



United States Department of Agriculture

Lincoln National Forest Plan Draft Assessment Report

Volume II: Socioeconomic Resources



Forest Service

Lincoln National Forest

June 2018

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer and lender.

Forest Plan Assessment Report Lincoln National Forest Volume II. Social and Economic Resources Forest Plan Assessment Report

For Information Contact: Lincoln National Forest

Plan Revision Team

3463 Las Palomas Road

Alamogordo, NM 88310

Phone: (575) 434-7200

E-mail: Inf_fpr_comments@fs.fed.us

Web site: <http://www.fs.usda.gov/lincoln>

Abstract: The Assessment Report presents and evaluates existing information about relevant ecological, economic, and social conditions, trends, and risks to sustainability and their relationship to the 1986 Lincoln National Forest Land and Resource Management Plan (forest plan), within the context of the broader landscape.

Contributors:

Charlie Sharp, Forest Planner

David Baker, Forest Plan Revision Ecological Lead

Phillip T. Hughes, Forest Plan Revision Wildlife Lead

Heather Berman, Forest Plan Revision Recreation, Social, Economic Lead

Jennifer Hickman, Forest Soil Scientist

Pete Haraden, Forest Hydrologist

Aurora Roemmich, Forest Botanist

William Sapp, Ph.D, Forest Archeologist and Tribal Liaison

Linda Cole, GIS Coordinator/Analyst

Ralph Fink, Sacramento Ranger District Range Specialist

Christina Thompson, Smokey Bear Ranger District Recreation and Special Uses Program Manager

Kim Kuhar, Forest Fuels Program Manager

Craig Wilcox, Forest Restoration Program Manager

Rhonda Stewart, Forest Wildlife Program Manager

Ralph Castanon, Forest Engineer

Jack Triepke, Regional Ecologist and Air Program Coordinator

Josh Hall, Regional Air and Water Quality Specialist

Special recognition and thanks to the “Z-Team”; Matt Turner, Catherine Luna, and for their help and guidance through the assessment process.

Table of Contents

CHAPTER 1 - Socioeconomic Assessment Introduction	1
Purpose	1
Sustainability of Social, Cultural, and Economic Systems	1
Structure of the Socioeconomic Assessment	2
Ecosystem Services Framework.....	7
CHAPTER 2 - Social, Cultural, and Economic Conditions	9
Introduction.....	9
Population Statistics.....	11
Economy of the Plan Area	19
Lincoln NF's Social, Cultural, and Economic Contributions to the Plan Area	33
Influence of the Lincoln NF on Social, Cultural, and Economic Conditions on the Broader Landscape	46
Stakeholder Input	46
Summary of Findings for Socioeconomic	49
CHAPTER 3 - Cultural and Historic Resources and Uses	51
Introduction.....	51
Social and Economic Contributions of Cultural and Historic Resources and Uses	51
Cultural and Historic Context of the Assessment Area	53
Description of Cultural and Historic Resources of the Assessment Area	65
Stakeholder Input	79
Summary of Conditions and Trends for Cultural and Historical Resources	79
CHAPTER 4 - Areas of Tribal Importance and Tribal Uses	81
Introduction.....	81
Social and Economic Contributions of Cultural and Historic Resources and Uses	81
Cultural and Historic Context of the Assessment Area	82
Areas of Known Tribal Importance	82
Land Ownership, Access, and Multiple Use	85
Findings for Areas of Tribal Importance and Tribal Uses	90
Stakeholder Input	91
Summary of Conditions and Trends for Cultural and Historical Resources	91
CHAPTER 5 - Multiple Uses	93
Introduction.....	93
Social and Economic Contributions of Multiple Uses	93
Rangelands	95
Timber and Forest Products	103
Water	113
Wildlife, Fish, and Plants	132
Stakeholder Input	148
Summary of Findings for Multiple Uses	151
CHAPTER 6 - Recreation and Scenic Character	153
Introduction.....	153
Recreation Settings, Opportunities, and Access	153
Sustainable Recreation.....	167
Economic Sustainability	170
Social Sustainability.....	175
Environmental Sustainability.....	179

Scenic Character	183
Key Findings.....	192
Stakeholder Input	192
Summary of Findings for Recreation.....	196
CHAPTER 7 - Designated Areas	199
Introduction.....	199
Social and Economic Contributions of Designated Areas	202
Statutorily Designated Areas (Established by Congress).....	202
Administratively Designated Areas (Agency Designated)	217
Wild and Scenic Rivers	239
Documented Needs and Opportunities	243
Stakeholder Input	244
Summary of Findings for Designated Areas	244
CHAPTER 8 - Infrastructure.....	247
Introduction.....	247
Social and Economic Contributions of Infrastructure.....	248
National Forest System Roads.....	248
National Forest System Trails	258
Aviation Facilities	268
Administrative and Recreation Facilities.....	269
Other Facilities and Infrastructure.....	278
Stakeholder Input	279
Summary of Findings for Infrastructure.....	282
CHAPTER 9 - Land Ownership, Status, Use, and Access	283
Introduction.....	283
Social and Economic Contributions of Land Ownership, Status, Use and Access	283
Land Status and Ownership.....	284
Existing Patterns of Ownership.....	284
Changes in Ownership.....	288
Land Use	288
Other Land and Resource Plans.....	291
Access, Rights-of-Ways and Travel Patterns	301
Stakeholder Input	308
Summary of Findings for Land Ownership, Status, Use, and Access	310
CHAPTER 10 - Energy Resources, Mineral Resources, and Geologic Hazards	313
Introduction.....	313
Mineral Classifications	313
Current Extent of Energy and Energy Facilities	314
Abandoned Mine Lands and Geologic Hazards	321
Stakeholder Input	322
Summary of Findings for Energy and Minerals.....	322
References	323

List of Tables

Table 1. Comparison of the overall population density within the State of New Mexico and the four counties comprising the Lincoln NF area of influence. Source: U.S. Census Bureau, Decennial Census, 1980, 1990, 2000, and 2010, Summary File 1 (UNM BBER 2014).....	11
Table 2. Language spoken at home by respondents five years and older within the Lincoln NF area of influence, the State of New Mexico, and the United States. Data are presented as the percentage of the total population within a given area. Source: U.S. Dept. of Commerce. 2016. Census Bureau, American Community Survey Office (ACS), Washington, D.C. Data are calculated by ACS using annual surveys conducted during 2011-2015 and are representative of average characteristics during this period.	16
Table 3. Educational attainment of persons age 25 and older residing in the four counties of the Lincoln NF area of influence and within the State of New Mexico (percent composition). Source: U.S. Census Bureau, 1990 and 2000 censuses, Summary File 3 and American Community Survey, 2006-2010 5-year Estimates (UNM BBER 2014).....	17
Table 4. Components of employment change (expressed as number or jobs, includes full-time and part-time positions) within the Lincoln NF area of influence and the personal (real) income. Personal income figures are shown in real terms (i.e. adjusted for inflation) as of 2016. Personal income is reported by place of residence and employment by place of work. Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.	20
Table 5. Employment levels (number of jobs, includes full-time and part-time positions) by industry within the Lincoln NF area of influence between 1970 and 2000. Employment data are organized according to the Standard Industrial Classification and reported by place of work. Estimates for data that were not disclosed are indicated with tildes (~). Data Source: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.	21
Table 6. Employment levels (number of jobs, includes full-time and part-time positions) by industry within the Lincoln NF area of influence between 2001 and 2015. Employment data are organized according to the North American Industrial Classification System and reported by place of work. Estimates for data that were not disclosed are indicated with tildes (~). Data Source: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.	21
Table 7. Components of total personal income change from 1970 to 2015. All income data are presented in thousands of 2016 dollars and may not add to total personal income due to adjustments made by the Bureau of Economic Analysis. Data Source: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Tables CA05, CA05N & CA35.	26
Table 8. Total number of homes and percentage of homes located within the wildland-urban interface (WUI). Data Sources: Gude, P.H., Rasker, R., and J. van den Noort. 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. (Headwaters Economics 2017h).....	32
Table 9. Current contribution of the Lincoln National Forest to the regional economy, which includes Chaves, Eddy, Lincoln, and Otero Counties in New Mexico and El Paso County in Texas.	41
Table 10. Current contribution of the Lincoln National Forest by program area	42
Table 11. Fiscal year 2015 Payment in Lieu of Taxes (PILT) amounts received by the four counties within the Lincoln NF area of influence (Headwaters Economics 2017i).....	43

Table 12. Fiscal year 2015 Forest Service Revenue Sharing Payment amounts received by the four counties within the Lincoln NF area of influence (Headwaters Economics 2017i)	44
Table 13. Comparison of revenue from the 25% Fund and the Secure Rural School and Community Self-Determination Act programs for each of the counties within the Lincoln County area of influence	44
Table 14. Phase Sequences for the Jornada Mogollon.....	57
Table 15. Proposed Revised Phase Sequence for a portion of the Jornada Mogollon area.....	59
Table 16. Proposed Revised Phase Sequence for a portion of the Jornada Mogollon area.....	66
Table 17. Number of Historic Properties and National Historic Register Eligibility for the Lincoln NF.....	66
Table 18. Density of Historic Properties by District.....	67
Table 19. Number of Sites of Historic Property Types for the Lincoln NF	67
Table 20. Cultural Affiliation by the Number of Sites for the Ranger Districts of the Lincoln NF	67
Table 21. National Register Eligibility sites by ranger district.....	70
Table 22. Archaeology Sites (property affiliation types) by ERU System types	74
Table 23. Historic Property Cultural Affiliations by ERU System Type	74
Table 24. Percentage of historic properties per ERU, including percent of survey	75
Table 25. Number of Sites by Affiliation with Key ERUs.....	75
Table 26. Number of Sites by Site Damage Types.....	78
Table 27. Common Usage of Traditional Materials.....	84
Table 28. Lesser Usage of Traditional Materials	85
Table 29. Comparison of active, vacant and closed allotments in the Lincoln NF.....	96
Table 30. Grazing Data for the Lincoln NF 2015 (Source: NRM Database).....	97
Table 31. Permitted livestock numbers permitted in 2015 (rounded).....	99
Table 32. Cattle number, number of farms and ranches producing cattle, total number of farms and ranches in New Mexico, and cash receipts from cattle production for New Mexico and counties within the Lincoln NF area of influence (NMDA 2013 and USDA 2014). Note: values shown in () are percent of the four counties relative to the state value.....	102
Table 33. Economic effect of logging on the Lincoln NF.....	105
Table 34. Finished product sales of New Mexico’s primary wood products.....	105
Table 35. Payment receipts for 2015 from the Lincoln NF’s revenue (Headwaters Economics).....	106
Table 36. Suitable Timber, Fire Mortality (2000-2012) and Insect & Disease (2000 to 2016).....	111
Table 37. Hydrologic unit codes (HUCs) are nested within each other from largest to smallest geographic area and are represented by a two to twelve digit number	113
Table 38. Total regional water demand expressed in percent of use by county for 2010 in the Lower Pecos Valley Water Planning Region (Lower Pecos Valley Water Plan 2016).....	120
Table 39. Impaired water bodies in Context Area of the Lincoln National Forest Plan Assessment Report	127
Table 40 Big game species permits, applications, and take in 2015-2016.	133
Table 41 Other commonly-harvested small game on the Lincoln National Forest.....	139
Table 42. Angler participation in 2013.	143
Table 43 Sportsmen participation and expenditures in 2013.....	147
Table 44 Total number of jobs, income, and taxes generated from hunting and fishing in 2013	148
Table 45. Recreation Opportunity Spectrum Classes for the Lincoln NF.....	159
Table 46. Summary of Volunteer Hours and Costs, 2011-2016.....	171
Table 47. Recreation fees collected on Lincoln NF.....	173
Table 48. Visual quality objective definitions and acreage summary for the Lincoln National Forest	184
Table 49. NVUM Site Visit Numbers for Wilderness Areas (2007 and 2014).....	206
Table 50. Survey of Invasive Plants within the Wilderness Areas	212
Table 51. Location and characteristics of inventoried roadless areas on the Lincoln NF	221

Table 52. Proposed research natural areas on the Lincoln NF.....	231
Table 53. Burn Severity Acreages for the Telfer RNA.....	233
Table 54. Percentage of MSO Critical Habitat by ERU Type (greater than 10%)	238
Table 55. Percentage of MSO Critical Habitat Burned by Intensity	238
Table 56. Eligible Wild and Scenic Rivers for the Lincoln NF and their Eligibility Category.....	240
Table 57. Miles of National Forest System roads within the Lincoln NF by Operational and Objective Maintenance Levels.....	251
Table 58. Miles of roads within the Lincoln NF by Jurisdiction.....	256
Table 59. Miles of Trail Class by Designed Use	259
Table 60. Costs for Trails by Trail Class.....	263
Table 61. Facility condition rating	270
Table 62. Land Ownership by County by Acres.....	285
Table 63. Land Ownership by County by Percent of Total for 2016.....	285
Table 64. A snapshot of special use authorizations issued by the Lincoln NF.....	289
Table 65. Percentage of USFS Lands accessible by 1/4, 1/2 and 1 mile from open roads	302
Table 66. Mileage and Percentage of USFS Jurisdiction Roads Needing ROW Easement. Note: Percentages are based upon the mileage for each Operational Maintenance Level.....	304

List of Figures

Figure 1. Summary of comments received from the public	4
Figure 2. Four counties adjacent to the Lincoln NF.....	5
Figure 3. Planning unit vicinity.....	6
Figure 4. Vicinity Map of the Lincoln NF area of influence, which consists of Chaves, Eddy, Lincoln, and Otero Counties	10
Figure 5. Historical and projected population of Lincoln NF counties that comprise the area of influence. Source: U.S. Census Bureau, Decennial Census, 1980, 1990, 2000, and 2010; November 2012 population projection (UNM BBER 2014).	12
Figure 6. Historical and projected age distribution in the Lincoln NF area of influence. Source: U.S. Census Bureau, Decennial Census, 1990, 2000, and 2010 Summary File 1. New Mexico County population projections: July 1, 2020 to July 1, 2040; November 2012 population projections (UNM BBER 2014).	14
Figure 7. Comparison of Hispanic/Latino population percentages within the four counties comprising the Lincoln NF area of influence and the overall population percentage of New Mexico. Source: U.S. Census Bureau, Decennial Census, 1990, 2000, and 2010 Summary File 1 (UNM BBER 2014).	15
Figure 8. Racial composition of counties located within the Lincoln NF area of influence. Source: U.S. Census Bureau, Decennial Census 2010 Summary File 1 (UNM BBER 2014).	16
Figure 9. Education attainment of individuals age 25 or older within the Lincoln NF area of influence. Source: U.S. Census Bureau, Decennial Census, 1990 and 2000, Summary File 3 and American Community Survey, 2006-2010 5-year Estimates (UNM BBER 2014).	19
Figure 10. Average annual unemployment rate among the Lincoln NF area of influence counties and the State of New Mexico. Source: New Mexico Department of Workforce Solutions, Economic Research and Analysis Bureau, Table A (UNM BBER 2014).	20
Figure 11. Percent of total private employment in industries that includes travel and tourism, in 2015, within the Lincoln NF area of influence. Data Sources: U.S. Department of Commerce. 2017. Census Bureau, County Business Patterns, Washington, D.C. (Headwaters Economics 2017e).	23
Figure 12. Aggregate household income (expressed in real 2010 millions of dollars) of the four counties located within the Lincoln NF area of influence. Data Source: U.S. Census Bureau, 1990 and 2000 censuses, Summary File 3 and American Community Survey, 2006-2010 5-Year Estimates (UNM BBER 2014).	24
Figure 13. Household income distribution (expressed as percent of household incomes) within the Lincoln NF area of influence. Note: income values have not been adjusted for inflation. Data Source: U.S. Census Bureau, 1990 and 2000 censuses, Summary File 3 and American Community Survey, 2006-2010 5-Year Estimates.	25
Figure 14. Per capita income within the Lincoln NF area of influence. Data Source: U.S. Census Bureau, 1990 and 2000 censuses, Summary File 3 and American Community Survey, 2006-2010 5-Year Estimates (UNM BBER 2014).	27
Figure 15. Poverty rates of Hispanic and Non-Hispanic groups from 1989 to 2010. Data Sources: U.S. Census Bureau, 1990 and 2000 censuses, Summary Files 3; 1990 Census of Population, Social, and Economic Characteristics: New Mexico, 1990 CP-2-33; and American Community Surveys, 2006-2010 5-Year Estimates (UNM BBER 2014).	28
Figure 16. Percent of poverty among racial groups within the Lincoln NF area of influence. Data Sources: U.S. Census Bureau, 1990 and 2000 censuses, Summary Files 3; 1990 Census of Population, Social, and Economic Characteristics: New Mexico, 1990 CP-2-33; and American Community Surveys, 2006-2010 5-Year Estimates (UNM BBER 2014).	28

Figure 17. Number of vacant houses for seasonal or recreational use within the four counties of Lincoln NF area of influence.....	30
Figure 18. Percent of the wildland-urban interface with and without homes within the four counties of the Lincoln NF area of influence and the State of New Mexico. Data Sources: Gude, P.H., Rasker, R., and J. van den Noort. 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. (Headwaters Economics 2017h).....	31
Figure 19. Inflation adjusted total gross receipts collected for the Lincoln National Forest from 1986 to 2016	45
Figure 20. Inflation adjusted total gross receipts collected by source for the Lincoln National Forest from 2001 to 2016. Note: From 1986 - 2000 the U.S. Forest Service provides only total receipts. Beginning in 2001, receipts are broken out by source. These data do not include receipts deposited into special accounts and trust funds available to the Forest Service without additional appropriation by Congress.	45
Figure 21. Range allotment status on Lincoln NF.....	98
Figure 22. Distribution of Types of Grazing Use.....	100
Figure 23. Trends of authorized animal unit months (AUMs) from 2006-2015.	101
Figure 24. Average total volume of saw timber cut and sold on the Lincoln NF, 1986-2014.....	104
Figure 25. Suitable Timber Types (Wilderness Area Vegetation Removed)	110
Figure 26. Predicted Basal Area Loss due to Insect and Disease (2013-2027).....	112
Figure 27. The Lincoln National Forest lies partially within six sub-basins (HUC 4) as shown above.	115
Figure 28. Water wells on and around Lincoln NF	118
Figure 29. Total 2010 water use (597,279 acre-feet) by category in the Lower Pecos Valley Water Planning Region (NMISC 2016a). Note: Tribes and Pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.	120
Figure 30. Illustration of the total projected regional water demand for the Lower Pecos Valley region, under high and low demand scenarios, with normal administrative water supply and the drought-adjusted water supply estimates (NMISC 2016a).	123
Figure 31. Total water use (32,814 acre-feet) by category in the Tularosa-Sacramento-Salt Basins Water Planning Region in 2010 (NMISC 2016b). Note: Tribes and Pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.....	124
Figure 32. Depiction of the total projected regional water demand for the Tularosa-Sacrament-Salt Basins region, under high and low demand scenarios, with normal administrative water supply and the drought-adjusted water supply estimates (NMISC 2016b).....	125
Figure 33. Watershed Condition Class ratings for the Lincoln NF.....	130
Figure 34. Game Management Units of the Lincoln NF.	135
Figure 35. Recreation Site Niches for the Lincoln NF	155
Figure 36. Recreation Opportunity Spectrum on the Lincoln NF.....	157
Figure 37. Recreation sites on the Lincoln NF.....	169
Figure 38. Recreational visitation by activity.....	176
Figure 39. Percentage of Lincoln NF visits by age	177
Figure 40. Dispersed Camping and Vegetation Types	180
Figure 41. White Mountain Wilderness and Capitan Mountains Wilderness, examples of very high existing scenic integrity.....	186
Figure 42. National Forest System Road 540, an example of high existing scenic integrity.....	186
Figure 43. Black Bear Group Campground, an example of moderate existing scenic integrity.....	187

