion of the field) is only mineable by underground mining and the lack of transportation out of the area is a hindrance to development (Roybal 1984). Neither the Monero field nor the Pennsylvanian outcrops are assessed in this report; however, the Amik prospect (northeast of Regina) is mapped and described as in the Monero field.

In 1969, the U.S. Geological Survey published a “Coal Land Classification” in the Federal Register (Baker January 9, 1969) in which it classified part of the northern Cuba RD within the Monero field as “coal lands.” This classification recognized the potential for coal leasing on the Forest lands.

Drivers that may alter trends in coal development in the Santa Fe NF

Due to the presence of the larger, more easily developed coal units north and west of the Santa Fe NF, which are currently being mined, it is unlikely the Forest coal resources will be explored or developed. Coal is known to occur under Forest lands; however, the depth to the coal, thinness of the coal beds, and lack of transportation make the coal unfeasible to mine.

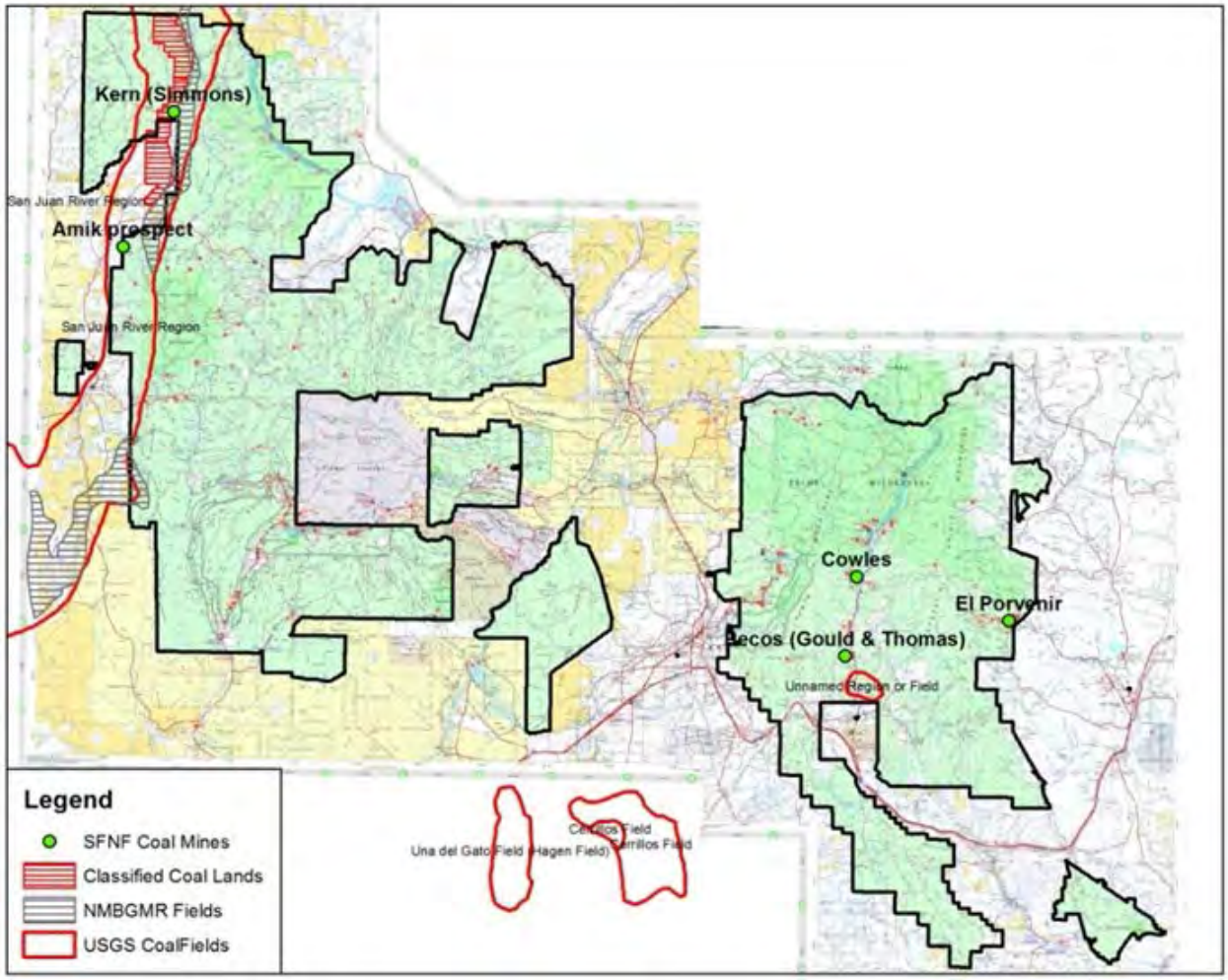

Figure 71. Coal resources on the Santa Fe NF

Geothermal Energy

Geothermal energy is used in two ways—direct use and electrical generation. Direct use generally uses lower temperature water systems for such things as spas (hot springs), aquaculture, facility heating, and greenhouses. Electrical generation uses higher temperature and pressure systems, including enhanced systems in which water is injected into hot, dry rocks to generate steam.

Current Condition

Several hot springs are directly used for recreational purposes on the Santa Fe NF, although there are no leases for commercial use. There are no current electrical generation operations on the Santa Fe NF. The area surrounding the Valles Caldera was extensively explored during 1970s, but no development occurred. Geothermal lease proposals were received in 2012, so the Santa Fe NF is in the process of writing a Geothermal Leasing EIS.

Forest Potential

Much of the western Santa Fe NF is classified as moderately to highly favorable for geothermal energy (figure 72) (DeAngelo and Williams 2010); however, previous plans to develop the resource did not proceed because of a lack of power lines and environmental concerns with constructing new lines.

Drivers that may alter trends in geothermal energy development on the Santa Fe NF:

- Economics – Will investors be able to recover the costs of developing, constructing, and operating the power plant from the sale of electricity? Or will government subsidies be necessary? If subsidies are necessary, are they available and will they continue for the long term?
- Access to and availability of transmission lines – This was a major factor in the lack of development during the 1970s. A suitable power line corridor could not be found between the proposed generating plant and the end use at that time.