Figure 44. Wofford Communication Site, an example of low existing scenic integrity.....	188
Figure 45. Ski Apache, an example of very low existing scenic integrity.....	188
Figure 46. Designated areas in the four county assessment area	201
Figure 47. Map of the White Mountain Wilderness Area with the Little Bear Fire.	208
Figure 48. Map of the Capitan Wilderness Area with the Peppin Fire	211
Figure 49. Guadalupe Escarpment Wilderness Study Area	215
Figure 50. Roadless areas on the Lincoln NF.....	224
Figure 51. A large room and lake beneath the Guadalupe Ranger District. Note: Caver in blue shirt at left/center for scale.	226
Figure 52. Critical habitat designated on the Lincoln NF.....	237
Figure 53. Eligible Wild and Scenic Rivers on the Lincoln NF.....	242
Figure 54. Transportation Budget From 2006-2016.....	254
Figure 55. Trail Design Use for the Smokey Bear RD.....	260
Figure 56. Trail Design Use for the Sacramento Ranger District.....	261
Figure 57. Trail Design Use for the Guadalupe Ranger District.....	262
Figure 58. Trail Classes of the Smokey Bear Ranger District.....	264
Figure 59. Trail Classes of the Sacramento Ranger District	265
Figure 60. Trail Classes of the Guadalupe Ranger District	266
Figure 61. Lincoln NF Administrative Facilities	275
Figure 62. Percent of land ownership by major land owners in four-county area. Note: If percentage is less than 0.5, it is not represented in this figure.	286
Figure 63. Surface Ownership for the Four County Area.....	287
Figure 64. Roads without Right-of-Way Easements for the Smokey Bear RD.....	305
Figure 65. Roads without Right-of-Way Easements for the Sacramento RD.....	306
Figure 66. Roads without Right-of-Way Easement for the Guadalupe RD	307
Figure 67. Non-renewable mineral resources on the Lincoln NF.....	317

List of Commonly used Acronyms

ATV	All Terrain Vehicle
BASI	Best Available Scientific Information
BBER	Bureau of Business and Economic Research
BISON	Biota Information System of New Mexico
BLM	Bureau of Land Management
BMP	Best Management Practice
CAA	Clean Air Act
CCC	Civilian Conservation Corps
CFR	Code of Federal Regulations
CFRP	Collaborative Forest Restoration Program
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of Interior
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERU	Ecological Response Unit
FAR	Functioning at Risk
FSH	Forest Service Handbook
FWS	Fish & Wildlife Service
FY	Fiscal Year
HUC	Hydrologic Unit Code
IMPROVE	Interagency Monitoring of Protected Visual Environments
MCD	Mixed Conifer, with Frequent Fire
MCW	Mixed Conifer, with Aspen
MDN	Mercury Deposition Network
MOU	Memorandum of Understanding
MSG	Montane Subalpine Grassland
MVUM	Motor Vehicle Use Map
NEI	National Emission Inventory
NEPA	National Environmental Policy Act
NF	National Forest
NFMA	National Forest Management Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NM	New Mexico
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMED-AQB	New Mexico Environment Department, Air Quality Bureau
NMOCD	New Mexico Oil Conservation Division
NMOSE	New Mexico Office of the State Engineer
NPS	National Park Service

NRHP	National Register of Historic Places
OHV	Off-Highway Vehicle
ONRW	outstanding natural resource water
PILT	Payment in lieu of taxes
PJO	Piñon-Juniper Woodland
PJS	Piñon-Juniper Sagebrush
PPF	Ponderosa Pine Forest
RD	Ranger District
RHR	Regional Haze Rule
RMP	Resource Management Plan (Bureau of Land Management document)
RNA	Research Natural Area
ROD	record of decision
ROS	Recreation Opportunity Spectrum
SCC	Species of Conservation Concern
SEINet	Southwest Environmental Information Network
SFF	Spruce-Fir Forest (ecological response unit)
SMS	Scenic Management System
SYFMA	Sustained Yield Forest Management Act
TCP	traditional cultural properties
TES	Terrestrial Ecosystem Survey
TEU	terrestrial ecosystem unit
USDA	United States Department of Agriculture
UMCW	Upper Montane Conifer-Willow (riparian ecological response unit)
USGS	US Geological Survey
VDDT	Vegetation Dynamics Development Tool
WPA	Works Progress Administration
WQCC	Water Quality Control Commission
WUI	Wildland-Urban Interface

CHAPTER 1 - Socioeconomic Assessment Introduction

Purpose

Volume II: Socioeconomic Resources of the Lincoln National Forest Assessment Report addresses the social, cultural, and economic resources of the Lincoln National Forest (NF), in other words, the ways in which humans interact with and use the Lincoln NF (e.g., recreation, roads, wood products, scenery). The topics here assess the current condition of the social and economic resources on the Forest, the trends impacting those resources, and the ability of the Lincoln NF to continue to provide these resources into the future.

The Lincoln (NF) not only provides ecological sustainability through the natural resources the forest manages, but it also contributes to social and economic sustainability as they relate to the human environment. This means that people are just as affected by forest management as are the forest resources that are managed by the Forest Service. For example, people benefit either directly or indirectly by the multiple uses, ecosystem services, and Forest Service management and presence the Lincoln NF provides. Local communities, surrounding areas, and visiting publics all gain some benefit or hold expectations as to what the forest can offer them, in terms of livelihoods, traditional uses, clean air and water, forest products, and recreation, just to name a few. As such, this chapter of the assessment report focuses on the human dimension side of forest management and offers a comprehensive approach to the assessment, alongside the ecological analysis in Volume I.

The management of the Lincoln NF contributes to social and economic sustainability by maintaining a set of desired social, cultural, and economic conditions within the forest and by providing certain contributions to the broader landscape outside the forest. These contributions are primarily the provision of multiple uses and ecosystem services, infrastructure, and the direct management operations of the Lincoln NF. In turn, these contributions affect social, economic, and cultural conditions in a broader area of influence outside of the forest. Since land management planning only relates to making decisions about how to manage the national forest, understanding how management of the forest contributes to or affects social, economic, and cultural conditions in the broader area of influence is the focus for evaluating social and economic sustainability.

In this context, economic sustainability refers to the capability of producing goods and services, including contributions to jobs and market and nonmarket benefits. Social sustainability refers to the capability of the forest to support the network of relationships, traditions, culture, and activities that connect people to the land and to one another, and support vibrant communities. The assessment uses existing information to determine forest influences and contributions, the sustainability of these contributions, and any trends or risks related to influences or contributions.

Sustainability of Social, Cultural, and Economic Systems

In the same way the social, cultural, and economic conditions within the plan area influence the Lincoln NF, the Forest influences the social, cultural, and economic conditions in the plan area, as well as the broader landscape. Management of the Lincoln 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. The key social, cultural, and economic conditions for the assessment are those conditions that

are influenced by the management of the plan area and the likely components of the land management plan.

Structure of the Socioeconomic Assessment

The Lincoln NF is responsible for sustainable management of ecological resources within its boundaries, and the ecosystem services provided by those resources. This means that people are just as affected by forest management as are the ecological resources that are managed by the Forest. People benefit, either directly or indirectly from multiple use of forest resources. The plan area has a long human history of occupation that precedes the establishment of the Lincoln NF. Native American, Hispanic and Anglo-American traditional communities continue to use the Forest for economic, social and cultural purposes. Local communities, surrounding areas and visitors all gain some benefit and have expectations of what the Lincoln NF can offer them in terms of livelihoods, traditional uses, clean air and water, forest products and recreation to name a few. This section of the report focuses on the human dimension of forest management, and when considered hand in hand with the ecological analysis, provides for a comprehensive assessment.

Chapter Organization

Within this volume, the Lincoln NF will present information on the following subjects:

- Cultural and Historical Heritage
- Areas of Tribal Importance
- Socio-Economics
- Multiple Uses
- Recreation
- Designated Areas
- Infrastructure
- Lands
- Energy and Minerals

The management of the Lincoln NF contributes to social and economic sustainability by maintaining a set of desired social, cultural and economic conditions within the Forest and beyond the Forest boundary that benefit people. Since this forest planning effort informs decisions about how to manage the Lincoln NF, understanding how that management contributes to, or affects social, economic and cultural conditions in this area of influence is the focus for evaluating sustainability. The Lincoln NF area of influence is comprised of the four counties that contain the Lincoln NF within their boundaries: Otero, Lincoln, Eddy, and Chavez Counties. Areas beyond these four counties are part of the broader landscape where Forest contributions can affect a specific interest, but do not fundamentally affect the social, cultural, and economic conditions.

Public Involvement

Comments, concerns, issues and management suggestions have been received associated with plan revision since our initial March 2015 kickoff public meetings. A summary of all comments received including letters, survey responses and emails will be shown near the end of each chapter. Also presented are the survey results to analyze stakeholder comments on condition and trend. They are presented immediately preceding the overall trend section so that as we move forward in determining “what needs to change”, all of these comments are easy to reference.

March 2015 Public Meetings

At this initial meeting we asked a number of questions all pertaining to what your expectations would be and three overarching areas were expressed; transparency, communicate, track comments.

Transparency in all aspects was critical and to support this the Lincoln NF placed on its website all documents created throughout the process. To help communicate better, the second large concern, a newsletter was produced quarterly to help show our progress, delays, news, information and what to expect. Also associated with communication was the need to find more frequent and more involved forms of sharing ideas and information in a new way. This latter form of communication is slowly being worked on and progressing and mostly has an overarching impact forest-wide and slightly out of the scope of plan revision. The third request was to show the public what the forest does with their comments.

November 2016 Public Meetings

During the second set of public meetings we wanted the Lincoln NF stakeholder's opinions on what their issues or concerns were and, in particular, what the conditions were in the past, are in the present and what they felt it would be in the future. These issues were assigned one or more of the 15 areas of interest, a tracking number and an issue sub-grouping to facilitate analysis.

Figure 1 shows the tallied results of these comments. In many cases, one issue or concern spanned more than one category which is reflected in the tabular results. A tracking system was developed through Microsoft access to give each survey response a unique number and carried through when summarized. Individual responses (redacted for privacy purposes) were posted on the web site along with summaries of all issues and concerns showing the response number. The top three set of comments were recreation, infrastructure and multiple uses. These results are further analyzed within each chapter of Volume II.

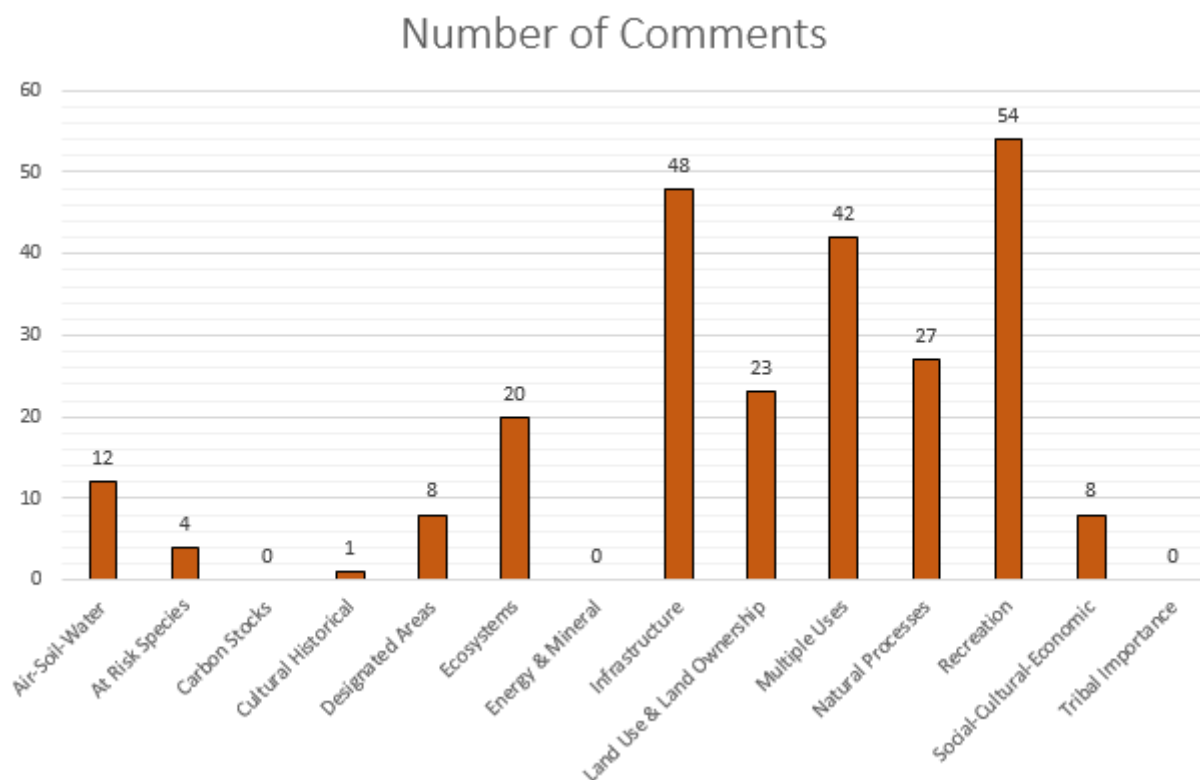


Figure 1. Summary of comments received from the public

Scale of Analysis

This chapter presents socioeconomic and land use information for the Lincoln NF area of influence (AOI). This 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 Lincoln NF, forest visitors and stakeholders, and the social and economic demands that influence forest management.

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).

There are two basic scales used to analyze the socioeconomic factors:

1. **Four County Area**
2. **Planning Unit Area**

The Four County Area are those counties immediately surrounding the forest: Chavez, Eddy, Lincoln and Otero Counties (Figure 2). 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 the Lincoln NF occur in these counties.

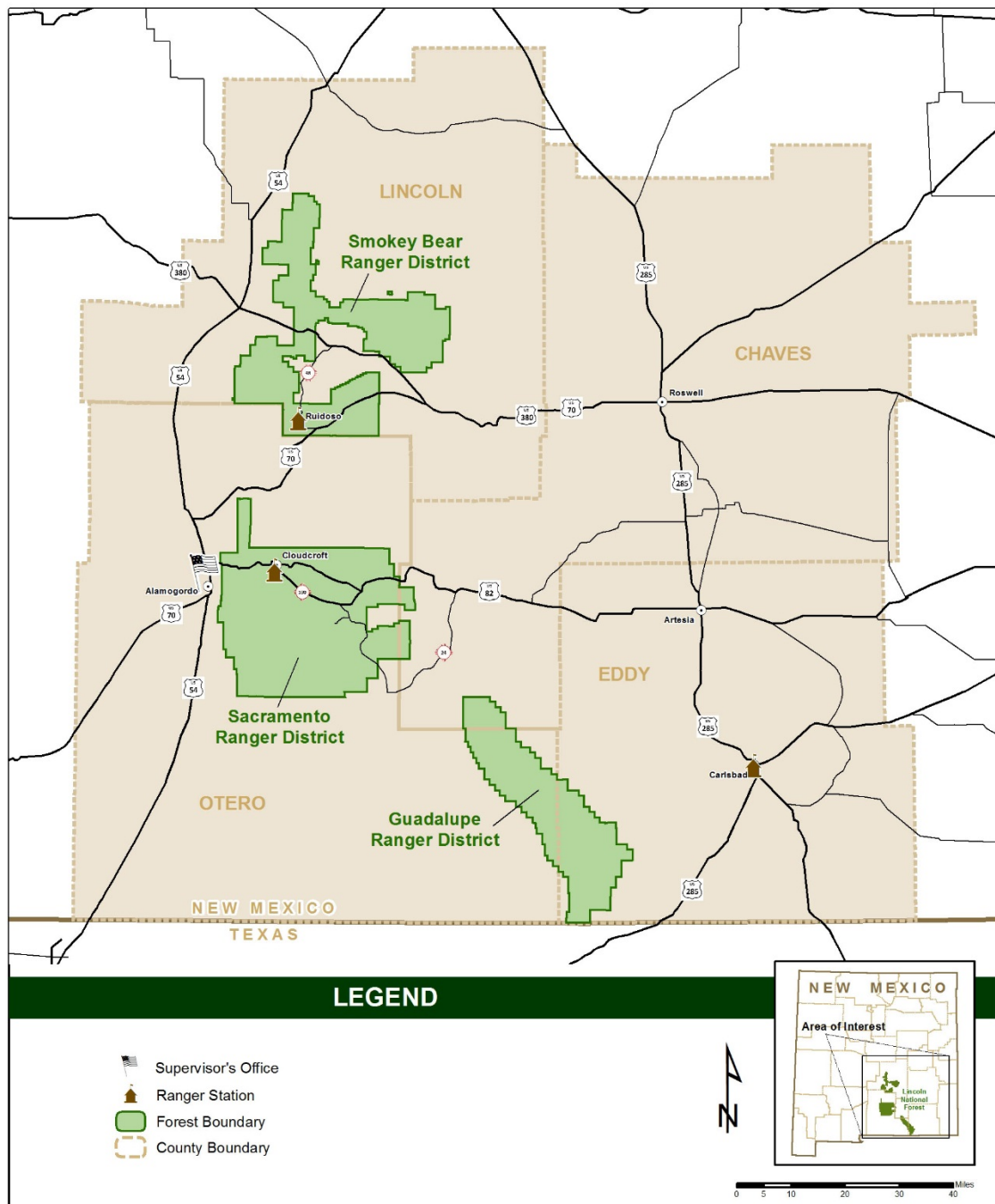


Figure 2. Four counties adjacent to the Lincoln NF

The Planning Unit Area encompasses lands within the boundary of the Lincoln NF itself (Figure 3). In some instances, such as recreation, there is data such as Recreation Opportunity Spectrum that is only available within this planning unit and must be analyzed within this area. Unless noted otherwise, condition and trend information will be presented within this scale as these are the only areas that the Lincoln NF oversees and influence directly with management decisions.