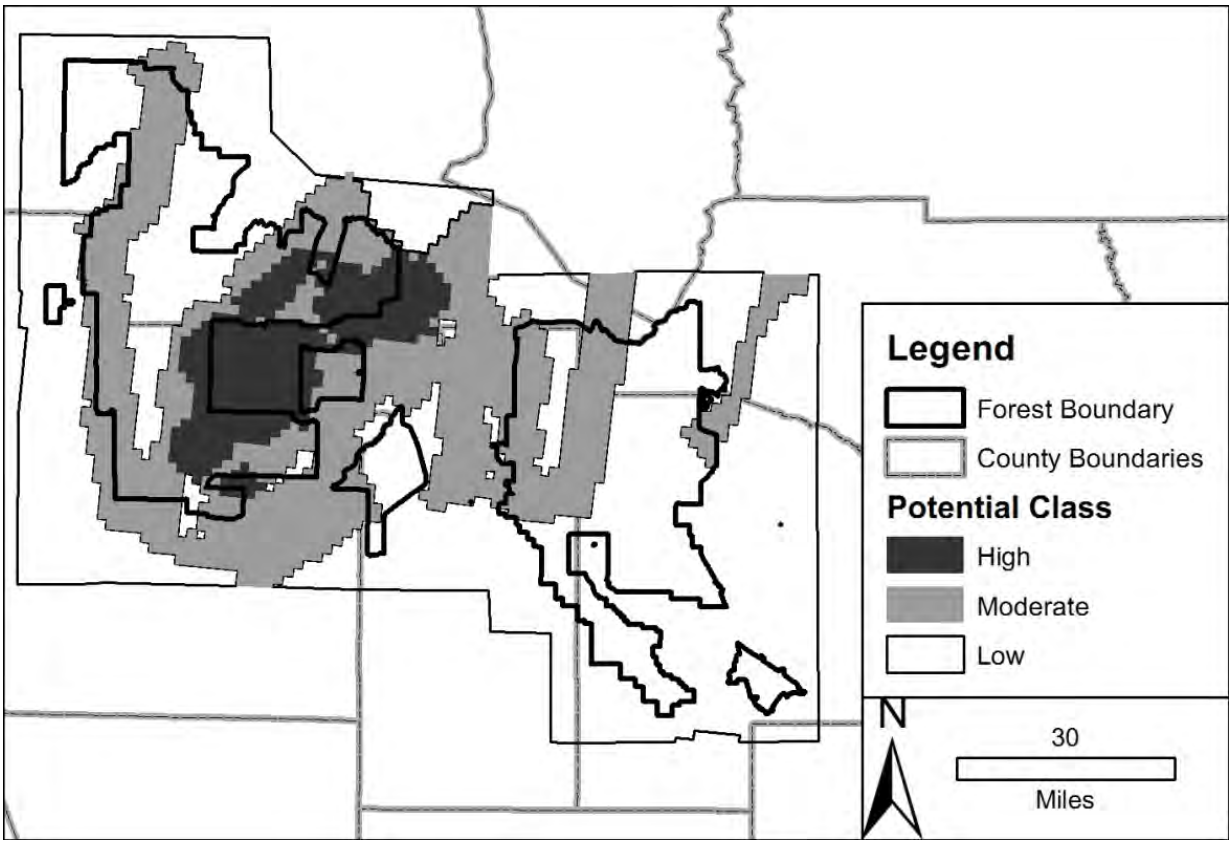

Figure 72. Geothermal energy favorability on the Santa Fe NF (modified from DeAngelo and Williams 2010)

Wind Energy

Current Condition

There are no active or pending proposals for wind energy on the Santa Fe NF. Some interest was expressed for testing/development on Rowe Mesa (Pecos RD) in 2009, but no formal application was made and no work was done.

Forest Potential

There is little potential for wind energy development on the Santa Fe NF (figure 73).

Drivers that may alter trends in wind energy development in the Santa Fe NF

The Santa Fe NF does not have the conditions necessary for economical wind energy production (figure 73); therefore, no future developments are expected.

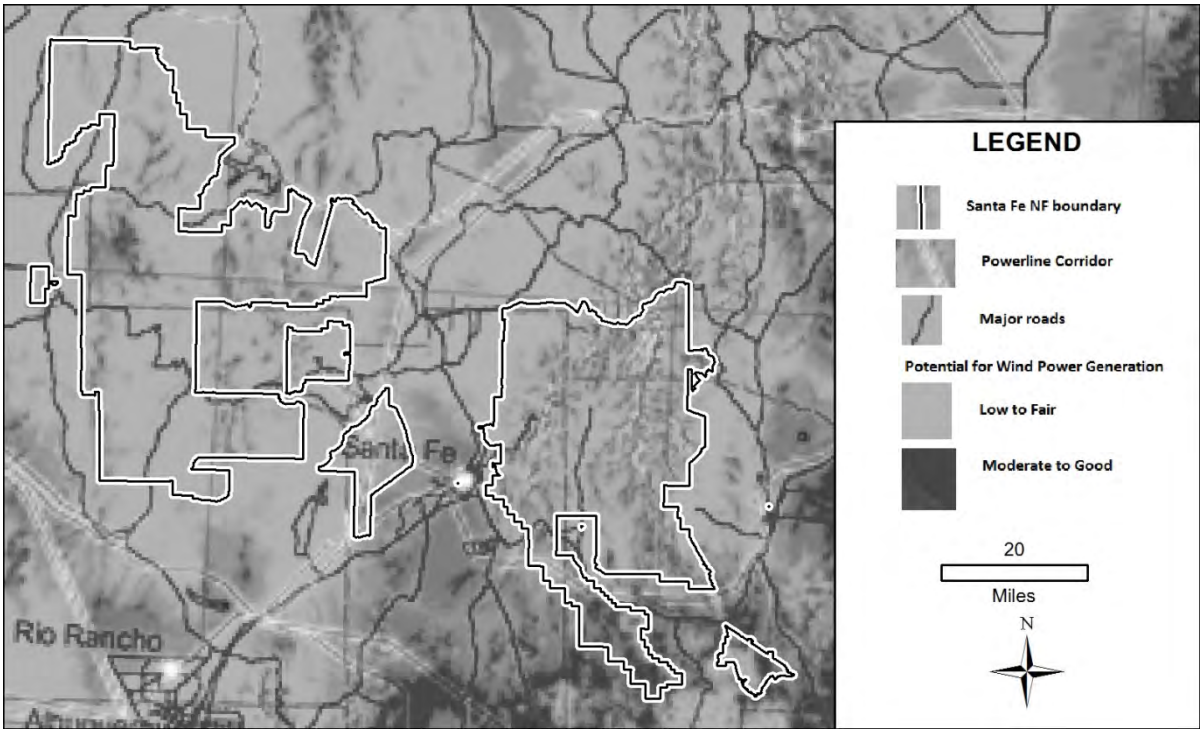

Figure 73. Wind speed map (modified from NM EMNRD 2007) of New Mexico

Hydroelectric Power

Current Condition

There is no Federal Energy Regulatory Commission (FERC) licensed hydroelectric power generation on NFS lands. There are two FERC sites on the Chama River (El Vado and Abiquiu) outside of the Proclaimed Forest Boundary, and two FERC exempt sites on the Santa Fe River (Nichols Reservoir and McClure Reservoir) within the Proclaimed Forest Boundary (FERC 2014).

Forest Potential

There is no known potential for hydroelectric power on the Santa Fe NF.

Drivers that may alter trends in hydroelectric energy development on the Santa Fe NF

The lack of potential sources will not change, so no development is foreseen.

Biomass

Please see the Timber section in chapter 4 for more information.

Transmission Corridors for Energy Development

Current extent and general location

There is a well-developed system of petroleum product pipelines and power transmission lines on and adjacent to the Santa Fe NF as discussed in the Lands section of this report.

Forest Potential

No new pipelines to transport oil and natural gas products are expected to be constructed across the Forest; although the existing pipelines will be repaired and replaced as needed. New on-lease pipelines may be needed as new wells are drilled.

As discussed above, the potential for future power generation from geothermal sources hasn't been tested yet. Previously, the capability of generating geothermal power was found to be feasible, but finding an acceptable route for the power line was not possible. There is low potential for wind, hydroelectric, or biomass electrical generation on the Forest requiring new power lines.

Salable Minerals (Mineral Materials)

All salable mineral disposals requires the operator to obtain a permit from the appropriate Ranger District. The type of permit depends upon the circumstances of the disposal as described in 36 CFR 228.57.

Sand and gravel (pit run aggregate)

Current extent and general location

Sand is plentiful on the Forest, but Cuba Mesa on the Cuba RD is the only authorized common-use area (as defined in 36 CFR 228.42) . Gravel sources containing quantities of quality gravel are scarce, and there are no developed sites on the Forest. Decomposed granite has been used as aggregate on several roads, and several sites are developed for this material. Between 2006 and 2013, the annual sales of sand and gravel from the Forest averaged 7 tons (USFS 2014).

Future potential of sand and gravel

Sand is plentiful both on and off the Forest, so it is unlikely that additional sources will be developed. Due to the lack of good gravel deposits and environmental concerns, it is unlikely gravel sources will be developed. The decomposed granite sites that are developed and available may continue to be used.

Crushed rock and riprap

Current extent and general location

Extensive deposits of limestone, basalt/rhyolite, and granite on the Forest yield good quality crushed rock and riprap (figure 74). Between 2006 and 2013, the annual sales of crushed rock and riprap from the Forest averaged 23 tons of crushed rock, and 750 tons of riprap (USFS 2014).

Future potential of crushed rock and riprap

Many sites were developed in the past, and then closed as the need for the materials ended (sites no longer needed to maintain timber haul roads). Some of these sites could be re-opened and new sites can be developed as the need arises.

Pumice

Current extent and general location

Pumice deposits resulting from the Toledo and Valle Caldera eruptions blanket the Jemez Mountains (figure 74) (Schwab et al. 2008). These deposits have been extensively mined since the early 1940s. Cinders are mined from a volcanic cone southwest of Santa Fe from a site jointly managed by the Forest and the BLM. Between 2006 and 2013, the annual sales of pumice and cinders from the Forest averaged 43,345 tons (BLM 2014, USFS 2014).

Future potential of pumice

A recent case (2013) determined that pumice is no longer locatable, so all pumice deposits are now salable minerals. Deposits of pumice are extensive, but threatened and endangered or special status species protection measures, archeological resources, cultural concerns, along with recreational and visual concerns makes authorizing mine sites controversial.

Decorative stone (moss rock and flagstone)

Current extent and general location

Decorative rock is found over the entire Forest; however, resource concerns and mineral withdrawals limit the availability of stone. Between 2006 and 2013, the annual sales of decorative stone from the Forest averaged 66 tons (USFS 2014).

Future potential of decorative stone

There are large deposits of desirable decorative stone throughout the Forest; however, resource concerns have made authorizing sale areas difficult. Similar stone is available from the private lands and BLM-administered lands adjacent to the Forest, so it is unlikely decorative stone areas will be developed on the Forest.

Humate (shale/coal with extractable humic acids)

Current extent and general location

This material is exposed on the Santa Fe NF within the Menefee Formation, mapped as the San Juan River region (figure 71). There are no current sales of this material, and very little interest has been expressed since the mid-1990s. There are several mine sites on private and BLM-administered lands in the Cuba area for this material, and two processing plants near Cuba, one at San Ysidro, and one in Farmington/Bloomfield.

Future potential of humate

There is a market for this material, but ample sources exist and are already developed off of the Forest. Therefore, no development is foreseen on the Forest.

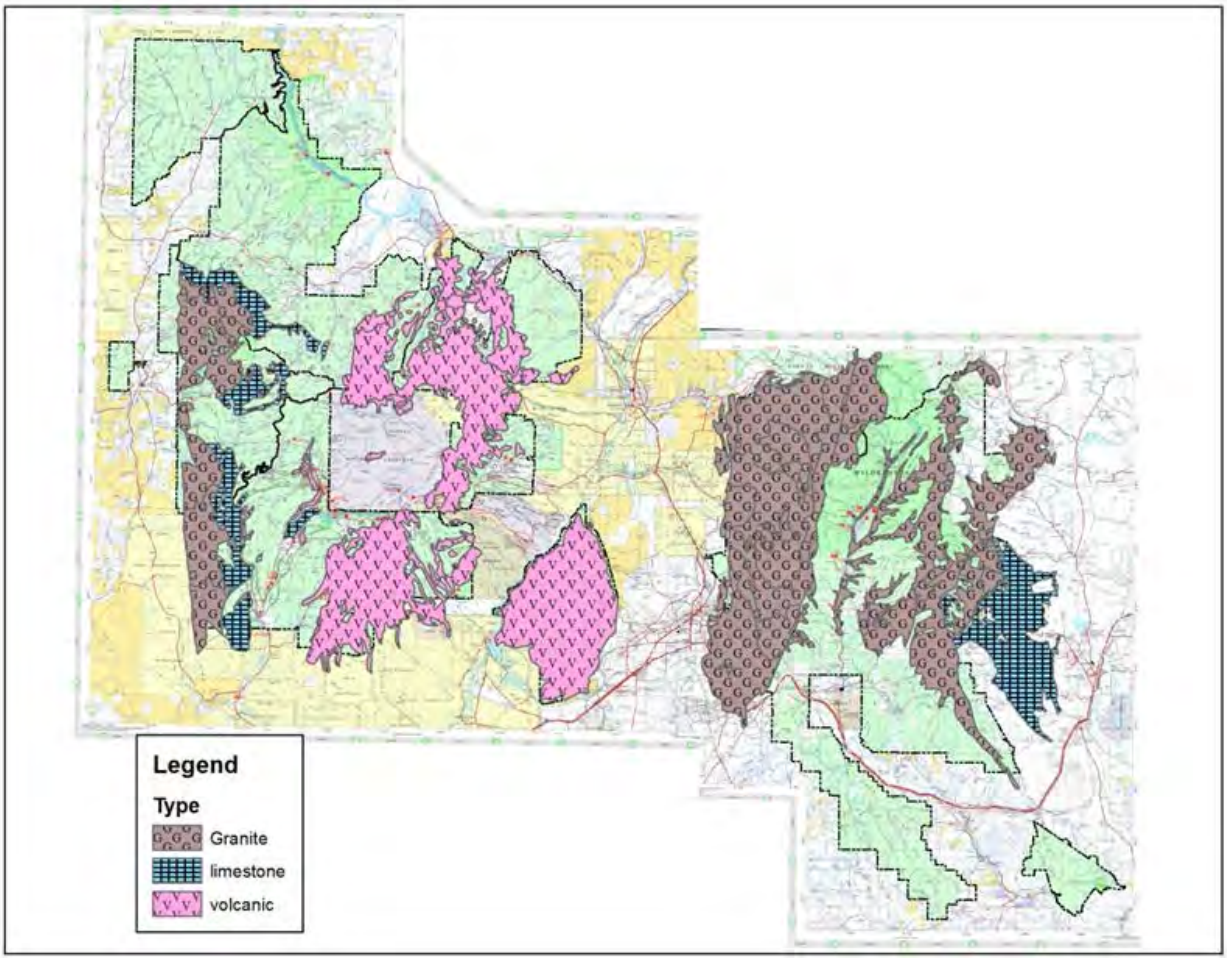

Figure 74. Sources for crushed rock and stone

Drivers That May Alter Trends in Salable Minerals Development on the Santa Fe NF

- The Forest will continue to have an active salable mineral materials program, although surface use restrictions limit the areas from which material is available.
- One of the biggest public concerns with commercial sales is the impact of trucks hauling material over Forest roads and through the surrounding communities.
- Sources outside the Forest on private, State, and other Federal lands are commercially developed for these commodities, so the restrictions on the Forest will have no or only a minimal impact on the overall supply of these materials.

Locatable Minerals

Pumice

Pumice is no longer locatable on the Santa Fe NF (2013). See discussion above under “Salable Minerals” for more information.

Copper

Current extent and general location

There are no active mines or exploration projects, although there are current mining claims for copper (figure 75) (BLM 2014). Copper minerals are collected from several of the claims for sale as mineral specimens.

Future potential

Known occurrences appear to be too small and low grade to be economically mined and transported and there are no processing plants nearby, so there is low potential for future development (McLemore 1984a).

Uranium

Current extent and general location

There are no active mines or exploration projects, and the recent mining claims (figure 70) have been abandoned (BLM 2014)(BLM 2014).

Future potential

Known occurrences are too small and low grade to be economically mined and transported and there are no processing plants nearby, so there is low potential for future development (McLemore 1984b).