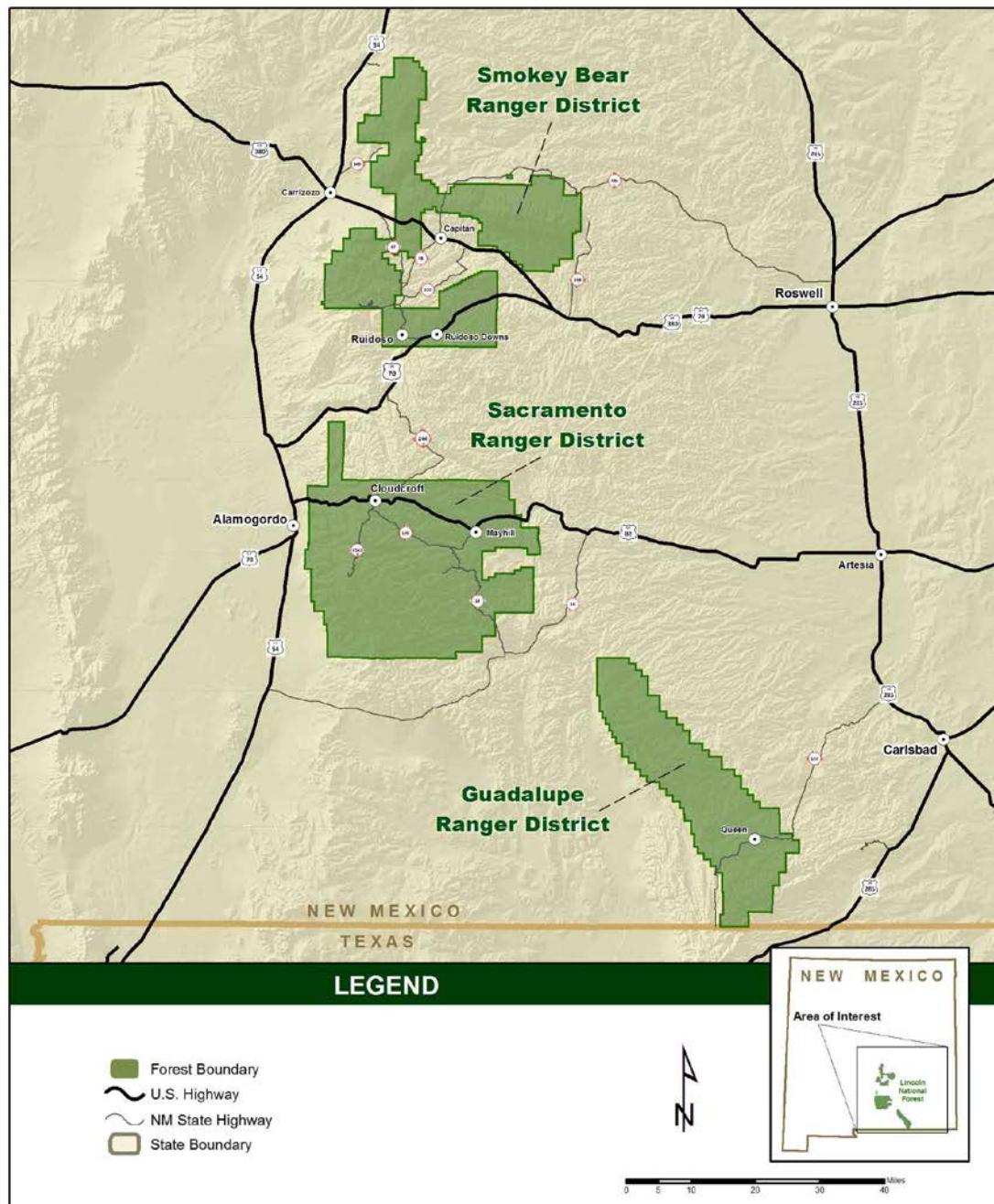


Figure 3. Planning unit vicinity

Data, Methods and Scales of Analysis

For the purpose of this assessment, a four county “assessment area” was selected for analysis, unless noted otherwise. Collectively, Chavez, Eddy, Lincoln, and Otero counties best represent the relationship of current Forest Service management and the communities the Lincoln NF serves. These counties benefit from having the Lincoln NF close by for activities such as recreation, wood product harvesting, and livestock grazing.

Ecosystem Services Framework

In Volume I of this combined Lincoln 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. Volume II 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 I. Because of that dependence, risks to sustainability noted in Volume I will also apply to these associated benefits. Additional risk factors identified in Volume II, however, are also highlighted in brief ecosystem services summaries at the end of appropriate sections.

Within the Human Systems of Ecosystem Services Framework are two principle services:

- **Cultural Services:** Land use, aesthetic values, spiritual and religious values, recreation and ecotourism
- **Provisioning Services:** Forage, livestock, forest products and fresh water

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 when the Lincoln NF starts to draft the “Need for Change” statements.

CHAPTER 2 - Social, Cultural, and Economic Conditions

Introduction

One of the most unique characteristics of southwestern New Mexico is its diversity of people, culture, traditions, and values. The information in this chapter describes the area's demographics illustrating the area's diversity; and highlighting the social, cultural, and economic conditions and trends. Social and cultural sustainability refer to the capability of the Lincoln NF to support the network of relationships, traditions, culture, and activities that connect people to the land and to one another to support resilient communities. Economic sustainability refers to the capability of the Lincoln NF to produce goods and services, including contributions to jobs and market and nonmarket benefits.

The Lincoln National Forest (Lincoln NF) consists of approximately 1.1 million acres of National Forest Systems land that is divided into three Ranger Districts: the Smokey Bear Ranger District, Sacramento Ranger District, and the Guadalupe Ranger District. The Lincoln NF is located, in whole or in part, within four counties in south-central New Mexico, including: Chaves, Eddy, Lincoln and Otero Counties. Within these four counties, the largest incorporated areas are Roswell (Chaves County), Alamogordo (Otero County), Carlsbad (Eddy County), and Artesia (Eddy County); all other incorporated areas have populations of less than 10,000 (as of the 2000 Census). To accurately portray the relationship of Lincoln NF and the surrounding communities, the demographic and economic statistics presented in this chapter are within the context of a multi-county *area of influence*, which is the area where the management of the plan area substantially affects social, cultural, and economic conditions (FSH 1909.12, section 13.21). The area of influence concept recognizes that the Forest provides contributions and has effects outside the Forest boundary. The Lincoln NF area of influence is comprised of the four counties that contain the Lincoln NF within their boundaries: Otero, Lincoln, Eddy, and Chaves counties (Figure 4). Areas beyond these four counties are part of the broader landscape where Forest contributions can affect a specific interest, but do not fundamentally affect the social, cultural, and economic conditions.

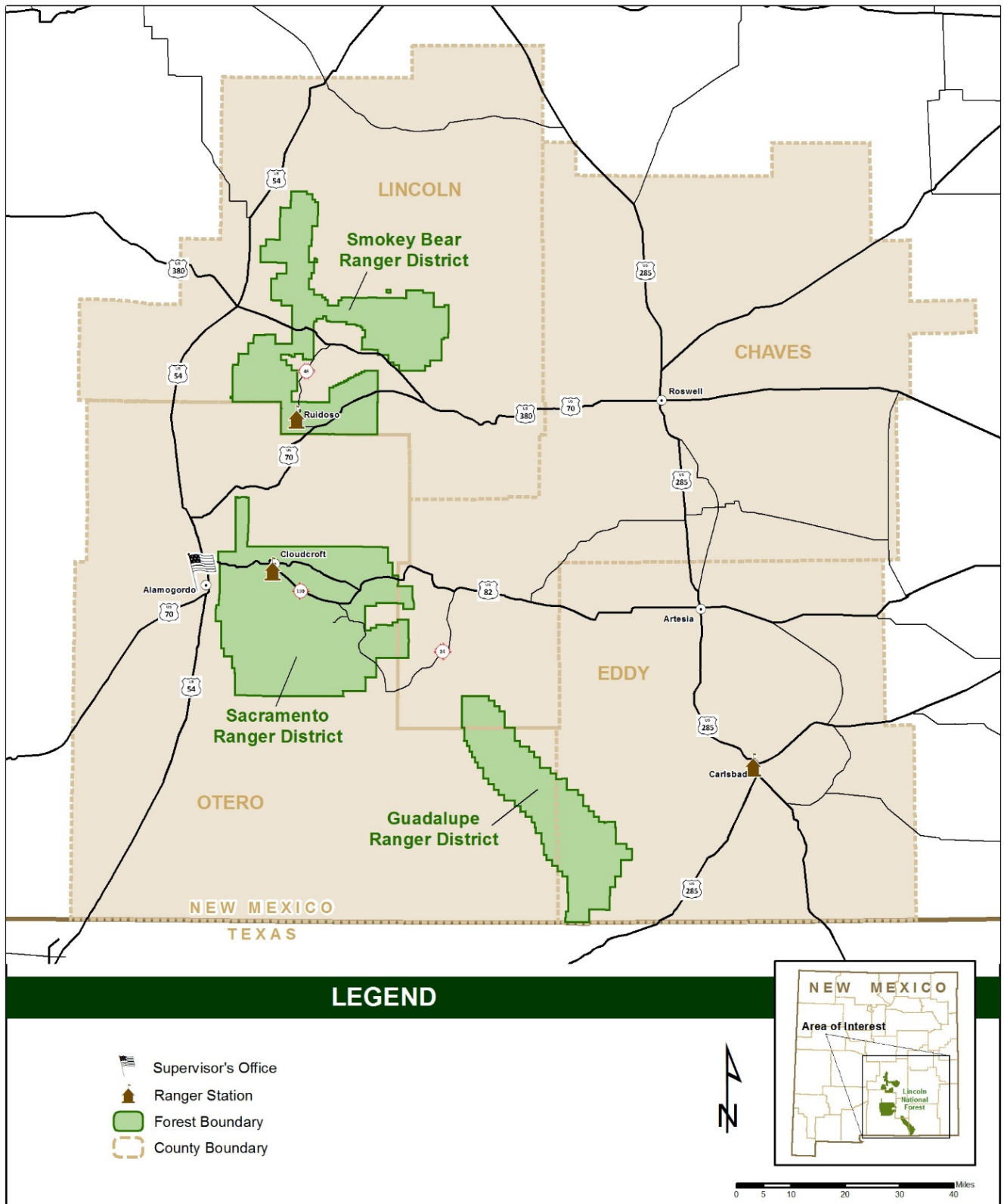


Figure 4. Vicinity Map of the Lincoln NF area of influence, which consists of Chaves, Eddy, Lincoln, and Otero Counties

Population Statistics

Population Density

Compared to other states, New Mexico has a relatively small population, ranking 36th in the nation with a little over 2 million people (UNM BBER 2014, Headwaters Economics 2017a and 2017b). In addition to having a small population, New Mexico's land area is large, resulting in a low average population density. As of 2010, the population density state-wide was only 17 people per square mile. Only four states have lower population densities: Alaska, Montana, North Dakota, and Wyoming.

The four counties that comprise the Lincoln NF area of influence (Otero, Lincoln, Eddy, and Chaves Counties) are predominantly rural counties. Together, these counties contain approximately 11 percent of the population of New Mexico; and, in 2010, the average population density was roughly 60 percent of the state's average, with 9 people per square mile (Table 1) (UNM BBER 2014).

Table 1. Comparison of the overall population density within the State of New Mexico and the four counties comprising the Lincoln NF area of influence. Source: U.S. Census Bureau, Decennial Census, 1980, 1990, 2000, and 2010, Summary File 1 (UNM BBER 2014).

Population Density			
Geographic Area	1990	2000	2010
Chaves	9.5%	10.1%	10.8%
Eddy	11.6%	12.4%	12.9%
Lincoln	2.5%	4.0%	4.2%
Otero	7.8%	9.4%	9.6%
New Mexico	12.5%	15.0%	17.0%

While the populations of Chaves, Eddy, and Otero Counties are all similarly sized, the population of Lincoln County is notably smaller. As of 2000, the communities within the area of influence with the largest populations were Roswell in Chaves County (pop. est. 45,293), Alamogordo in Otero County (pop. est. 35,582), and Carlsbad and Artesia in Eddy County (pop. est. 25,625 and 10,692, respectively). All other communities within the area of influence had populations of less than 10,000 individuals (UNM BBER 2007).

Population Growth

Nonetheless, the state's population grew more rapidly than that of the United States, between 1980 and 2010. New Mexico's population grew by approximately 16 percent (1980-1990), 20 percent (1990-2000), and 13 percent (2000-2010) during the last three decades. In comparison, the U.S. population grew at approximately 10, 13, and 10 percent during these same time periods. In the current decade (2010-2020) population increases have slowed for both New Mexico and the U.S., which are both estimated at 4 percent (UNM BBER 2014, Headwaters Economics 2017a and 2017b).

Within New Mexico, the population growth rate varied greatly among counties between 2000 and 2010 with some experiencing population increases and others decreases. Population declines occurring during these years is partially attributed to the Great Recession, which was a period of severe economic decline in 2008 and 2009 due to a housing market correction and subprime mortgage crisis. During the Great Recession many people moved to find work (UNM BBER 2014).

From 1980 to 2000, the population within the area of influence increased by about 40,000 individuals. However population growth within the four-county area was highly uneven. The greatest amount of growth occurred in more sparsely populated areas of Lincoln and Otero Counties, where the largest swaths of national forest land is located. During this time, the populations of Lincoln and Otero Counties increased by 47 percent. By comparison, Chavez and Eddy Counties collectively increased by only 14 percent from 1980 to 2000. The rapid population expansion of Otero and Lincoln Counties is at least partially explained by relocation of retirees or partial retirees attracted by the mountains and recreational amenities (UNM BBER 2007). Although the growth rate is expected to diminish in all four counties after 2010 (along with the overall state trend), the population projection for the area of influence is predicted to increase by 6 percent between 2010 and 2030. However, population growth is expected to be most prevalent in Lincoln County (Figure 5) (UNM BBER 2014).

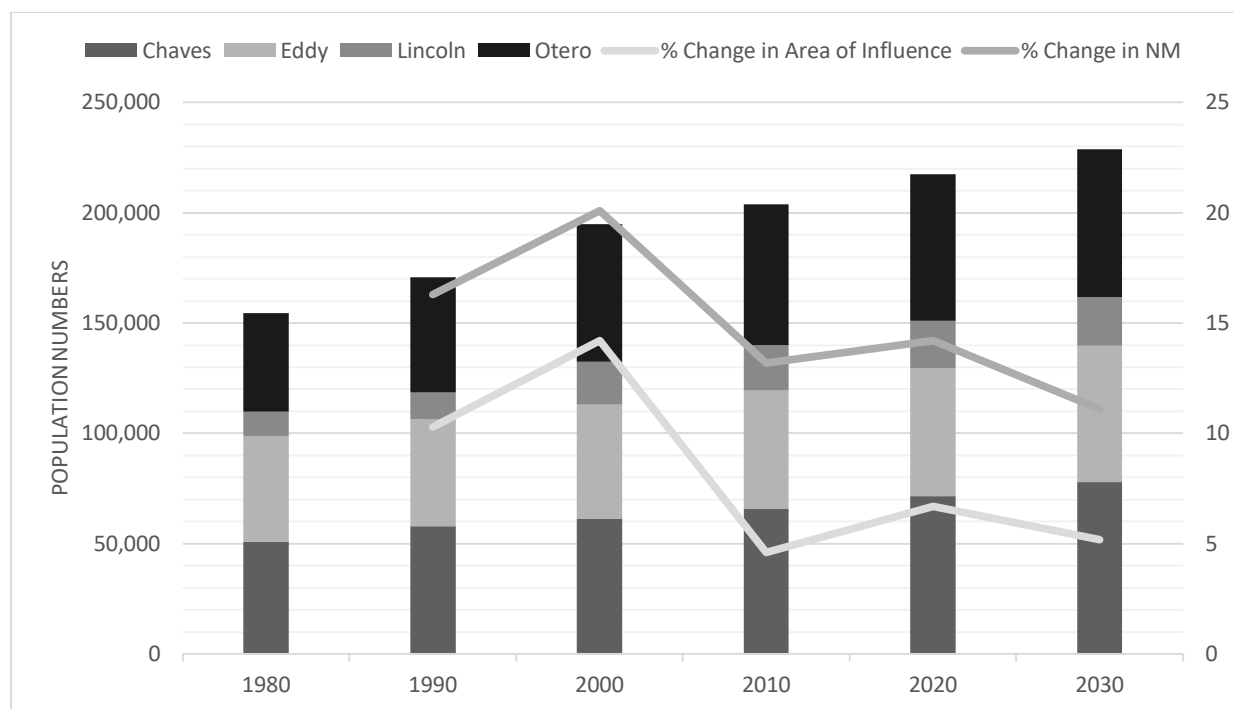


Figure 5. Historical and projected population of Lincoln NF counties that comprise the area of influence. Source: U.S. Census Bureau, Decennial Census, 1980, 1990, 2000, and 2010; November 2012 population projection (UNM BBER 2014).

Net Migration

Migration has played a relatively minor role in New Mexico's population growth. Net in-migration to New Mexico was approximately 150,000 people between 1990 and 2000, and approximately 100,000 people between 2000 and 2010. Likewise, net movements in and out of Chaves and Eddy Counties have been minimal. Conversely, Lincoln and Otero Counties have both experienced significant amounts of net in-migration between 1990 and 2000 (approximately 6,700 and 5,000 individuals, respectively). For Lincoln County, this level of increase represented more than 50 percent of the county's 1990 population. However, during the decade of the Great Recession (2000-2010) net in-migration fell dramatically in both Lincoln and Otero Counties. In fact the decline was so dramatic in Otero County that it resulted in net out-migration; thereby affecting migration levels of all Lincoln NF Ranger Districts (UNM BBER 2014). Net out-migration and minimal net in-migration are likely to continue as the area slowly recovers from the Great Recession.

Gender and Age Distribution

The gender makeup of the area of influence (50.4 percent male; 49.6 percent female) is not significantly different than the State of New Mexico (49.5 percent male; 50.5 percent female), or the United States (49.2 percent male; 50.7 percent female) (Headwaters Economics 2017a and 2017b). Furthermore, changes in the age structure of New Mexico's population are similar to that of the United States. The younger population (14 and under) steadily declined between 1990 and 2010 (from 25 to 21 percent), while the portion that is age 65 or older steadily increased from 11 to 13 percent. These trends are expected to continue and current projections estimate that by 2030, those aged 14 and under will comprise 20 percent of New Mexico's population, and individuals age 65 and older will comprise 21 percent. Between 1990 and 2010, the portion of New Mexico's working age population (ages 15 to 64) grew from 64 to 66 percent; however, this figure is expected to decline to 60 percent by 2030 (Figure 6) (UNM BBER 2014).