Gold and Silver

Current extent and general location

There are no commercial operations on the Forest (figure 75); although there is occasional Notice level activity from hobbyists. There are several areas with mining claims (BLM 2014), but no recent exploration or development activities.

Future potential

McLemore (1984c, 1996) states the potential for additional deposits in the Cochiti District (Jemez RD) is good, but processing facilities are too distant to make development feasible. The Macho Canyon area (Pecos RD) is a massive sulfide deposit containing zinc, copper, lead, silver, and gold (Lane 1980) which has been extensively explored, but no production is known. Potential for future development is low for both of these areas.

Rare Earth Elements

Current extent and general location

There are no current mining claims or exploration activities for rare earth elements on the Forest (figure 75). Historically, small quantities of rare earth elements were found in the pegmatite deposits in the southeastern part of the Forest (McLemore 2011).

Future potential

The pegmatite deposits on the Forest are considered too small to be economic deposits (McLemore 2011).

Drivers That May Alter the Locatable Minerals Development on the Santa Fe NF

- The small size and low grade of most of the locatable minerals deposits will continue to make them uneconomical to mine.
- The remoteness and lack of rail transportation to processing facilities is a significant factor in determining the economics of developing a mine.
- The massive sulfide deposit in the Macho Canyon area (Pecos RD) needs further exploration to determine if it is large enough and rich enough to warrant development. Approval of any plans of development will be difficult to obtain because of the rugged topography, lack of access, proximity to the Pecos Wilderness, and location within Santa Fe County (which has very restrictive mining regulations).

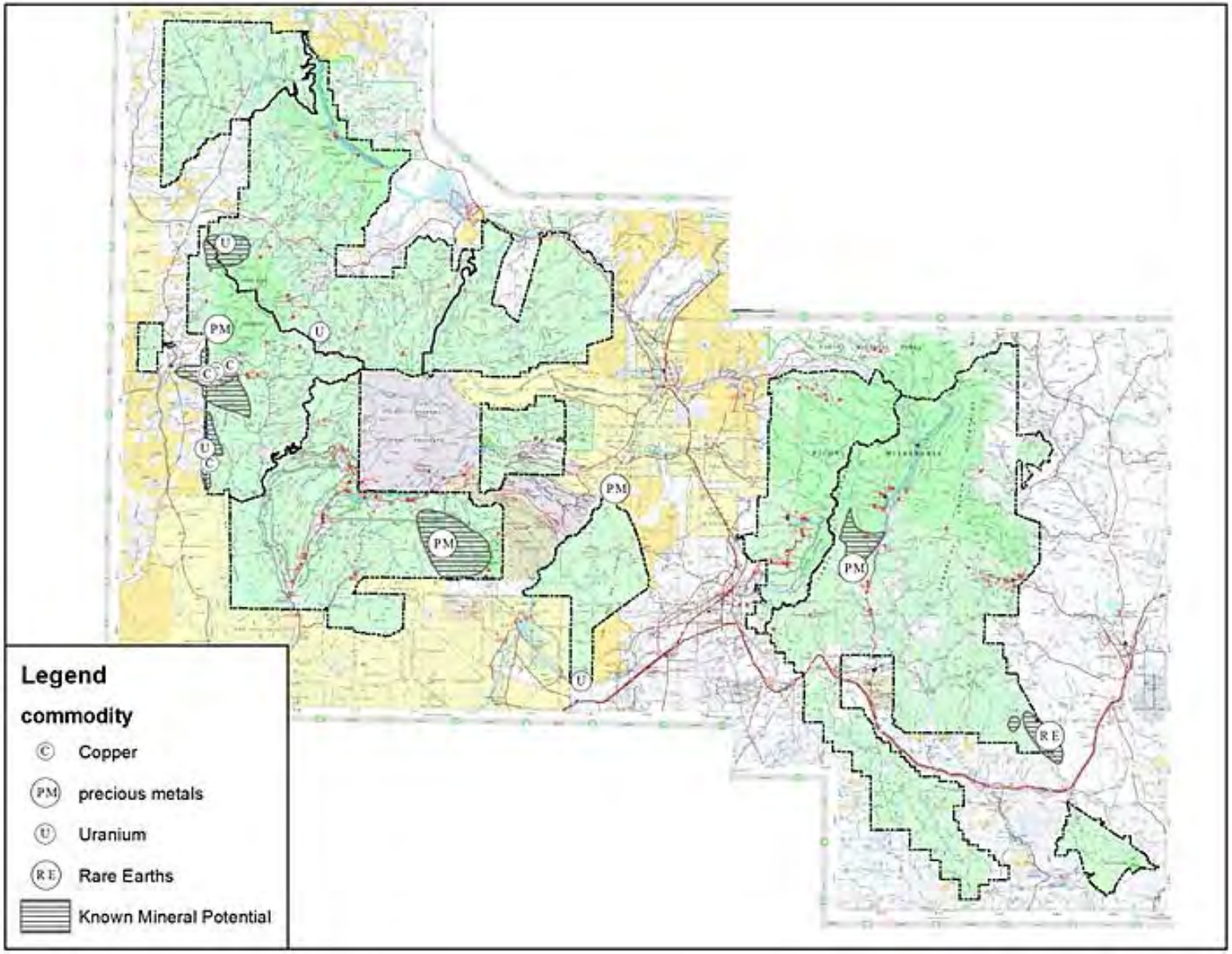

Figure 75. Locatable mineral sites on the Santa Fe NF

Abandoned Mined Lands

Known abandoned mines or mining-related hazards in need of reclamation or restoration

An abandoned and inactive mine land inventory was conducted on the Santa Fe NF in 1998 (Gese 1998). This inventory identified 61 mine sites, of which, 9 were identified as having the potential for acid mine drainage, and 8 sites were identified as having waste dumps impacting drainages.

The USGS Mineral Resources Data System (USGS 2014a) shows 237 sites on the Santa Fe NF (figure 76). The majority of these are surface prospects or shallow workings that have been reclaimed or naturally remediated, and present no public safety or environmental hazards.

Underground mining was done at several of the copper mines such as the Nacimiento Mine and patented claims on Eureka Mesa, San Miguel area, Mining Mountain, and the Spanish Queen Mine. The Cochiti Mining District (including Bland Canyon, Albemarle, and Peralta Canyon) saw extensive underground exploration and development. There was also underground exploration and development at Jones Hill mine and vicinity (figure 76). Preliminary Assessment/Site Investigations have been conducted on most of these sites to determine hazards. No environmental hazards have been identified, other than the Nacimiento water contamination, which is being remediated. Public safety hazards may exist, but most of the sites are not easily accessible to the public under the current travel management.

The New Mexico Mining and Minerals Division (Intera 2010) has surveyed uranium mine sites around the state, including those on the Santa Fe NF.