Within the Lincoln NF area of influence, the age structures of Chaves, Eddy, and Otero Counties are relatively similar to each other with approximately 22 percent of the population in the younger age class (14 and under), 64 percent represents the working age class (15 to 64), and 14 percent is age 65 or older. Furthermore, these percentages are reflected in the overall age structure of the area of influence despite the fact that the age structure of Lincoln County has a much smaller percentage of the younger age class (15 percent) and a larger proportion of individuals ages 65 or older (22 percent).

Nonetheless, the overall age of the area's population is expected to slowly increase through at least 2030. This may be partially attributed to the fact that while Chaves, Eddy, and Otero Counties have mid-sized populations and cities, they also have less economic activity and diversity than urban centers in the state. Therefore, limited opportunities for employment may force some younger people to migrate to larger cities with more diversified economic bases. In addition, a nominal increase in the 65 or older age group may be attributed to the popularity of Lincoln County as a retirement destination (UNM BBER 2014).

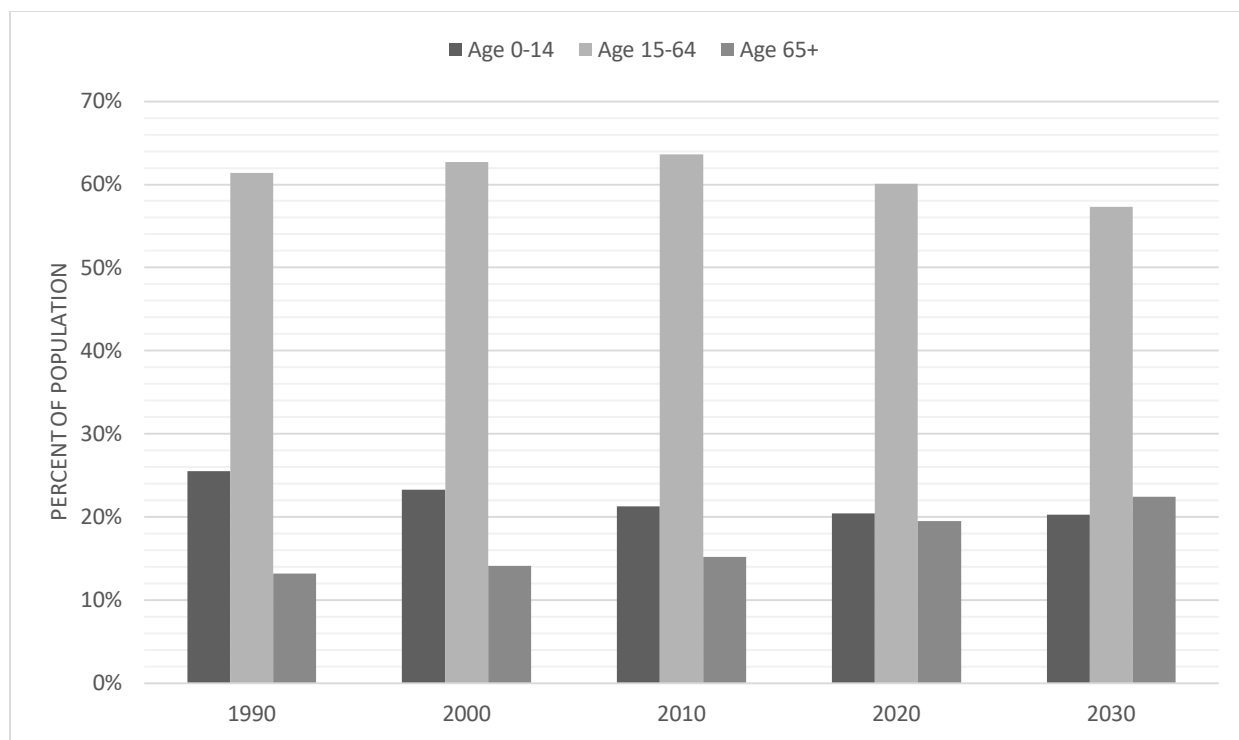


Figure 6. Historical and projected age distribution in the Lincoln NF area of influence. Source: U.S. Census Bureau, Decennial Census, 1990, 2000, and 2010 Summary File 1. New Mexico County population projections: July 1, 2020 to July 1, 2040; November 2012 population projections (UNM BBER 2014).

Racial Composition and Diversity

Cultural diversity is rich and evident in New Mexico. In 2000, New Mexico became a majority-minority state, with a total minority population exceeding that of the White, Non-Hispanic population (UNM BBER 2007). The portion of the New Mexico population that identified themselves as “Hispanic” increased from 38 to 46 percent between 1990 and 2010. At the same time, the portion of the state population that self-identified as “White” decreased from 76 to 68 percent and has been off-set by slight increases among other racial groups (UNM BBER 2014). The proportion of American Indians increased between 1990 and 2000, and was last estimated at 9 percent in 2010. By comparison, the population within the Lincoln NF area of influence is consistently more predominately White and less predominately American Indian than the overall racial composition of New Mexico.

Population trends for race and ethnicity varied by county within the area of influence. Although the ethnic composition of Chaves and Eddy Counties are overall quite similar to the whole of New Mexico, Lincoln and Otero Counties have fewer Hispanics and Latinos (30 and 35 percent in 2010) than the overall population of New Mexico (46 percent in 2010). Generally speaking, the counties within the area of influence have become more predominantly Hispanic or Latino over the past three decades and this is a trend that is expected to continue (Figure 7) (UNM BBER 2014).

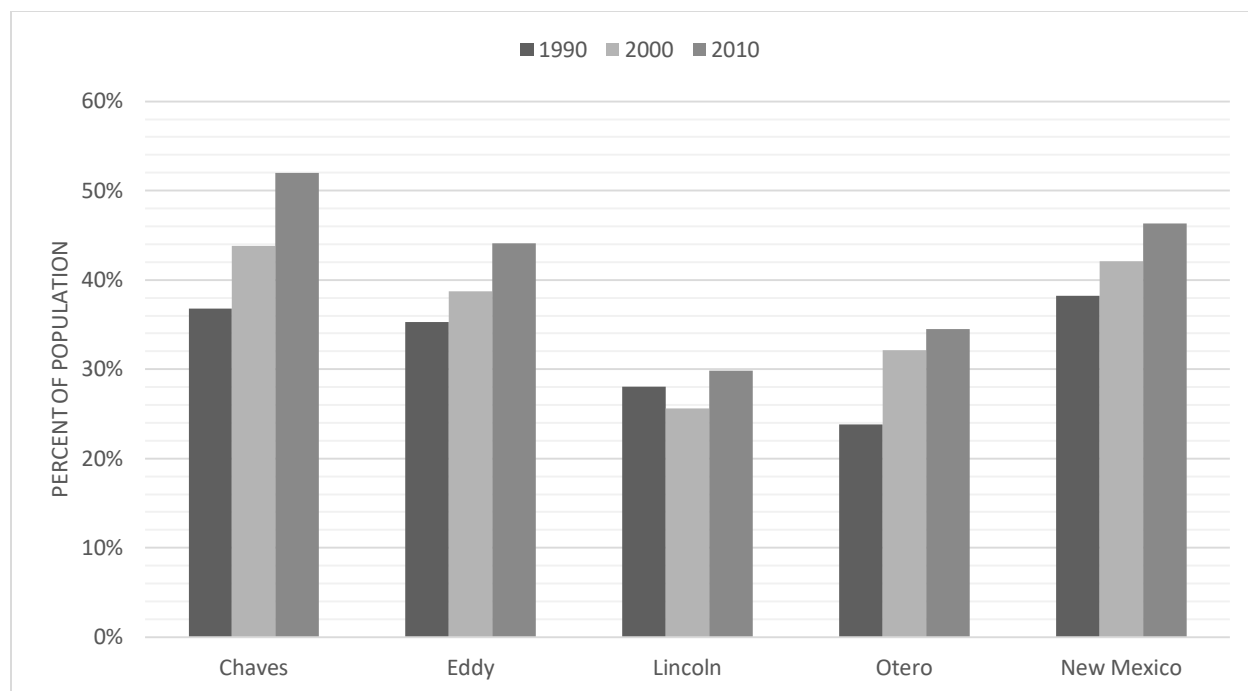


Figure 7. Comparison of Hispanic/Latino population percentages within the four counties comprising the Lincoln NF area of influence and the overall population percentage of New Mexico. Source: U.S. Census Bureau, Decennial Census, 1990, 2000, and 2010 Summary File 1 (UNM BBER 2014).

However, the only exception to this trend occurred in Lincoln County between 1990 and 2000, when the population exhibited a marked increase in the number of non-Hispanic retirees. As a result, Lincoln County is more predominately White and has smaller portions of other races. In contrast, Otero County has the most diverse population of the four counties (Figure 8). Otero County, home of the Mescalero Apache, also has the greatest proportion of American Indians of the four counties. When applied to the Lincoln NF at the district-level, these same racial compositions are reflected in each district. For example, the Guadalupe and Sacramento Ranger Districts have consistently had similar ethnic compositions, while the Smokey Bear Ranger District has been more predominately non-Hispanic. Furthermore, the racial compositions of the three districts are more similar than the ethnic compositions. Only the "Other Alone" racial category is notably different across the three districts; relative to the Guadalupe and Sacramento Districts, a smaller portion of the Smokey Bear Ranger District population self-identifies as "Other Alone" (Figure 8) (UNM BBER 2014).

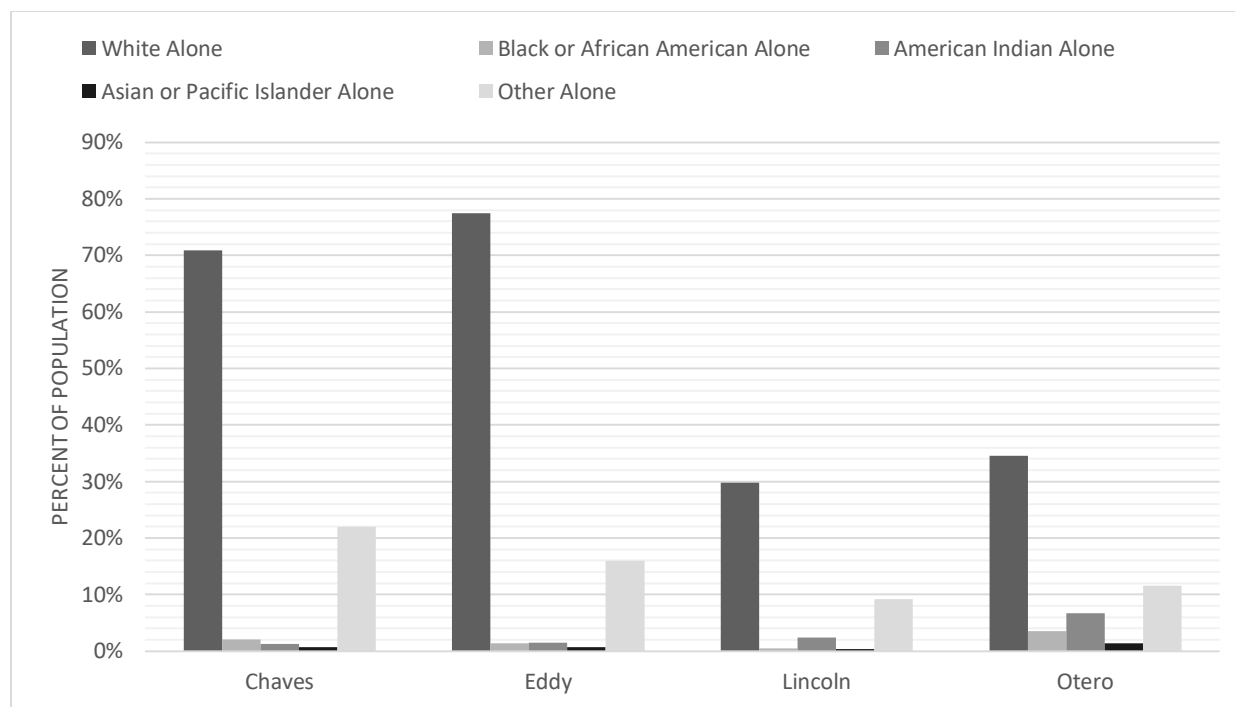


Figure 8. Racial composition of counties located within the Lincoln NF area of influence. Source: U.S. Census Bureau, Decennial Census 2010 Summary File 1 (UNM BBER 2014).

Language

Nearly 70 percent of the people who live in the area of influence primarily speak English; Spanish is spoken by approximately 27 percent, while less than 4 percent speak a language other than English or Spanish (Table 2). When compared to the rest of the United States, the cultural diversity of the communities surrounding the Lincoln NF is evident by the percent of individuals who speak a language other than English (21 percent vs. 30.2 percent, respectively) although the State of New Mexico has a greater diversity of languages spoken as a whole (UNM BBER 2014).

Table 2. Language spoken at home by respondents five years and older within the Lincoln NF area of influence, the State of New Mexico, and the United States. Data are presented as the percentage of the total population within a given area. Source: U.S. Dept. of Commerce. 2016. Census Bureau, American Community Survey Office (ACS), Washington, D.C. Data are calculated by ACS using annual surveys conducted during 2011-2015 and are representative of average characteristics during this period.

Language	Area of Influence (%)	New Mexico (%)	U.S. (%)
Only English	69.8%	64.3%	79.0%
Spanish or Spanish Creole	27.1%	28.3%	13.0%
Indo-European	1.6%	1.3%	3.7%
Asian and Pacific Island	0.7%	1.0%	3.4%
Other	0.9%	5.2%	1.0%
Speak English less than “very well”	9.6%	9.3%	8.6%

These data are important because providing accessible information and services to all individuals is a priority of the United States government. Whether in an emergency or in the course of routine business, the success of government efforts to communicate effectively with the public depends on accurate, timely, and vital information that is accessible to all. Executive Order 13166, “Improving Access to Services for Persons with Limited English Proficiency” (issued August 2000) seeks to ensure that individuals with limited English proficiency (LEP) are able to receive information and services from federal agencies and that federal agencies are able to communicate with LEP individuals in the course of their activities. As a result, Executive Order 13166 requires federal agencies to provide LEP individuals with meaningful access to federally conducted activities. This executive order also requires agencies to ensure that federally assisted activities—which recipients of federal financial assistance carry out—comply with the nondiscrimination prohibitions of Title VI of the Civil Rights Act of 1964 and its implementing regulations. Title VI prohibits national origin discrimination and, for this reason, obligates recipients to provide LEP individuals with meaningful access to their services, programs, and activities.

To date, almost all communications from the Lincoln NF to the public have been conducted in English; however, the Forest recognize the need to provide information to individuals with limited English proficiency and plans to do so in the future.

Education

In the last two decades, New Mexico’s population has become more educated. This trend has also been observed among the larger population of the United States (Snyder 1993). The portion of individuals in New Mexico age 25 or older with an education level less than a high school graduate (high school diploma or equivalent) decreased from approximately 25 to 17 percent. At the same time, the proportion of individuals with some form of higher education (education beyond high school) increased from approximately 46 to 56 percent (Table 3) (UNM BBER 2014).

Although the area of influence’s population is slightly less educated than New Mexico’s overall population, similar trends can be observed at the state and local levels. For instance, between 1990 and 2010 the level of education in all four counties within the area of influence increased. More specifically, the number of individuals with a level of education less than a high school graduate decreased from approximately 28 percent to roughly 19 percent, while the portion of the population with at least some higher education increased from 41 to 51 percent (Figure 9).

Table 3. Educational attainment of persons age 25 and older residing in the four counties of the Lincoln NF area of influence and within the State of New Mexico (percent composition). Source: U.S. Census Bureau, 1990 and 2000 censuses, Summary File 3 and American Community Survey, 2006-2010 5-year Estimates (UNM BBER 2014).

Geographic Area	Less than 9th Grade	9th to 12th Grade	HS Diploma or GED	Some College; no Degree	Assoc., BA/BS, Grad. or Prof.
Year 1990					
Chaves	16.5%	16.3%	27.3%	20.1%	19.8%
Eddy	15.5%	17.2%	33.1%	18.9%	15.3%
Lincoln	9.5%	13.3%	32.4%	24.8%	19.9%

Geographic Area	Less than 9th Grade	9th to 12th Grade	HS Diploma or GED	Some College; no Degree	Assoc., BA/BS, Grad. or Prof.
Otero	7.6%	10.9%	33.0%	27.1%	21.5%
New Mexico	11.4%	13.5%	28.7%	20.9%	25.5%
Year 2010					
Chaves	12.8%	11.0%	29.3%	23.9%	23.1%
Eddy	8.2%	11.6%	33.5%	23.5%	23.3%
Lincoln	5.5%	8.0%	27.0%	27.3%	32.3%
Otero	6.5%	8.5%	28.8%	28.2%	28.0%
New Mexico	7.8%	9.5%	27.0%	23.1%	32.7%

At the county-level, Chaves and Eddy Counties have consistently had the smallest percentage of individuals with higher education and despite improvements in education levels, in 2010 more than half of the population of these counties still had at most a high school diploma (or equivalent) (Table 3). By comparison, nearly 60 percent of Lincoln County’s population has some form of higher education (UNM BBER 2014). Such a figure may lead one to believe that the visiting public of the Smokey Bear Ranger District would consist of more highly educated individual, by virtue of its association with Lincoln County. However, it is worth noting that the population of Lincoln County is much smaller than that of Chaves, Eddy, and Otero Counties therefore the actual number of individuals with some level of higher education in each of those counties (18,679; 15,933; and 22,569; respectively) is greater than the total number of individuals age 25 and older residing in Lincoln County (15,070). In addition, the Lincoln NF (and its three districts) receives visitors from and has interested stakeholders throughout all four counties. Regardless, the trend of increasing education is expected to continue throughout New Mexico, including the four counties within the Lincoln NF area of influence. Educational attainment is closely tied to one’s ability to generate income. In fact the average earnings of a college degree holder are almost twice that of an adult with a high school diploma. As educational attainment increases, poverty rates should decrease (UNM BBER 2007); and as detailed in Carnevale et al. (2012), lingering effects of the Great Recession will likely continue to create an incentive for individuals to obtain higher levels of education (UNM BBER 2014).

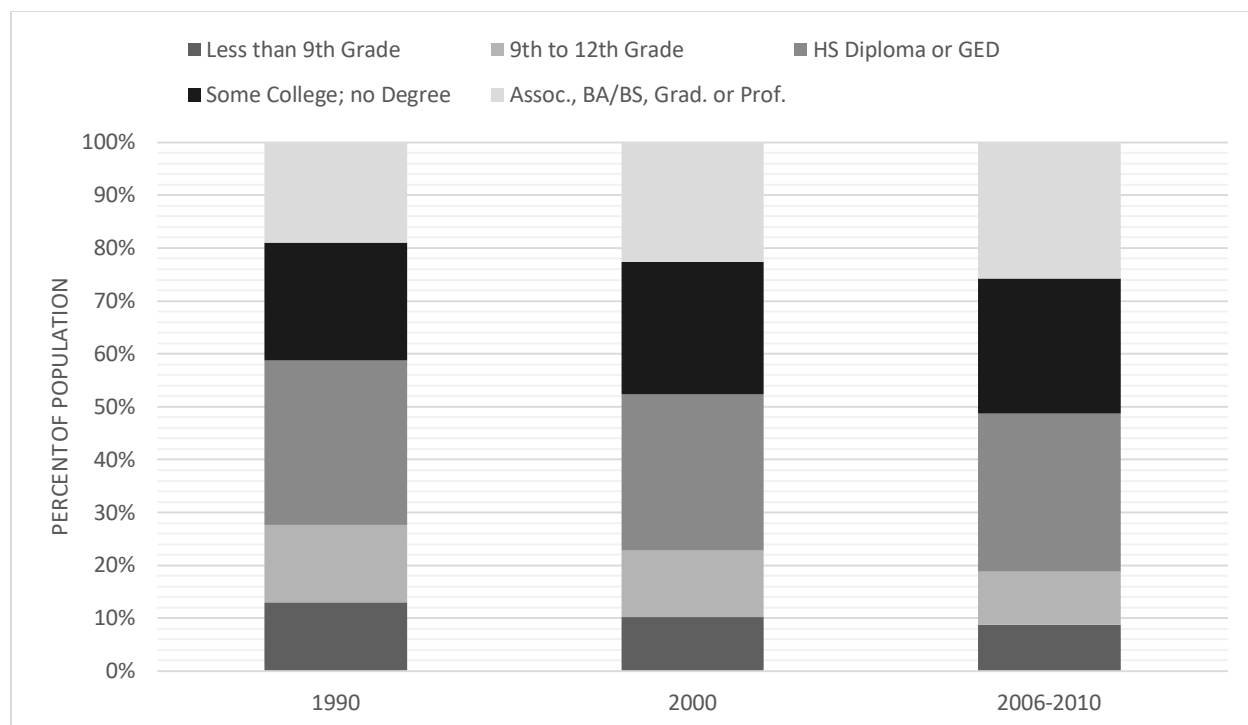


Figure 9. Education attainment of individuals age 25 or older within the Lincoln NF area of influence. Source: U.S. Census Bureau, Decennial Census, 1990 and 2000, Summary File 3 and American Community Survey, 2006-2010 5-year Estimates (UNM BBER 2014).

Economy of the Plan Area

Employment

New Mexico's unemployment rate has historically exceeded that of the United States, however, this has changed over the past few decades. From 1970 to 2015, the employment rate within the State of New Mexico grew by 175 percent, while the employment rate of the nation increased 108 percent (Headwaters 2017c). As a result, New Mexico's unemployment rate dropped below the national average in 2006. The gap between New Mexico and the United States unemployment rates grew during the Great Recession, as the U.S. unemployment rate rose faster than New Mexico's. The gap between the two was greatest in 2009, when New Mexico had an unemployment rate of 6.8 percent, while the U.S. unemployment rate was 9.3 percent (UNM BBER 2014).

Between 1990 and 2003 the unemployment rate within the Lincoln NF area of influence was generally higher than that of New Mexico. However since 2004 the area of influence has had a lower unemployment rate than New Mexico (Figure 10). At the individual county-level, the number of employment opportunities are similar among Eddy, Chaves, and Otero Counties. Each of the three counties has provided between 27 and 32 percent of the area's employment since 1990, while Lincoln County provides between 9 and 12 percent (UNM BBER 2014). However, Lincoln County has most often had the lowest unemployment rate, although in recent years Eddy County has usually had a lower rate. At the other end of the spectrum is Chaves County, which typically has had higher unemployment than other area counties. Certainly all notable unemployment rate spikes have occurred in Chaves County. Unemployment rates increased throughout the area during the Great Recession and continued to climb through 2010, however the rate of increase has slowed. As the nation's economy continues to slowly

recover, increases in the unemployment rate should continue to slow, and ultimately unemployment should begin to decline (UNM BBER 2014).

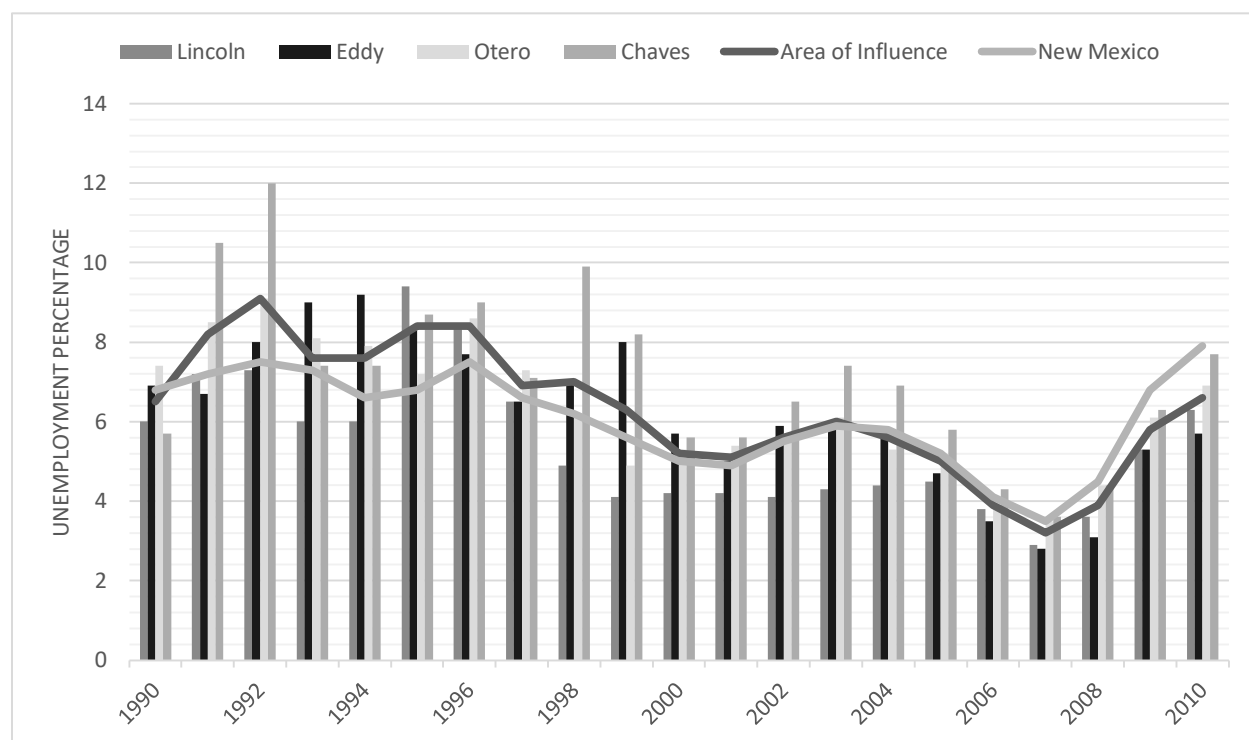


Figure 10. Average annual unemployment rate among the Lincoln NF area of influence counties and the State of New Mexico. Source: New Mexico Department of Workforce Solutions, Economic Research and Analysis Bureau, Table A (UNM BBER 2014).

Within the Lincoln NF area of influence, employment increased from 55,718 to 105,053 jobs (89 percent increase) between 1970 and 2015 (Table 4). This expansion included an increase in the number of proprietors as well as wage and salary jobs, which increased 76 percent and 152 percent, respectively. High levels of proprietors in an economy can signify a weak labor force. However, the long-term trend of growth in proprietors’ employment paired with a long-term trend of growth in real personal income is a positive indicator of economic growth within the area of influence (Headwaters Economics 2017d).

Table 4. Components of employment change (expressed as number of jobs, includes full-time and part-time positions) within the Lincoln NF area of influence and the personal (real) income. Personal income figures are shown in real terms (i.e. adjusted for inflation) as of 2016. Personal income is reported by place of residence and employment by place of work. Data Sources: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.

	1970	1980	1990	2000	2015
Total Employment	55,718	73,602	81,300	90,672	105,053
Wage and Salary Jobs	46,753	62,593	66,769	69,664	82,423
Number of Proprietors	8,965	11,009	14,531	21,008	22,630
Real Personal Income	\$2,893,236	\$3,883,114	\$4,555,444	\$5,408,301	\$8,555,429

Sectors of the Economy

Industries are organized according to three main categories: non-services related, services related, and government. From 1970 to 2000, jobs in non-services related industries, such as agriculture, manufacturing, and construction, experienced a 36 percent increase (13,795 to 18,710 jobs); and during that same period, jobs in the services related industry increased by 103 percent (25,397 to 51,681 jobs). In fact most new jobs created in the nation's economy over the last thirty years have been in the services related industry. This industry encompasses a wide-variety of job categories including high- and low-wage jobs from hotels and amusement parks to legal, health, business, and educational services. Government jobs, which increased by 23 percent from 1970 to 2000, along with the retail trade, and the services sector were the three sectors that added the most new jobs historically, within the Lincoln NF area of influence (3,760; 8,574; and 12,194 new jobs, respectively). In fact, overall, these three industry sectors provided the largest number of jobs, within the area of influence, from 1970 to 2000 (Table 5) (Headwaters Economics 2017d).

Table 5. Employment levels (number of jobs, includes full-time and part-time positions) by industry within the Lincoln NF area of influence between 1970 and 2000. Employment data are organized according to the Standard Industrial Classification and reported by place of work. Estimates for data that were not disclosed are indicated with tildes (~). Data Source: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.

Job Sector	1970	1980	1990	2000
Total Employment (number of jobs)	55,718	73,602	81,300	90,672
Non-Services Related	13,795	18,683	18,540	~18,710
Farm	3,771	3,662	3,231	3,467
Agric. service, forestry, fishing & other	447	611	975	~1,311
Mining (including fossil fuels)	4,295	5,361	5,192	~4,279
Construction	1,920	4,070	3,577	5,123
Manufacturing (incl. forest products)	3,362	4,979	5,565	4,530
Services Related	25,397	35,177	41,758	~51,681
Transportation & public utilities	2,490	3,202	4,028	4,428
Wholesale trade	1,217	1,837	1,953	~2,094
Retail trade	8,163	11,597	13,968	16,737
Finance, insurance, & real estate	2,896	4,412	4,178	5,597
Services	10,631	14,129	17,631	22,825
Government	16,526	19,742	21,002	20,286

In recent years, non-services related jobs have maintained an increase of 35 percent, while employment growth in the services related industry slowed, resulting in an increase of only 20 percent. In fact, from 2001 to 2015, two of the three sectors that added the most new jobs - mining (6,879 new jobs) and construction (1,485 new jobs) - were a part of the non-services industry; while the third was from the services related industry - accommodation and food services (1,362 new jobs) (Table 6). Regardless, the three industry sectors with the largest number of jobs in 2015 included the healthcare and social assistance sector (10,370 jobs), retail trade (11,837 jobs), and the government (19,912 jobs) (Table 6) (Headwaters Economics 2017d).

Table 6. Employment levels (number of jobs, includes full-time and part-time positions) by industry within the Lincoln NF area of influence between 2001 and 2015. Employment data are organized according to the North American Industrial Classification System and reported by place of work. Estimates for data that were not disclosed are indicated with tildes (~).

Data Source: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.

Job Sector	2001	2005	2010	2015
Total Employment (number of jobs)	89,302	93,548	98,956	105,053
Non-Services Related	~17,963	~17,350	19,303	~24,253
Farm	3,806	3,256	2,859	3,093
Agric. service, forestry, fishing & other	~786	~787	749	~726
Mining (including fossil fuels)	~4,530	~4,622	7,130	~11,409
Construction	4,997	6,225	6,128	6,482
Manufacturing (incl. forest products)	3,844	2,460	2,437	2,543
Services Related	~50,934	~55,259	~58,523	~61,013
Utilities	367	327	487	525
Wholesale trade	1,784	1,836	1,851	2,254
Retail trade	10,391	10,691	10,780	11,837
Transportation and warehousing	2,731	2,906	2,645	3,139
Information	1,110	997	~995	998
Financial Services	2,322	2,611	3,031	2,830
Real estate and rental leasing	2,589	2,986	3,274	3,317
Professional and technical services	3,147	3,823	~4,024	~3,786
Management of companies and	~220	~331	~311	~275
Administrative and waste services	~3,685	~4,130	~4,614	~4,925
Educational services	~481	496	930	789
Health care and social assistance	~7,929	9,530	10,718	10,370
Arts, entertainment, and recreation	1,574	1,590	1,679	1,659
Accommodation and food services	7,465	7,533	8,020	8,827
Other services, except public administration	5,139	5,472	5,164	5,482
Government	20,274	21,005	21,303	19,912

In many rural communities, government employment represent an important component of the economy, as is the case for the Lincoln NF area of influence. Despite, a two percent decrease in the number of government jobs (20,274 to 19,912) over the last fifteen year (Table 6), the government has consistently provided a significant portion of jobs within the area of influence since 1970. On average, the government provides approximately 19 percent of total employment within the area of influence; however, in 2011, government jobs comprised nearly 40 percent of all employment in Otero County (UNM BBER 2014). This is due to a large military presence in Otero County, specifically, Holloman Air Force Base, White Sands Missile Range, and the German Force Flying Training Center (UNM BBER 2014).

Furthermore, public lands can play a key role in stimulating local employment by providing opportunities for recreation and scenic resources. Communities adjacent to public lands can benefit economically from visitors who spend money on hotels, restaurants, ski resorts, and gift shops. Travel and tourism consists of industry sectors that provide goods and services to visitors, the local economy, and the local population, such as: retail trade; passenger transportation; arts, entertainment, and recreation; and accommodation and food. In areas that have natural and social amenities and offer recreational opportunities, travel and tourism can significantly contribute to the local economy. Since 1998, travel and tourism related employment has represented 20 percent of the total employment

within the Lincoln NF area of influence. In 2015, Lincoln County had the largest percentage of travel and tourism related employment with 37.8 percent, while Eddy County had the smallest with 13.1 percent (Figure 11 (Headwaters Economics 2017e)). Industries that contain travel and tourism often pay relatively low wages, though this varies by industry sub-sector, and many of these jobs are part-time or seasonal.

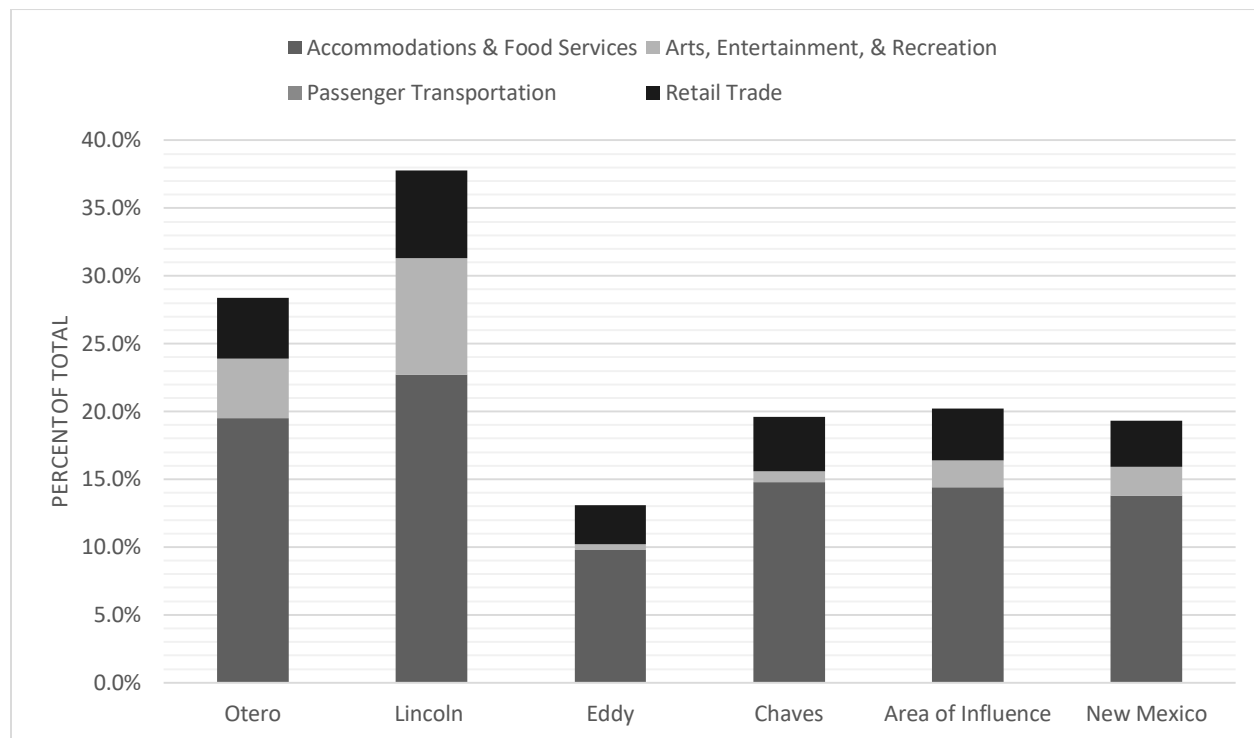


Figure 11. Percent of total private employment in industries that includes travel and tourism, in 2015, within the Lincoln NF area of influence. Data Sources: U.S. Department of Commerce. 2017. Census Bureau, County Business Patterns, Washington, D.C. (Headwaters Economics 2017e).

Income

New Mexico's aggregate household income grew by 41 percent between 1989 and 1999, and grew by 11 percent between 1999 and 2010. By comparison, aggregate household income in the area of influence grew by 34 percent between 1989 and 1999, but subsequently grew by only 5 percent between 1999 and 2010. Aggregate household income levels are comparable among Chaves, Eddy, and Otero Counties (all of which had aggregate household incomes between \$1.1 and \$1.2 million in 2006-2010). Although between 1989 and 1999 Lincoln County experienced a significant rise in aggregate household income, it still lags far behind other area counties (Figure 12); in 2006-2010 Lincoln County aggregate household income was on average approximately 40 percent of that of other area counties.