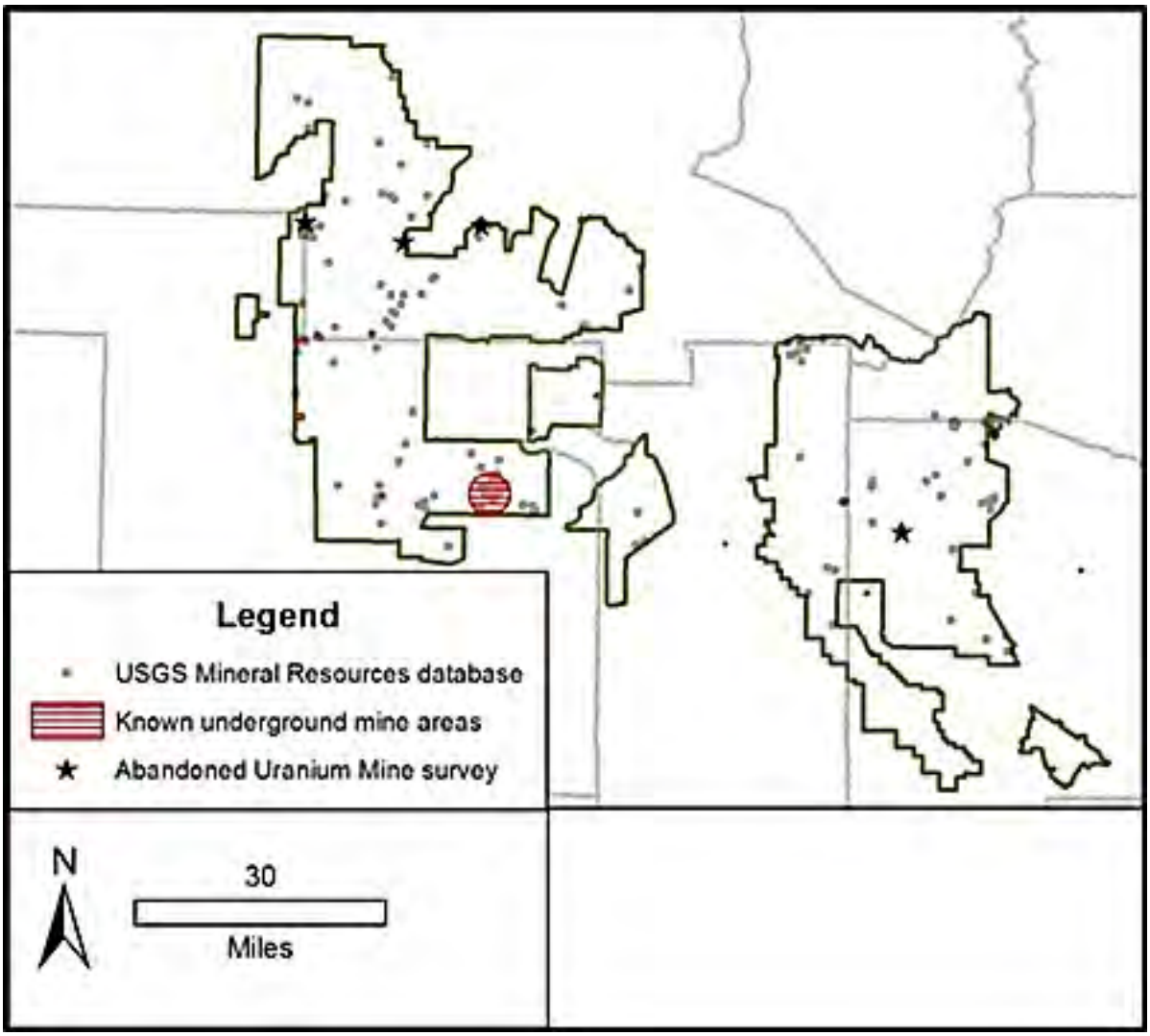

Figure 76. Abandoned mined lands on the Santa Fe NF

Geological Resources

Groundwater

Current Situation

The management of groundwater resources is complex. The primary responsibility for the use of groundwater is found within the Watershed and Air program, but as a natural resource, it falls under the Geology program. The Forest Range, Special Uses, Recreation, and Wildlife and Fisheries programs all use groundwater to some extent. This assessment will focus on the occurrence and withdrawal of groundwater, without specifying the use.

Two primary aquifers underlie the Santa Fe NF (figure 77). The Colorado Plateau aquifers consist of the Uinta-Animas aquifer system, the Mesaverde aquifer system, the Dakota aquifer system, and the Coconino-de Chelly aquifer system. The Uinta-Animas aquifer includes the San Jose, Nacimiento, and Ojo Alamo formations which are the principal aquifers in the Cuba-Regina-Lindrith areas. The Mesaverde aquifer system includes the Mesaverde Group and Gallup Formation. Below the Mesaverde aquifers are the Dakota aquifers and Coconino-de Chelly aquifers. (Robson and Banta 1995).

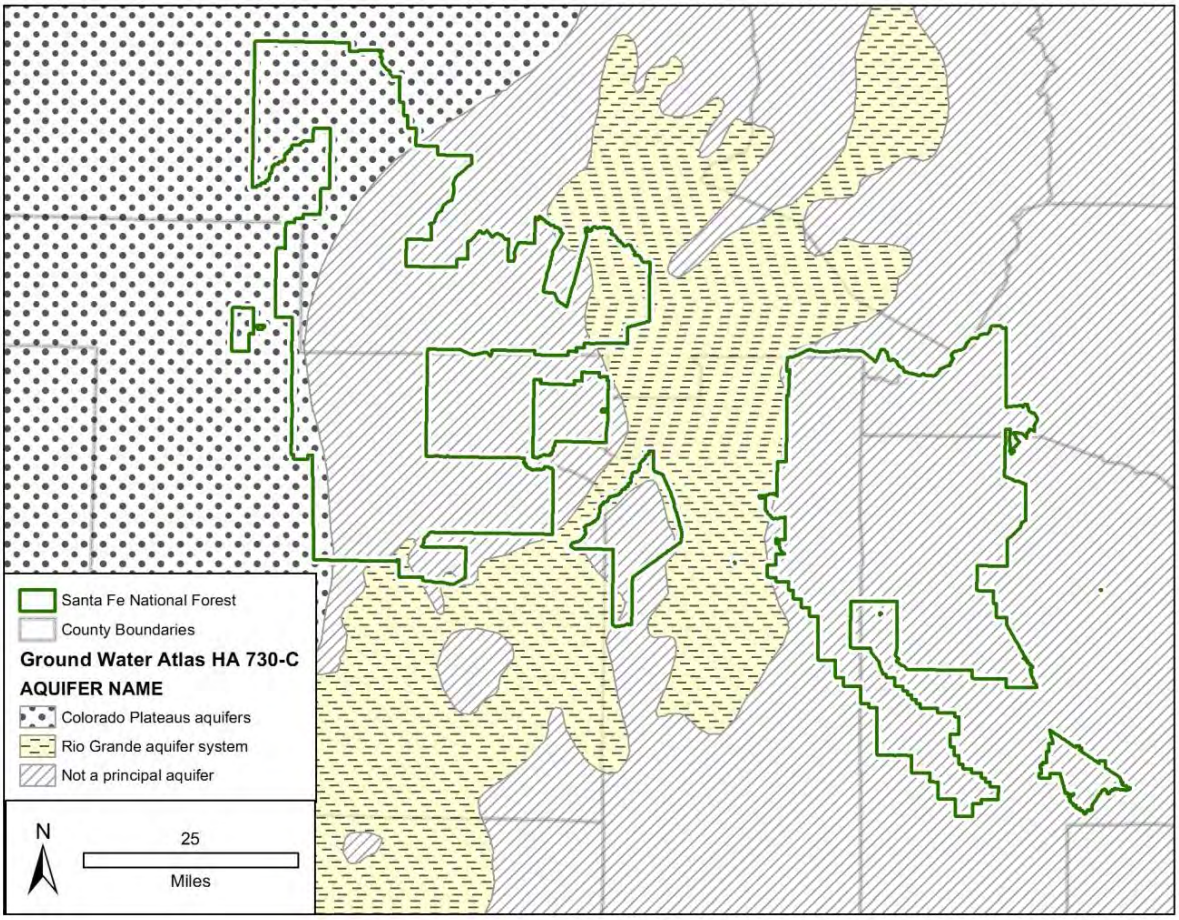

Figure 77. Map of principal aquifers from the USGS Groundwater Atlas

There are numerous wells and springs with water rights (NMED 2013) within the Forest boundary (Figure 78). Many of these wells are within the area mapped as “not a principal aquifer” in the Ground Water Atlas (Robson and Banta 1995). These wells and springs indicate the presence of local, surficial aquifers which may require further study.