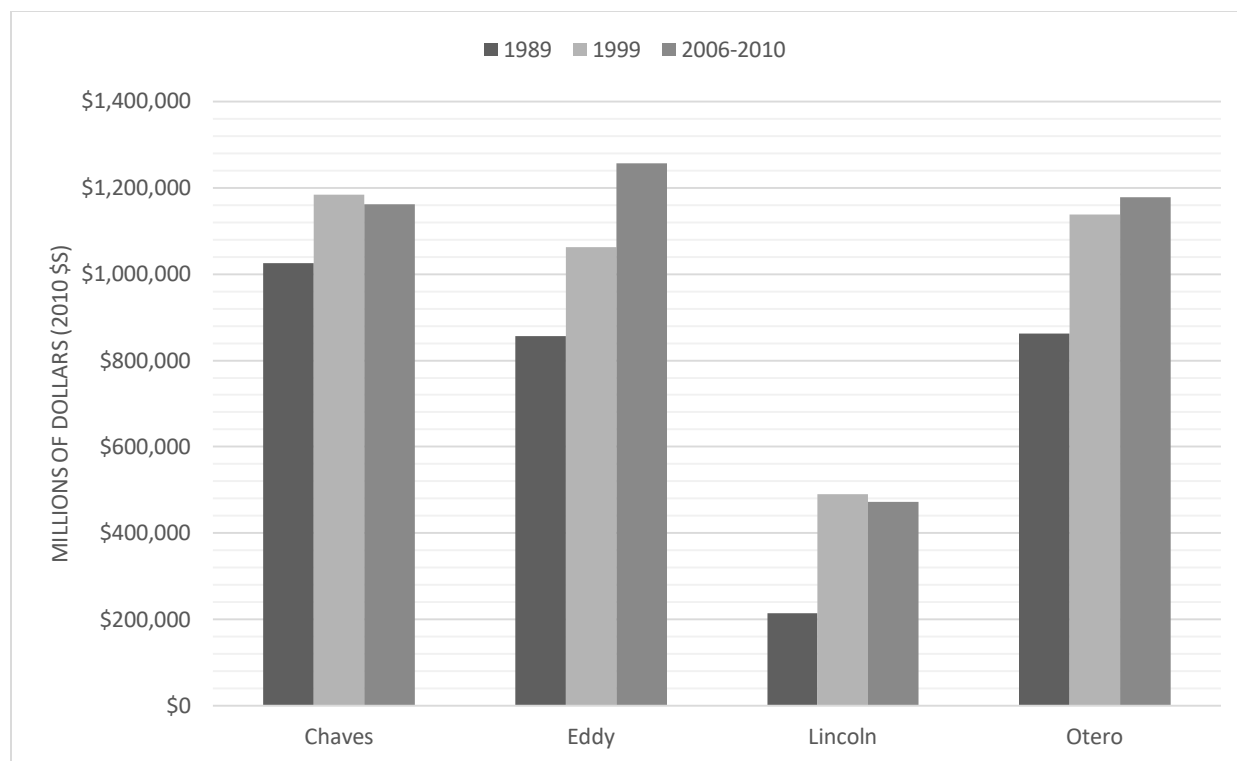


Figure 12. Aggregate household income (expressed in real 2010 millions of dollars) of the four counties located within the Lincoln NF area of influence. Data Source: U.S. Census Bureau, 1990 and 2000 censuses, Summary File 3 and American Community Survey, 2006-2010 5-Year Estimates (UNM BBER 2014).

Effects of the Great Recession on aggregate household income varied by county. Most notable is the sharp change in the growth of aggregate household income in Lincoln County between 1989 and 1999 aggregate household income grew by 130 percent, but subsequently suffered a slight 4 percent decline. Other area counties also experienced slower growth between 1999 and 2010, although changes were not as dramatic as in Lincoln County. It is expected that as the economic recovery continues the area of influence will experience more aggregate household income growth, although lingering effects of the Great Recession will likely limit growth for some time. Specifically, the low levels of population growth projected for the area (and in fact population declines for some area counties) will further dampen growth in aggregate household income (UNM-BBER 2014).

County-level differences in aggregate household income of course translate to Ranger District-level differences. The most recent data shows that the Guadalupe Ranger District has a greater aggregate household income than any other Lincoln NF Ranger District. This may be due to the fact that, in recent years, Eddy County had the largest percent of total mining employment (24.3 percent) of all the counties located within the area of influence. The mining sector has the potential to provide high-wage jobs, which can range from \$77,000 to \$132,000 annually (Headwaters Economics 2017f, while high-wage services sector jobs within the area of influence only range from \$39,000 to \$51,000 annually (Headwaters Economics 2017g).

The distribution of household income has improved over time. The portion of households within the Lincoln NF area of influence with incomes of less than \$35,000 has declined, while the portion with incomes greater than \$50,000 has consistently increased (Figure 13). This trend is similar to that which has occurred across New Mexico, and is expected to continue. Lincoln NF Ranger Districts have

household income distributions that are quite similar - the portion of households in a given income bracket vary by roughly two percentage points at most (UNM BBER 2014).

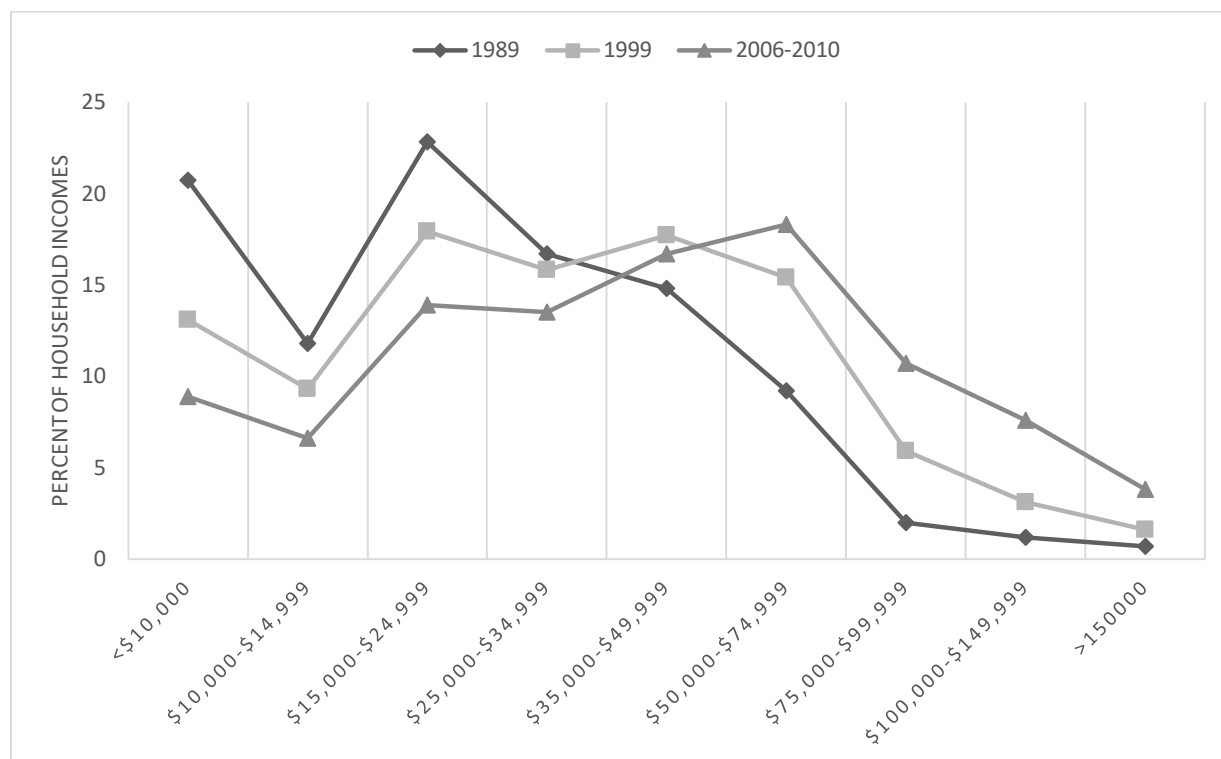


Figure 13. Household income distribution (expressed as percent of household incomes) within the Lincoln NF area of influence. Note: income values have not been adjusted for inflation. Data Source: U.S. Census Bureau, 1990 and 2000 censuses, Summary File 3 and American Community Survey, 2006-2010 5-Year Estimates.

Total personal income comprises labor and non-labor income. Labor income (i.e. wage and salary disbursements) and non-labor income (i.e. dividends, interest, rent, retirement, unemployment benefits, etc.) increased by 136 percent and 356 percent, respectively, from 1970 to 2015 (Table 7).

Non-labor income is often the largest source of income in rural areas and is also the fastest growing. Growth in non-labor income can be an indication that a place is an attractive place to live and retire (Headwaters Economics 2017c). Non-labor income can also be important to places with struggling economies, either as a source of income maintenance for the poor or as a more stable form of income in areas with declining industries and labor markets. If public lands resources are one of the reasons growing areas are able to attract and retain non-labor sources of income, as is the case for the Lincoln NF area of influence, then public lands are important to local economic well-being by contributing to economic growth and per capita income (Headwaters Economics 2017c).

Table 7. Components of total personal income change from 1970 to 2015. All income data are presented in thousands of 2016 dollars and may not add to total personal income due to adjustments made by the Bureau of Economic Analysis. Data Source: U.S. Department of Commerce. 2016. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C. Tables CA05, CA05N & CA35.

	1970	1980	1990	2000	2015
Total Personal Income	\$2,893,236	\$3,883,114	\$4,555,444	\$5,408,301	\$8,555,429
Labor Income	\$2,301,721	\$2,559,143	\$2,767,637	\$3,287,093	\$4,956,125
Non-Labor Income	\$789,516	\$1,323,970	\$1,787,807	\$2,249,279	\$3,599,305
Dividends, Interest, and Rent	\$535,497	\$852,970	\$1,108,227	\$1,202,810	\$1,596,502
Age-Related Transfer Payments	\$129,672	\$291,626	\$413,962	\$593,341	\$985,091
Hardship-Related Transfer Payments	\$54,017	\$83,877	\$160,227	\$318,910	\$811,981
Other Transfer Payments	\$69,705	\$95,293	\$105,301	\$134,219	\$205,730

Per capita income has also been rising within the area of influence, from \$17,739 in 1989 to \$21,659 by 2010. In 1989 all four counties had per capita incomes that were similar to but slightly below New Mexico's per capita income. By 1999 the Lincoln County per capita income had increased markedly (by 40 percent) to \$25,305 and surpassed that of NM, which was likely due to in-migration of retirees with relatively high incomes. However, between 1999 and 2006-2010, per capita income in Lincoln County declined somewhat (Figure 14) (UNM BBER 2014). In contrast, per capita income in Eddy County grew steadily during both decades, such that by 2010 per capita income had increased by nearly 40 percent from the 1989 level (ultimately surpassing the NM per capita income level). As a result, in 2006-2010 the per capita income in Eddy County was higher than that in other counties within the area of influence (Figure 14). This growth in Eddy County stems from the extraction and mining of oil, gas, and potash. Although per capita incomes also rose in Chaves and Otero Counties, the increases were much smaller (UNM BBER 2014).

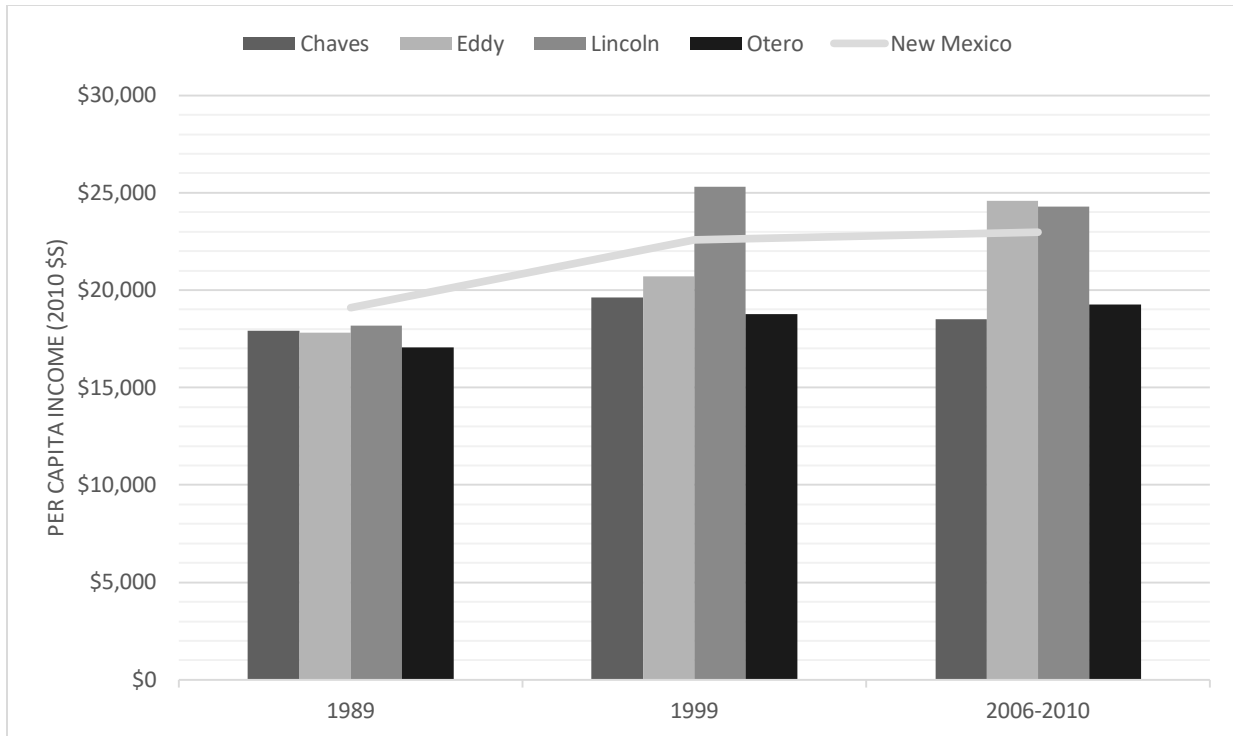


Figure 14. Per capita income within the Lincoln NF area of influence. Data Source: U.S. Census Bureau, 1990 and 2000 censuses, Summary File 3 and American Community Survey, 2006-2010 5-Year Estimates (UNM BBER 2014).

In addition to per capita income and household income distribution improvements, the portion of individuals living below poverty within the area of influence has declined somewhat (from 20 percent during 1989 to 17 percent during 2006-2010). The decline in poverty rates has been most notable in Lincoln County, where the rate declined by 7.2 percent (from 20.1 percent in 1989 to 12.9 percent in 2006-2010). The decline in poverty in Eddy County was nearly as large, where the proportion of people living below poverty in Eddy County declined by 6.8 percent. In contrast, the poverty rate in Otero County actually increased from 16.7 percent in 1989 to 20 percent in 2006-2010 (UNM BBER 2014).

In 1989 the poverty rate among Hispanics and Latinos (33.8 percent) within the area of influence was two-and-a-half times the rate among non-Hispanics (13.5 percent). Between 1989, 1999, and 2006-2010 the poverty rate among Hispanics and Latinos consistently fell, while that among non-Hispanics remained relatively stable (Figure 15). By 2006-2010 the poverty rate among Hispanics and Latinos was 25.2 percent (approximately twice that among non-Hispanics). The poverty rate among Whites has remained relatively stable, while poverty rates among both Blacks or African Americans and "Others" declined rather dramatically between 1989 and 2006-2010 (from 32 to 17 percent and from 36 to 26 percent, respectively). In contrast, the poverty rate among American Indians & Alaskan Natives was the greatest of all racial groups and the poverty rate was essentially the same in 2006-2010 as in 1989 (Figure 16) (UNM BBER 2014).

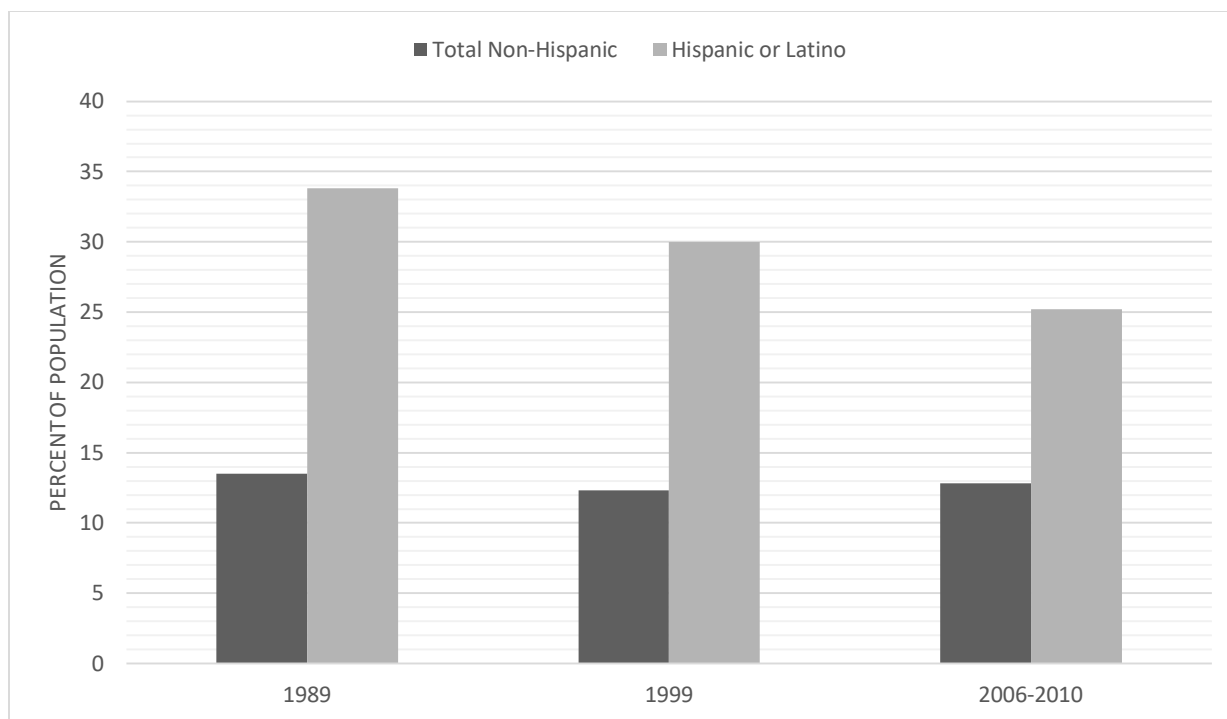


Figure 15. Poverty rates of Hispanic and Non-Hispanic groups from 1989 to 2010. Data Sources: U.S. Census Bureau, 1990 and 2000 censuses, Summary Files 3; 1990 Census of Population, Social, and Economic Characteristics: New Mexico, 1990 CP-2-33; and American Community Surveys, 2006-2010 5-Year Estimates (UNM BBER 2014).