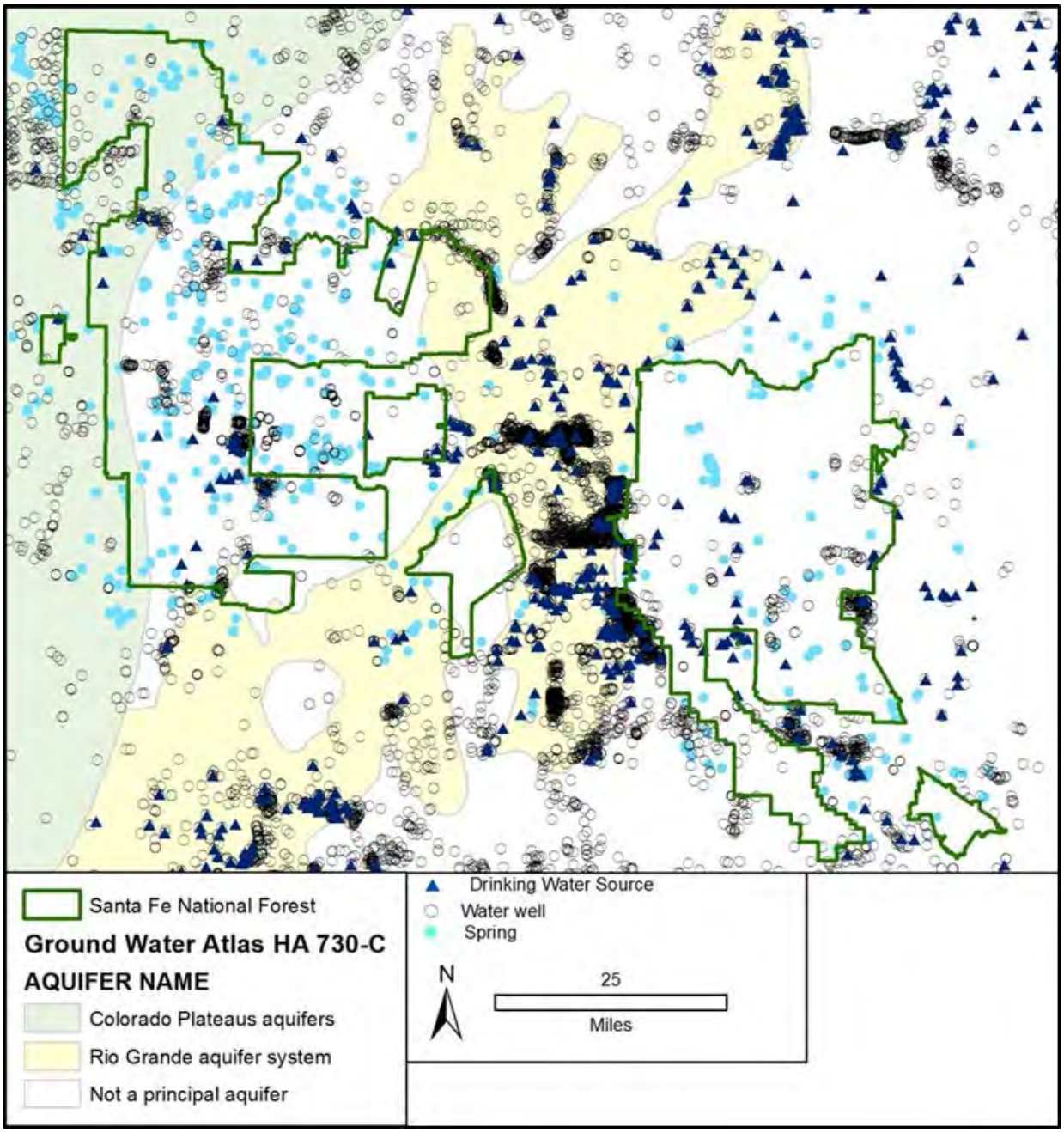

Figure 78. Water wells and springs mapped over the USGS aquifers

The New Mexico Office of the State Engineer has divided the State into "Declared Ground Water Basins," but these do not correlate to groundwater occurrences or aquifers; they are administrative areas closely following surface water watersheds for managing the interconnected surface water and groundwater resources.

Future potential

Groundwater is an important resource on the Santa Fe NF, and will increase in importance to wildlife, ecology, and human uses for the foreseeable future. If surface water volume continues to decrease across

the Forest and State, the use of groundwater will increase; however, if precipitation (particularly snowfall) decreases over the long term, recharge of the local, surficial aquifers will also decrease.

Groundwater management will be complex due to the many programs which have responsibilities (special uses, range, wildlife, geology, and others) for using, authorizing the use, and managing the resource. Further, there are multiple state agencies which also have management responsibilities (the Office of the State Engineer, Environment Department's Ground Water Quality Bureau and Surface Water Quality Bureau, and the Energy, Minerals and Natural Resources Department's Mining and Minerals Division, among others)

Caves

Current Situation

Caves management is currently done under several different programs, including recreation, archeology/cultural resources, biology, and geology. The Santa Fe NF designated five significant caves in 2012, and is currently (2015) considering one more.

The number of caves on the Forest is unknown; but there are favorable formations for solutions caves (limestone and gypsum), lava tubes, tectonic caves (underground spaces created by the falling and/or sliding of rock beds), and weathering caves (alcoves created by erosion of softer units from beneath more resistant beds) underlying much of the Forest.

Future

Management plans will be created and implemented in accordance with the Cave Protection Act and Forest Service guidance for the existing significant caves. As additional caves are documented and assessed, they may be designated as significant caves.

Paleontology

Current Situation

The paleontological resources on and near the Santa Fe NF have a long history of being collected; however, until the Paleontological Resources Protection Act (Public Law 111-11) (PRPA) was passed in 2009, there wasn't comprehensive protection for the resource. The Forest Service regulations implementing the Paleontological Resources Protection Act have not been finalized.

The Forest issued nine reconnaissance/collecting permits for paleontological resources between 1997 and 2014.

In 2004, seasonal interns researched published and documented paleontological work on the Santa Fe NF. They identified 1,335 fossil localities within Rio Arriba, Sandoval, Santa Fe, Los Alamos, San Miguel, and Mora Counties. Of these sites, 240 are within the Forest boundary or within a 2-mile buffer around the Forest. The formations containing these sites were used to determine which formations would be considered to have a high and moderate potential for vertebrate fossil occurrence. However, it is noted that the PRPA stipulates that all paleontological resources on National Forest System lands must be managed using scientific principles and expertise and does not limit agency management to vertebrate fossils, although management options may reflect the specific nature of the resource.

As required by Forest Service Manual 2882.6, the Potential Fossil Yield Classification (PFYC) ranking for the Santa Fe NF has been created using the results of the 2004 project, along with more recent work (Table 48). The results of the PFYC or other Forest Service-sanctioned classification of paleontological

resource potential will be used to assure surface disturbing activities on the Forest are managed to prevent degradation or loss of the scientific value of the paleontological resources.

The Potential Fossil Yield Classification system has five categories:

- High (FYP 5) – Fossiliferous geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant non-vertebrate (plant and invertebrate) fossils and that are at risk of natural degradation and/or human-caused adverse impacts.
- High – not threatened (FYP 4) – Fossiliferous geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant non-vertebrate (plant and invertebrate) fossils; but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation.
- Moderate/undetermined (FYP 3) – Fossiliferous geologic units whose fossil content varies in significance, abundance, and predictable occurrence. Also, sedimentary units of unknown fossil potential are included in this category.
- Low (FYP 2) – Sedimentary geologic units that are not likely to preserve vertebrate fossils or scientifically significant non-vertebrate fossils.
- Very Low (FYP 1) – Igneous and metamorphic geologic units that are not likely to contain recognizable fossil remains. Volcanic ashes are excluded from this category and can be in any of the other categories depending upon the known occurrences of vertebrate fossils and/or scientifically significant non-vertebrate (plant and invertebrate) fossils.

Table 48. Potential fossil yield classification for the Santa Fe NF

Classification Category	Units	Acres	% Area Forest
High	San Jose, Chinle, Abo/Cutler Formations	252,680	15%
High – not threatened	None	0	0%
Moderate/undetermined	Quaternary pediment deposits, Chamita/Abiquiu (Santa Fe Fm), Nacimiento Fm, Mancos Fm, Summerville Fm, Madera/Alamitos Fm, La Pasada and Osha Canyon (Sandia) Fm	180,224	11%
Low	All other sedimentary units and the Bandelier Tuff	635,650	38%
Very Low	All metamorphic and igneous/volcanic units except Bandelier Tuff	602,060	36%

Future

When the Forest Service paleontological resource regulations are finalized, they will be implemented on the Forest. The management practices will include requiring paleontological surveys prior to surface-disturbing activities on some areas of the Forest, so the number of collecting/reconnaissance survey permits will most likely increase.

Geological Hazards

Seismic Activity

Current Situation

Figure 79 maps the earthquake probability for northern New Mexico and the epicenters of the earthquakes between 1962 and 2014. The map shows the probability of an earthquake exceeding magnitude 5 within 20 years (USGS 2014b). A magnitude 5 earthquake may cause damage to poorly constructed structures, but little to no damage to well-constructed structures. It will be felt by everyone.

There were 54 earthquakes in the vicinity of the Santa Fe NF between 1962 and 2014, with the largest having a magnitude 3.5.

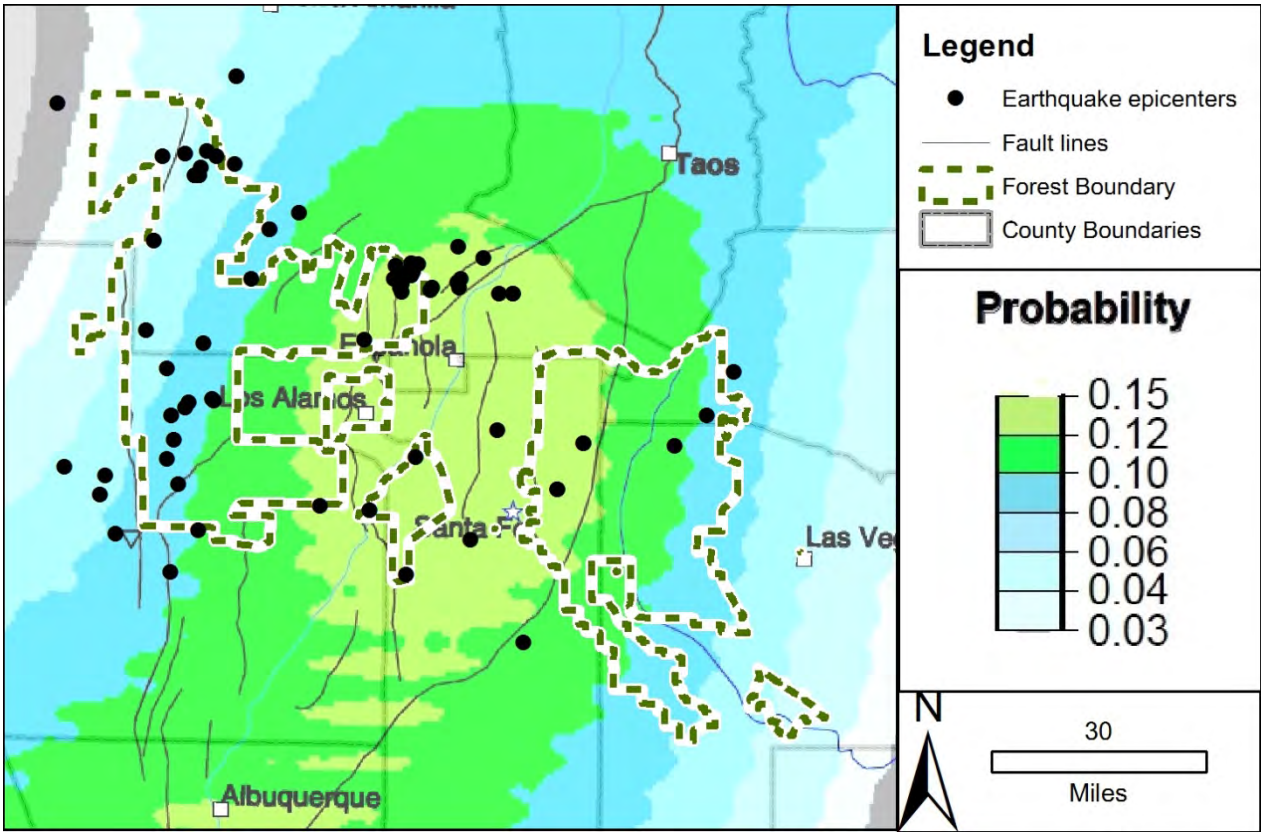

Figure 79. U.S. Geological Survey earthquake probability map with earthquake epicenters between 1962 and 2014

Future

The probability for hazardous seismic activity ranges from 3 percent to 15 percent, although small earthquakes will continue to occur.

Landslides and Rock Falls

Current Situation

Many of the soil units on the Santa Fe NF are conducive to landslides and rockfalls (figure 80). Miller et al. (1993) mapped 409,348 acres with a moderate potential for mass wasting (landslide or rockfall), 278,399 acres with a high potential, and 13,126 acres with a severe potential. Stoeser et al. (2005) mapped 4,100 acres of landslides within the Santa Fe NF.

Future

Landslides and rockfalls will continue with no significant changes expected. Engineering controls or re-locating roads and facilities may be used to minimize the impacts.