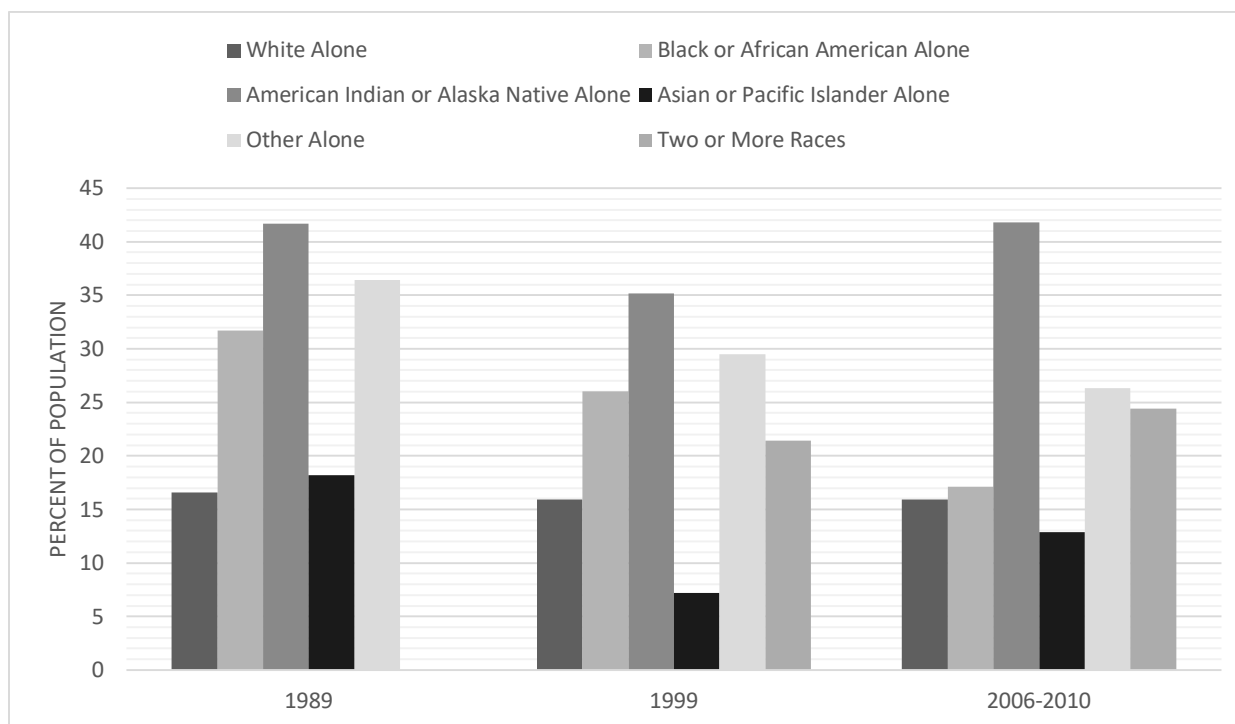


Figure 16. Percent of poverty among racial groups within the Lincoln NF area of influence. Data Sources: U.S. Census Bureau, 1990 and 2000 censuses, Summary Files 3; 1990 Census of Population, Social, and Economic Characteristics: New Mexico, 1990 CP-2-33; and American Community Surveys, 2006-2010 5-Year Estimates (UNM BBER 2014).

These data are important to considering when addressing environmental justice in minority and low-income populations (Executive Order 12898, issued February 11, 1994). The purpose of Executive Order 12898 is to focus federal attention on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities. The intent is to promote nondiscrimination in federal programs that affect human health and the environment, as well as provide minority and low-income community's access to public information and public participation. Executive Order 12989 directs federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. It also directs each agency to develop a strategy for implementing environmental justice.

Environmental justice in minority and low-income populations will not be addressed in this assessment but will be analyzed in the subsequent Forest Plan Environmental Impact Statement.

Housing

Seasonal and Recreational Homes

The number of vacant seasonal and recreational homes in New Mexico increased by approximately 67 percent between 1990 and 2010, although growth between 1990 and 2000 was much more pronounced than growth between 2000 and 2010 (46 percent versus 21 percent, respectively). The slower rate of increase between 2000 and 2010 is likely a result of the Great Recession that occurred between 2008 and 2009, when a housing market correction and subprime mortgage crisis caused a period of severe economic decline nation-wide (UNM BBER 2014). In fact, the United States endured two periods of recession in the last decade (2000-2010), the first encompassed most of 2001 (Mar. 2001 to Nov. 2001); while the previous decade (1990-2000) included only a short period of recession early in the decade (Jul. 1990 to Mar. 1991) (Headwaters Economics 2017c).

The number of vacant seasonal and recreational homes in the Lincoln NF area of influence increased only moderately between 1990 and 2010. Nearly all of the area's seasonal and recreational homes are located in Lincoln and Otero Counties (Figure 17). However, the number of such homes has been slowly declining in Lincoln County (by approximately 4 percent each decade), but increased notably in Otero County between 2000 and 2010 (from 2,451 to 3,279 homes, a 34 percent increase). In fact Otero County is solely responsible for the increase in vacation homes that occurred between 2000 and 2010; all other area counties within the area of influence experienced a decline. As a result of these changes, the proportions of vacant seasonal and recreational homes located within the four counties of the area of influence have changed somewhat. For example, in 1990 Lincoln County housed 70 percent of the area's vacant seasonal and recreational homes, but by 2010 contained only 61 percent. In contrast, the proportion of vacant seasonal and recreational homes within Otero County increased from 28 to 34 percent during this same period. Nonetheless, the Smokey Bear Ranger District is associated with the vast majority of the area's seasonal and recreational homes due to its proximity to both Lincoln and Otero Counties (UNM BBER).

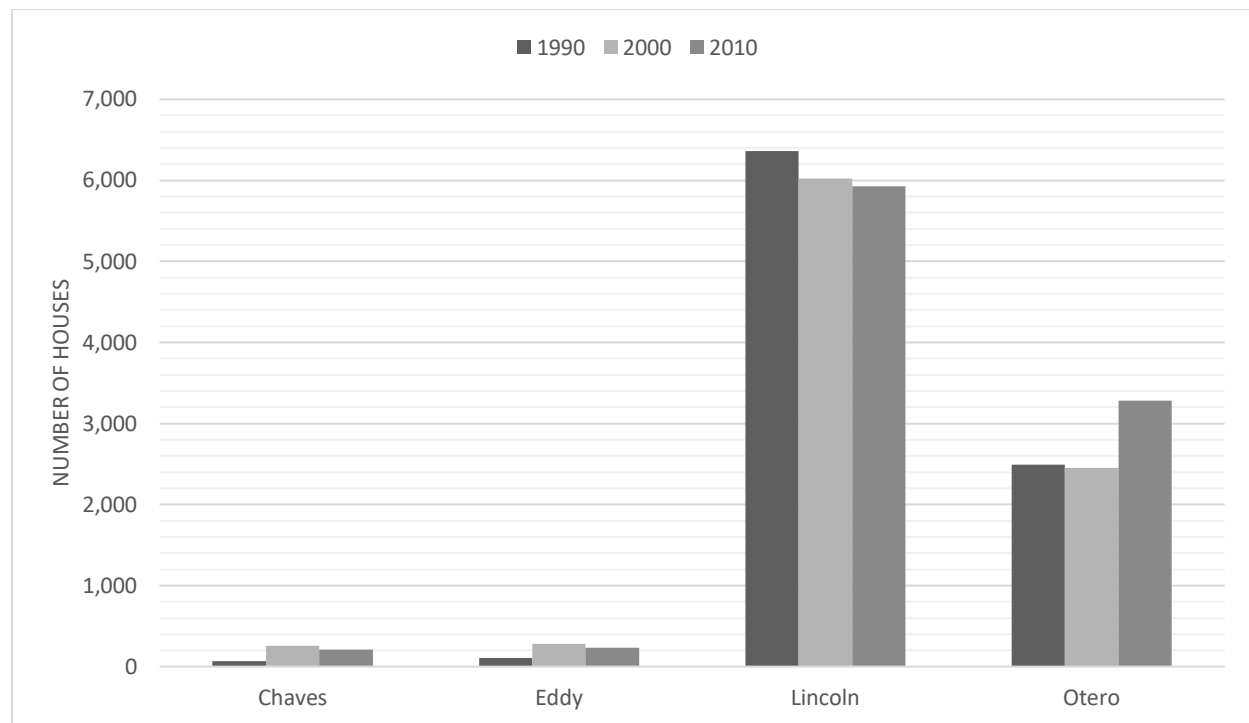


Figure 17. Number of vacant houses for seasonal or recreational use within the four counties of Lincoln NF area of influence.

Relative to New Mexico, growth in the number of vacant seasonal and recreational homes within the Lincoln NF area of influence has been rather limited; and as New Mexico's economy recovers from the Great Recession, the growth of such homes within the area of influence will likely be slower than that experienced elsewhere in NM.

Homes within the Wildland-Urban Interface

It is now common to have a large number of homes, second homes, and vacation homes bordering or surrounded by public lands in the western United States. In fact, approximately 32 percent of U.S. housing units and one-tenth of all land with housing are situated in the wildland-urban interface (WUI), which is the area commonly characterized as the transitions zone where urban development intersects with private and public wildlands.

Wildfire is a fundamental ecological component for 94 percent of wildlands across the conterminous United States (Stein et al. 2013), including the Lincoln NF. However, the relationship between wildlands and wildfire is complex, and it varies considerably depending on the location, size, and intensity of the fire; the season; the weather; the ecological characteristics of the land; and the type and amount of human influence. While the degree of risk may vary from one place to another, given the right conditions, wildfire can affect people and their homes in almost any location where wildland vegetation is found. Even structures not immediately adjacent to wildland vegetation are at risk of damage from fire, because embers can be transported by wind and ignite vulnerable homes a mile or more ahead of the flame front (Stein et al. 2013). Furthermore, as more people live or work in the WUI, fire management becomes more complex and the costs to reduce fire risk, manage wildfires, and protect human lives and homes have risen sharply in recent decades (Stein et al. 2013). Today, the increasing expense of wildland fire management on both public and private lands costs the Federal Government

more than \$3 billion per year. A principal reason for the rising cost of wildland firefighting is the growing number of homes built in the wildland-urban interface. Many studies have delineated the increasing costs of forest and other wildland fires, and all point to the expanding pattern of residential development adjacent to public lands as a significant contributing factor (Headwaters Economic 2017h).

The entire four-county Lincoln NF area of influence contains roughly 1/6th of New Mexico's wildland-urban interface, which is approximately 102 sq. miles and nearly all of it is contained within Lincoln and Otero Counties. No wildland-urban interface occurs in Eddy County and Chaves County only contains approximately one sq. mile of WUI, which doesn't encompass any homes (Figure 18). By comparison, Lincoln County contains approximately 40 sq. miles of WUI and roughly 32 percent includes homes; while, Otero County contains approximately 61 sq. miles of WUI, 51 percent of which encompasses homes (Figure 18) (Headwaters Economics 2017h).

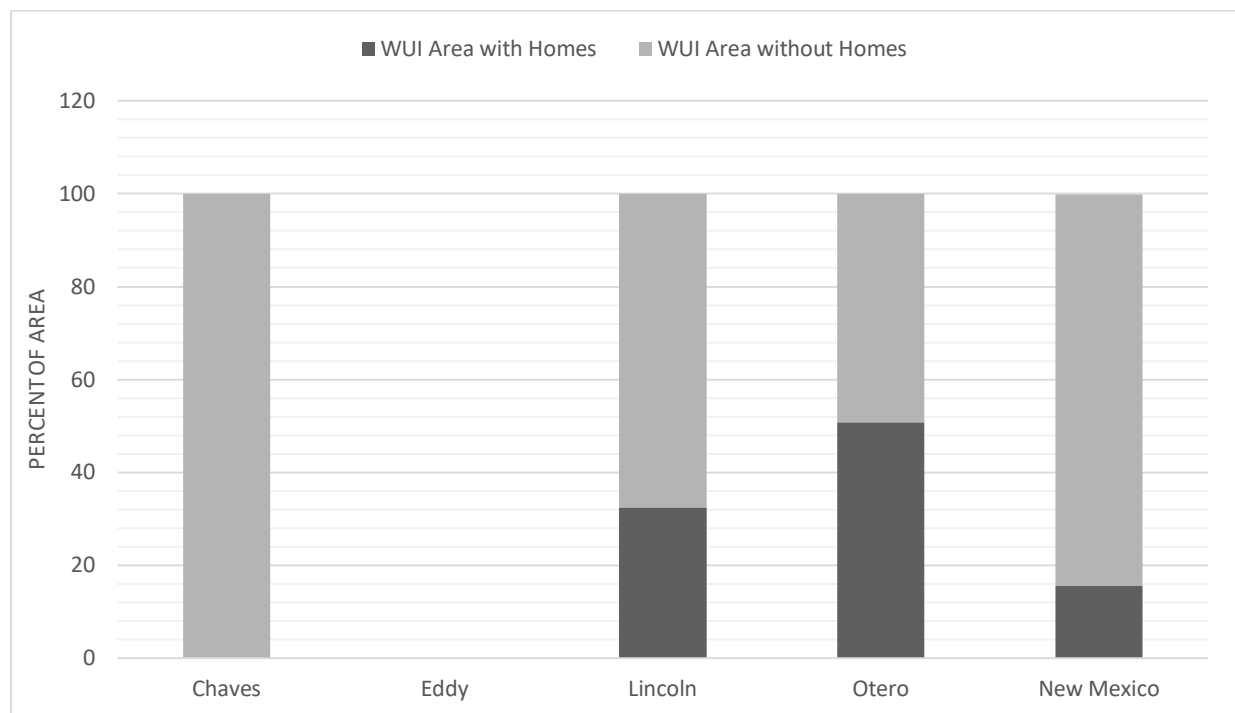


Figure 18. Percent of the wildland-urban interface with and without homes within the four counties of the Lincoln NF area of influence and the State of New Mexico. Data Sources: Gude, P.H., Rasker, R., and J. van den Noort. 2008. Potential for Future Development on Fire-Prone Lands. *Journal of Forestry* 106(4):198-205; U.S. Department of Commerce. 2011. TIGER/Line 2010 Census Blocks and 2010 Summary File 1, Washington, D.C. (Headwaters Economics 2017h).

Even though Lincoln County has a smaller proportion of wildland-urban interface that includes residences compared to Otero County, Lincoln County has the largest percent of total homes built within the WUI (36 percent of 17,519 homes) and close to half of those homes are second homes (Table 8). Regardless, Otero County has the largest percent of second homes in the WUI (62 percent) (Table 8), not to mention the average lot size of the residences located within the wildland-urban interface are two- to four-time larger than the average lot size of the other counties in the area of influence and the State of New Mexico, in WUI or non-WUI areas. In general, homes built near forested public lands in the West are much more likely to be second homes than homes built on other private lands. In addition, residential lots built within the wildland-urban interface are much more likely to take up more space than homes built outside of the WUI and are much more costly to protect from wildfire than high

density residential areas (Headwaters Economics 2017h). It is important to understand these factors because defending homes from the risk of wildfire is a major cost for public land agencies, not only in terms of the billions of dollars spent each year but also the number wildland firefighter lives that are endangered or lost. Nationally, firefighter fatalities have tripled since the 1970s, a trend that is undoubtedly attributed to effects of changing vegetation conditions and climate combined with the continued expansion of the wildland-urban interface (Kuhar 2016). These factors are especially important, given the fact that Otero and Lincoln Counties are ranked first and third in New Mexico (out of 33 counties), respectively, for the risk of wildfire on lands already developed in the wildland-urban interface (Headwaters Economics 2017h).

Table 8. Total number of homes and percentage of homes located within the wildland-urban interface (WUI). Data Sources: Gude, P.H., Rasker, R., and J. van den Noort. 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. (Headwaters Economics 2017h).

	Otero County	Lincoln County	Eddy County	Chaves County	New Mexico
Total Number of Homes	30,992	17,519	22,585	26,697	901,388
WUI Homes	4,364	6,333	n/a	n/a	27,387
Second Homes in WUI	2,712	3,122	n/a	n/a	10,924
WUI Homes as % of Total Homes	14.1%	36.1%	n/a	n/a	3.0%
Second Homes as % of WUI Homes	62.1%	49.3%	n/a	n/a	39.9%

Prior to 1990, data is limited regarding the number of structures lost in wildfires. However, based on anecdotal information there were very few structures lost to wildfires in the 1970s and 1980s. Conversely, the wildland-urban interface on the Lincoln NF was heavily impacted in the 2000s by large fires and the data show a significant increase in the number of structures lost from the 1990s to 2000s. In the 1990s eleven structures were lost on the Burgett Fire in 1993, while 445 structures were lost in multiple large fires in the 2000s. This includes 80 structures that were lost on the Scott Able fire in 2000; and, the greatest number of structures lost was during the 2012 Little Bear fire where 254 structures burned (Kuhar 2016). This trend may be expected to continue or increase on the Lincoln NF as more and more people inhabit WUI areas, and warmer temperatures, less snow pack, and drier forests result in longer more intense fire seasons across the West (Headwaters Economics 2017h). However, since the advent of the National Fire Plan in 2000, the purpose for implementing vegetation treatments has significantly expanded to include hazardous fuels reduction and restoration objectives. As a result, the number of acres treated has significantly increased within the last decade and the focus has shifted to protecting values at risk, such as the wildland-urban interface. For example, the number of acres treated within the WUI in the 1990s was 26,510 acres, however, by the 2000s that number increased nearly four-fold to 100,422 acres (Kuhar 2016).

Furthermore, the Lincoln NF strives to engage other government agencies, non-government organizations and public stakeholders to collaboratively identify and seek all-lands solutions to wildland fire management issues, and reduce wildfire risk through concerted planning efforts (i.e. Community Wildfire Protection Plans) and vegetation treatments; the upshot is that the Forest has been relatively successful in its efforts (Kuhar 2016). Both the Smokey Bear and Sacramento Ranger Districts have long-standing partnerships with the Greater Ruidoso Area and Otero County Working Groups, which have

been actively engaged in the planning and implementation of vegetation treatments on the Forest. These groups include stakeholders from the Mescalero Tribe, other federal agencies, private contractors, educational institutions, as well as municipal, county, and state governments. In addition, the Lincoln National Forest works with private landowners to conduct fuels reduction treatments on their lands through the National Forest Lands (NFL) program. The NFL program is a cost-share program where U.S. Forest Service funds are given to the State of New Mexico, which in turn passes along the funding to private land owners to conduct fuels reduction treatments on their land, once they have committed a certain percentage of funds to qualify for NFL funding. From 2007 to 2014, 1,314 acres of private lands adjacent to the Lincoln NF were treated with approximately \$2,323,301 of federal funds through the NFL program (Kuhar 2016).