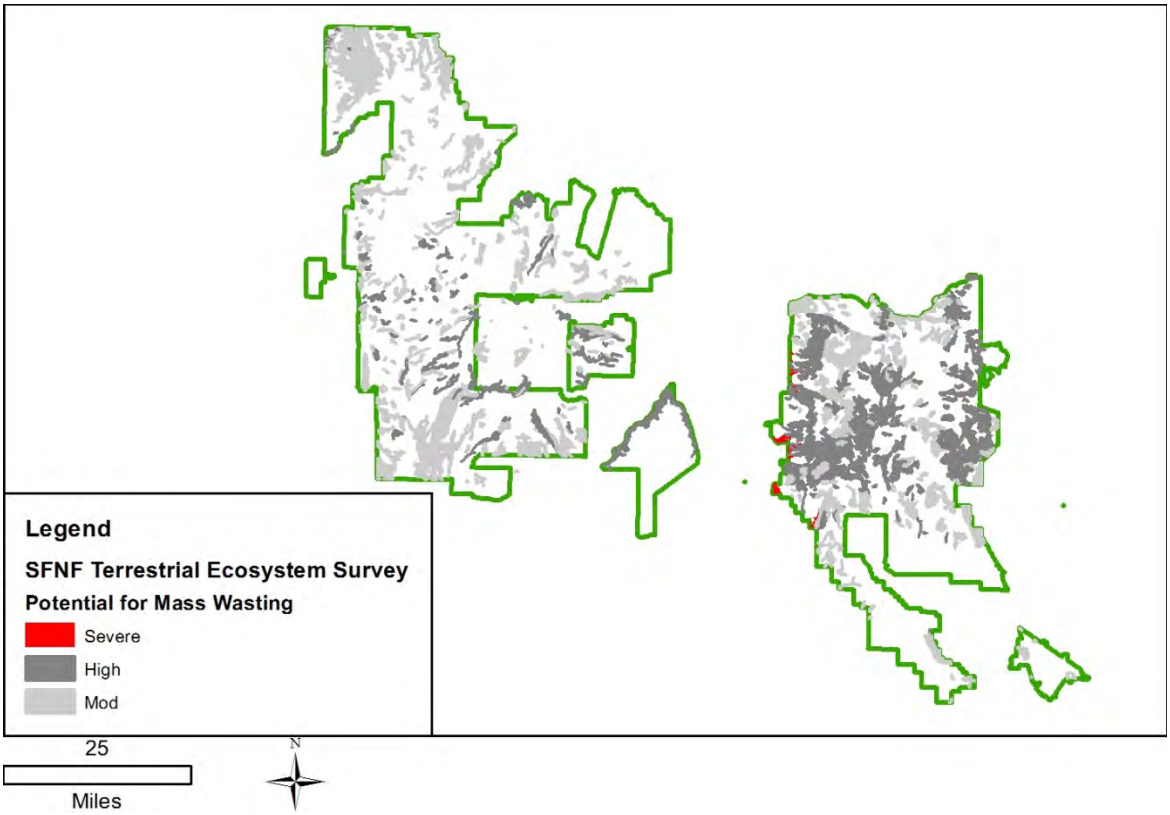

Figure 80. Potential for mass-wasting events such as landslides and rockfalls

Volcanic Activity

Current Situation

There is a long history of volcanic activity in northern New Mexico, including the Santa Fe NF (Schwab, Tafoya et al. 2008). All of the volcanoes on or near the Santa Fe NF are considered extinct, except for those in the Valles Caldera. Dunbar (2010) states “The presence of the new magma seen in these deposits suggests that the Jemez Mountains volcanics field may be entering a new phase of activity….The Jemez Mountains volcanic field is likely to erupt again, but the next eruptions may not take place for thousands, or even tens of thousands of years.”

Future

There is no evidence for an impending eruption, but the presence of a magma body indicates eruptions may occur.

Contribution of energy and mineral activity in the plan area to social, economic, and ecological sustainability

Oil and gas production has been an important part of the economy in the Lindrith/Llaves area, with some impacts to the Gallina, Regina, and Cuba communities. It provides several stable, relatively well-paying jobs; along with the taxes and royalties it pays. The industry is stable, and not expected to see any major gains or losses in employment in the foreseeable future.

Coal mining occurred for local use through the 1969, but was not a major employer. Coal mining ceased when other fuel sources, such as natural gas and electricity, became readily available and cheap. Future coal mining is not expected.

Renewable energy or “green energy” sources, including wind, solar, hydroelectric, and geothermal, have not been developed on the Santa Fe NF, although there is potential for geothermal energy for both direct use and electrical generation. Direct use of geothermal energy is occurring commercially in Jemez Springs, and being explored by the Jemez Pueblo. The hot springs on the Forest are not developed, but are used recreationally. Geothermal electrical generation may be developed several years in the future. The exploration and development would provide local employment; similar to the oil and gas development. The long-term operation of a power plant would provide stable jobs.

Copper mining on the Santa Fe NF began in the late 1800s, with the peak employment and production occurring during the late 1960s to early 1970s in the Cuba vicinity. The complete shutdown of the copper mining industry by the early 1980s had a significant impact that is still felt in the Cuba community. Future copper mining is not expected.

Precious and base metal mining were historically important in both the Pecos area (Terrero mine) and the Cochiti-Bland Canyon areas. These areas ceased production about 70 years ago and future production is not expected.

Pumice mining has occurred in the Jemez area for over 80 years, and provides a few jobs; primarily in the transportation of the pumice to the processing plants. Most of the pumice is used for cement block products, which have some environmental benefits due to their insulating properties and the lighter weight, decreasing transportation fuel use. However, the public questions whether these advantages offset the impacts of the mining.

Summary and Trends

For the purposes of this summary, trend will be described as increasing (more use is expected), level (use is expected to remain the same), or declining (less use is expected). The trend is projected for a time period of 15 to 20 years from the date of this report. As explained throughout the report, the trends are highly dependent upon the value of the product and the cost of production. If there is a large, unforeseen change in the value of the product and the cost of production also changes in the same direction (for example, the value increases and the cost of production also increases), the projected trend will probably remain. If the value and cost of production have opposite changes (for example, the value decreases and the cost of production increases) then the trend would probably change.

The Santa Fe NF has well-developed oil and natural gas resources, with ongoing production. The trend is seen as level to slightly declining.

There is high probability that geothermal resources exist on the Santa Fe NF, but they have not been developed; so whether they are economic resources has not been established. Therefore, the trend is very uncertain. Under the current conditions, the trend is projected to increase.

No need for additional pipelines for oil and natural gas is seen. Therefore, the trend for pipelines is expected to be level with the existing pipelines remaining in use, but no additional ones are projected.

If geothermal resources are developed, additional power lines will be required to tie the generating facilities into the transmission lines. Therefore, the trend for power lines is increasing.

The Santa Fe NF currently has a few “hobby” level locatable mineral operations such as gold prospecting and collecting mineral specimens for sale. A few claimants also maintain unpatented mining claims as family traditions with no operations. The trend for locatable minerals is expected to remain level, with no large-scale operations.

The salable mineral program on the Santa Fe NF is mostly small sales to individuals, with occasional commercial sales for local construction projects and pumice for lightweight aggregate. In-service use will continue. The trend for salable minerals is expected to remain level.

The Southwest Region and the Santa Fe NF have an active program to document, assess, and remediate abandoned mine land sites which are found to have environmental or public safety problems. This program is closely coordinated with New Mexico state agencies. The trend for remediation is expected to remain level, but is very dependent upon Forest Service and State funding levels.

Ecosystem Services

Within the region, a variety of resources have provided energy or mineral materials to meet the needs of the country. Along with the direct benefit of usable minerals or energy for homes, businesses and transportation, the resources provided by the SFNF have brought regional economic benefit through jobs and taxes, and the cultural service of educational and research experience. As noted in Chapter 3, however, most of the positive economic consequences related to mining activities on the Forest occur outside the region.

Oil and gas development on the forest has begun trending downward, primarily due to current prices versus production cost and resource depletion. Other energy sources and valuable minerals generally have low potential in the area, although solar is being developed regionally. Geothermal resources are considered to have moderate to high potential, but with limited take-away capacity at present.

Pumice mining, recently re-classified from a locatable to a saleable mineral, still contains an extensive supply, but area protections for sensitive species, archeological resources and visual integrity complicate authorizations.

Abandoned mines present some risk to water quality in downstream communities, with 17 sites thought to be potentially impacting drainages. Other socio-economic conditions mentioned as impacted by mining or leased production include roads and safety concerns from haul trucks.

Input Received at Public Meetings

This section summarizes input, perspectives, and feedback relevant to this assessment topic and received from the public between April and July 2014. Input was gathered from 14 public meetings as well as forms available at all Santa Fe NF offices and online.

Some participants expressed concerns about oil and gas development, and mining in the region in general—especially attendees in Abiquiu—though, other places as well. As one attendee commented, “socioeconomic conditions are changing with agriculture on the Cibola due to oil/gas and fracking.” In Santa Fe, a participant has noticed an increase in oil and gas development in one area of Santa Fe NF. In Las Vegas, an attendee asked for the Forest to have no more mining, oil or gas drilling, particularly fracking.

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