Lincoln NF's Social, Cultural, and Economic Contributions to the Plan Area

Introduction

For over a century, communities have relied on the Lincoln NF as a source of sustenance. In fact, many who live within the four-county area of influence have families who go back several generations, having supported themselves as ranchers, miners, or in the timber industry. Some of these uses may have included more cultural, historical, or traditional purposes such as hunting, fishing, gathering plants for food and medicinal uses, and firewood gathering. Over the past few decades, uses of the Lincoln NF have shifted along with broader patterns of national and global restructuring. Resource-based industries (mining, oil and gas extraction, ranching, and timber harvest) and uses have declined while amenity-based activities (recreation and residential development) have emerged as the predominate use in and around the Lincoln NF. In recent years, the area has attracted second home investments and a growing number of retirees, families and individuals who have opted for a rural lifestyle. At present, the vast majority of visitors (98 percent) come to the Lincoln NF to engage in recreation activities; as a result, the local tourism industry has expanded, offering more opportunities in traditional services such as food and accommodations as well as outfitter and guide services.

While ways and means of utilizing the benefits offered by the Lincoln NF have changes, people still enjoy a wide-range of activities on the Forest. The local population is a diverse mix of individuals with varied demographic characteristics, cultural backgrounds, and values, attitudes, and beliefs. Different groups of residents have various, and often opposing, expectations of the services and management obligations of the Forest Service. This section will explore the relationship between the Lincoln NF and surrounding communities by examining the benefits the Forest offers its communities; the demands for Forest resources and ecosystem services placed on the Lincoln NF local communities; how social and cultural conditions influence the Forest; and finally, how the Lincoln NF contributes to the economics of the area of influence, which consists of Chaves, Eddy, Lincoln and Otero Counties.

Important Social, Cultural, and Economic Influences on the Lincoln National Forest

Benefits People Obtain from the Lincoln NF

The Lincoln NF is rich in unique New Mexico cultural and traditional heritage that has blended with modern uses. The Forest continues to provide benefits that have been historically significant, as well as offering modern benefits that present day New Mexico culture has come to desire, expect, or rely upon. From a cultural and social standpoint, the best source to identify these benefits comes from the people and communities who directly benefit from them. Public comment and discussions have been ongoing in relation to forest plan revision since March of 2015 through presentations, meeting with working groups and many other venues. At 6 community meetings, conducted for this assessment in March 2015

and through subsequent public engagements, emails, and letters, stakeholders of the Forest had the opportunity to share what those benefits were. Some of the stakeholders input included:

Traditional Benefits

- Gathering firewood
- Livestock grazing
- Timber harvest
- Hunting and fishing
- Plant collection (medicinal and cultural uses)
- Christmas tree cutting

Natural Resource Benefits

- Clean water, especially for local communities
- Aesthetic value
- Clean air
- Wildlife habitat

Recreation Benefits

- Hiking
- Backpacking
- Mountain biking
- Camping
- Hunting and fishing
- Skiing
- Horse-back riding
- Wildlife observation/Bird watching
- Wildflower observation/fall colors
- Photography
- Rock climbing
- Caving
- Painting
- Picnicking
- Scenic drives
- Historical interests (homesteads and railroads)
- Off-highway vehicle use

Lifestyle Benefits

- Solitude
- Climatic relief
- Providing business and income opportunities (outfitting and guiding)
- Health (mental and physical)
- Spiritual and cultural connection
- Educational opportunities (plant collection, geological studies, school groups, professional groups, citizen science programs)
- Historical connection to Forest (through Family and Culture)
- Economic growth from tourism associated with the Lincoln NF

The goods and services listed above that people enjoy or benefit from are also known as ecosystem services. They are products of functioning ecosystems that affect social, cultural and economic conditions. Ecosystem services fall into four categories that include, regulating (climate regulation, water filtration and purification, soil stabilization, etc.), provisioning (clean air, water, wood products, food, etc.), supporting (pollination, seed dispersal, nutrient cycling, etc.), and cultural (aesthetic, educational, spiritual and recreational experiences). These ecosystem services are collectively valued by Forest users despite their varying backgrounds; therefore it is likely that these ecosystem services will continue to be desired in the future, despite changing demographics; and the Forest will be expected to continue to provide these benefits. However, management of the ecological systems on the Lincoln NF will influence its ability to support some of these ecosystem services. *Volume I: Ecological Resources* addresses ecosystem services from an ecological perspective. The [Multiple Uses chapter](#) will look at ecosystem services from a social, cultural, and economic perspective.

Concerns about the Lincoln NF

Public comment and discussions have been ongoing in relation to forest plan revision since March of 2015 through presentations, meeting with working groups and many other venues. Between November 2015 and January 2016 the Lincoln NF conducted official public meetings to educate the public in our process as well as to hear what they had to say. As part of that effort, we conducted a survey to see what their issues or concerns were, asked about possible solutions to that issue and finally asked them to rate conditions of the issue to help us see what they saw the trend was. These concerns are relevant as they in that they express underlying needs or demands that may need to be addressed in the future. Many of the concerns expresses by stakeholders are summarized below:

- Many people are concerned about diminished watershed health and the impacts that will have on water quality, stream turbidity, stream sedimentation, flood events, base flows and the subsequent impacts to other resources areas.
- People are concerned that management of the forest is weighted toward livestock grazing and ranching, and they are concerned about degraded range conditions resulting from overgrazing and poor management practices.
- People are concerned about the current condition of riparian areas, with specific concerns about the presence of invasive species and the loss of vegetation from livestock grazing and timber harvest activities.
- There is concern about the presence of non-native invasive species on the Forest (plant and animal).
- Many people would like to see more timber harvesting and to support local economies.
- Some stakeholders expressed the need for current data and field verification to make informed management decisions.
- Many stakeholders recognized the need for better communication and working relationships between the Forest Service, private land owners, local communities, other government agencies, stakeholder groups, and members of the public who are interested or affected by management activities on the Lincoln NF.
- There is wide recognition of the overgrown condition of many of the forest types but also some concern that vegetation treatments are not appropriately designed for the species present (e.g. ponderosa pine is being managed as the mixed conifer type).
- There is concern about increased damage to resources from motor vehicles and Off-highway vehicles.

- Some people are concerned about the management of Wilderness Area, especially regarding invasive species proliferation and increasing fuel loads.
- Some people are concerned that forest management activities are constrained by federally-listed species while others feel that not enough is being done to protect listed species.
- There is concern about the lack of understanding regarding the importance of cultural/heritage resources on the Forest.
- Some stakeholders are concerned about excessive regulatory control over cave use.
- Some individuals have expressed concern about overregulation of springs and infringement/taking of water rights.
- There is concern about the increased risk of uncharacteristic wildfire, and threats to private property and adjacent communities.
- Some people would like to see less elk on the landscape to reduce competition for forage, while others believe there is an appropriate amount of elk for hunting opportunities.

More stakeholder comments and concerns can be found in the *Public Participation* section of the Lincoln National Forest, Forest Plan Revision webpage located at:

<https://www.fs.usda.gov/detail/lincoln/landmanagement/planning/?cid=stelprd3814310>

Influence of the Lincoln NF on Social, Cultural, and Economic Conditions

Relationship of the Lincoln NF to Local Social and Cultural Conditions

Even before its inception as a National Forest in the early 1900s, the land that now comprises the Lincoln NF has been the provider for many of the needs essential for surviving and settling this region of the southwestern frontier. Human occupation of the areas in and around the Lincoln NF has spanned thousands of years. Although it is unclear when humans first inhabited the area that comprises the Lincoln NF, much of the Southwest was occupied by 10,000 B.C. The prehistoric peoples who occupied south-central New Mexico initially depended upon hunting, although climatic changes to a drier climate later caused a transition to dependence upon both hunting and gathering. Evidence of their camps (extinct fauna and human artefactual material) has been found in caves in the Guadalupe Mountains. Rock shelters and campsites have been located in both the basin and mountain regions.

Eventually, the native peoples inhabiting the area transitioned from generalized hunting and gathering subsistence to agricultural practices. By approximately 700 A.D., pit house villages were established and inhabited. The people who inhabited the pit house villages were part of the Jornada Mogollon Culture, one of numerous distinctive cultural traditions that had developed in the Southwest between 300 B.C. and 700 A.D. By 1200 A.D., pit houses were replaced with above-ground dwellings. Artifacts have suggested that the Jornada people were in contact with other parts of the Southwest and northern Mexico; a reliance on corn agriculture and bison from the plains is also evident. Then, for reasons that remain the subject of debate among scholars, the area encompassed by the forest was largely abandoned in the late 1300s or early 1400s. It is surmised that a period of drought severely limited the agricultural productivity of the land thereby forcing the inhabitants to move elsewhere.

At present, there is no archeological evidence of occupation of the Lincoln NF area between 1400 and 1600 A.D.; however, Spanish accounts from the late 1500s do mention the presence of nomadic peoples on the west side of the Tularosa Basin and along the Pecos River. These nomads later came to be known as the Apache. By the 1700s, the Sacramento and Guadalupe Mountains had become the heartland of the Mescalero Apache, a people whose subsistence depended upon hunting, gathering, and raiding.

Mescal, datil, piñon, and mesquite were the four plant foods of primary importance to the Mescalero. The mid 1800s brought about the start of the Anglo occupation. The Anglos made numerous attempts to end Apache raiding through the use of military campaigns, farming projects for the Mescaleros, and the establishment of Ft. Stanton. In 1874, a reservation was established for the Mescalero Apache, lies between what are now the Smokey Bear and Sacramento Ranger Districts. Due to the Apache's historic ties with Lincoln NF land, the Lincoln NF has cultural significance for the tribe as there are several Apache sites still located within the forest.

The area in and around the Lincoln NF became a popular settlement area in the late 1800s, because it was a good place for raising stock and had large tracts of land available. Tularosa was established in the 1860s as a ranching community on the west side of the Sacramento Mountains while communities such as Mayhill and Weed on the eastern slopes of the Sacramento's were established in the mid-1880s. A large cattle industry developed during that time and range conflicts ensued, the most famous of which was the Lincoln County War, which officially began in 1878.

The discovery of gold in the 1870s also had a tremendous impact on the local economy and communities as mining camps were established to mine gold. The end of the mining boom came around the turn of the century when the railroad, which was being built northward from El Paso, bypassed White Oaks leading to a decline of mining development in the area. However, the railroad did foster development in the high timber country of the Sacramento Mountains.

Alamogordo was established in 1898 as a railroad town with a line running directly into the mountains to obtain timber. High Rolls, Mountain Park, and Cloudcroft owe their existence to the railroad. The railroad linked this area to population centers of the east and west coasts and these new connections promoted and expanded new industries of sheep and cattle ranching, mining, and timber production (RM-GTR-295). However, by World War II, increased logging costs and the construction of the highways through the mountains made railroad logging uneconomical so tracks were removed, and the railroad days came to an end in the Sacramento Mountains.

The heritage, culture, traditions, and values of past and present inhabitants contribute to the uniqueness of the Lincoln NF and the surrounding area. All of these cultures have ties to the forest through strong attachments to the land that may be generations old or a new found discovery.

In addition to serving the local population, the Lincoln NF also offers visitors, who travel to the region, a unique experience in culture, exploration, wilderness, and other activities such as skiing, camping and hunting. Collectively, the Lincoln NF and surrounding area are strongly influenced and shaped by local time honored traditions, cultural diversity, and by those who wish to experience this unique setting from other areas around the country.

Traditions

Residents of communities surrounding the Lincoln NF have a strong connection to the land and its resources. There is also a strong sense of community across all of the diversity that exists within the area of influence. Both sentiments date back centuries, before the United States acquired this part of the country. Local passions continue to demonstrate these time honored connections to the land and culture, thereby giving long-lasting vibrancy to deeply rooted traditions and ways of life. The Lincoln NF has been an integral part of this history and continues to play a prominent role in the long-standing traditions and uses of the area of influence.

There is a strong sense of attachment to the land that is the Lincoln NF. There are three major components that characterize this sense of attachment. The first comes from traditional users having a sense of personal ownership, based on historical associations with National Forest System lands (USDA FS 2006). There is a significant generational element to this theme, which dates back to the time before the Lincoln NF was designated. The second component is derived from historical practices around the use of natural resources. These traditional users believe their first-hand knowledge and self interest in management of forest resources results in a culturally based understanding, and attachment to, forest lands (USDA FS 2006). The third component views the Lincoln NF as a sustainable legacy. It is viewed that this land has been inherited and is a unique resource that should be cared for and passed down to future generations.

Likewise, these historical connections to the land have been instrumental in giving the Lincoln NF a large part of its character. They still influence the Forest in present day terms, through various means, especially through traditional uses.

Traditional uses as they relate to the Lincoln NF are uses that have strong cultural ties to New Mexico's heritage. They hold historic significance, since they were necessities for survival, and many uses defined a way of life. While their prevalence has diminished somewhat over time, those with cultural ties to the area of influence still engage in many of these uses and view them as a vital part of their heritage. Those who have a cultural investment in the traditional uses of the area look to the Lincoln NF to continue providing these opportunities as a matter of right. These uses consist of hunting and fishing, livestock grazing, medicinal herb gathering, firewood gathering, open forest access, and wood harvesting for commercial uses.

Transitions in the Social Environment

Over the past several decades, uses of the Lincoln NF have shifted along with broader patterns of national and global restructuring. Resource-based industries (mining, oil and gas extraction, ranching, and timber harvest) have declined in prominence while amenity-based activities (recreation and residential development) have emerged as the predominate use in and around the Lincoln NF. In the past, communities and families who lived within the area of influence relied on natural resources to get by. The main activities were logging, mining, grazing, ranching, and farming. Today, these activities are not as prevalent as they once were. The declines in traditional uses are generally due to market demands, regulatory changes, and other economic constraints such as the long distance to markets. The decline in traditional uses is still strongly felt in the local economies of some communities, and many people would like more opportunities for economic development.

Recreation has emerged as one of the primary uses of the Lincoln NF. Forest Service data indicates that more than 780,000 people visited between 1999 and 2000 and the vast majority of these visits (98 percent) were for recreational purposes (UNM BBER 2007). The Lincoln NF features 70 designated recreational sites, most of which are located on the Smokey Bear and Sacramento Ranger Districts. Although the non-services related industry sectors (including forestry and livestock grazing/farming) of the local economy have declined, the shift toward more recreational use within the area of influence has significantly increased employment in service sectors related to tourism.

The four-county area and the Lincoln NF elicit a strong sense of connection that is not only traditionally based, but is also shared by those who are considered "non-traditional" users and live in the area or visit the Forest. Many of these connections are also based on interactions with the Forest and its resources, as well as personal experiences and values. Some users have special places on the Forest, while others speak of the inspiration, solitude, and appreciation they feel by being in the Lincoln NF. The diversity of

wildlife, plants, landscape, and other resources is another important value of the Forest. There is a local environmental presence that has actively pursued implementing preservation values and beliefs about forest management and landscape conditions (USDA FS 2006).

There is a perception within the Lincoln NF area of influence that a transition is occurring within the social fabric of the communities. This shift involves the exodus of younger people and the influx of newcomers (USDA 2006). Younger people are believed to be leaving the area in search of jobs, which are limited within the area of influence (UNM BBER 2014). Despite a strong sense of attachment, many of these young people rarely make it back. It is also believed that newcomers are increasing in number; however, there is also a perceived turnover in newcomers, because they leave when their expectations of rural living are not met. These perceptions imply there is also a transition occurring in values based on tenure, including those related to natural resources. It is held that newcomers may not have the same land ethic as longer term residents, and they may not have an appreciation for traditional uses (USDA FS 2006). It is also believed that these newcomers will place more management demands on the Lincoln NF (USDA 2006, UNM BBER 2007). While these perceptions may or may not be supported by data, they do indicate a social scenario where communities are feeling a change, and possibly a loss of traditional ways of life.

The assessment input also reveals areas of broader agreement that could be the focus of future collaboration efforts. Restoration of forests, grasslands, and watersheds is a perceived need that could improve ecosystem function and offers potential economic benefits to local communities. Despite the contentiousness of past relationships, there appears to be a potential foundation for future collaboration with stakeholders throughout the area. Coordinating with stakeholders, such as other federal agencies, state agencies, local governments, organizations, and private landowners would not only improve efficiency and effectiveness of these restoration efforts, but could also bridge gaps between social differences and value conflicts within communities (USDA FS 2006). There have been collaborative restoration efforts in the past, and this forest planning process is an opportunity to renew those relationships, and continue and expand this important work.

Lincoln NF's Contributions to Local Economic Conditions

The Lincoln NF is approximately 1.1 million acres or approximately 8 percent of the area of influence, which makes it an important contributor to the local economy. The Forest contributes to a wide range of economic values including market goods, such as timber/forest products, forage for livestock, and minerals. Recreation opportunities generate employment and income through tourism, while local communities benefit from payments that are made to state and local governments to compensate for the presence of non-taxable federal lands within their borders. Other forest benefits such as hunting and scenery are valued by the people who make use of these benefits, but only a portion of this value is represented in market purchases. Furthermore, non-market goods, such as unique ecosystems or the intrinsic value of rare plants and animals generate value that is reaped by all but is not necessarily paid for by all. Although numerous non-market social and economic values are associated with the Forest - including ecosystem service like clean water and air - many were not included in this economic contribution analysis. The following analysis considers only the market transactions that result from activities on the Lincoln NF; therefore, this analysis should not be conflated with a representation of the total economic value of the Forest.

The economic role of the Lincoln NF in the area of influence was analyzed using a combination of data modeled with IMPLAN Professional 3.1 software (using 2015 data) and data sourced by the independent, non-profits research group, Headwaters Economics. IMPLAN is an input-output model, which estimates the economic consequences of activities, projects, and policies on a region (Jaworski 2017). This input-

output analysis represents linkages between sectors in an economy. For instance, Forest visitors spend money on accommodations and food (a direct contribution). Accommodation and food service businesses buy supplies from other businesses (an indirect contribution), and employees of these firms spend their earnings on a variety of goods and services (an induced contribution). These transactions result in direct, indirect, and induced contributions in the analysis area (area of influence) economy (Jaworski 2017). Definitions of terms used in this analysis are described below:

- **Direct impacts** are the value of goods and services that are directly provided by the Lincoln NF.
- **Indirect impacts** are from linkages to other industries, not directly associated with the Lincoln NF.
- **Induced impacts** are generated when labor income increases, resulting in increased demand for goods and services in the local economy, creating additional employment and output.

All three types of impacts are measured in employment, labor income, value added, and output.

- **Employment** measures the number of jobs generated in the economy by Lincoln NF. These numbers are in terms of number of jobs and not in terms of full-time equivalent employees.
- **Labor income** is income earned by the labor force because of the Lincoln NF's presence.
- **Value added** by the Lincoln NF is the total amount paid for all factors of production (inputs that are used in the production of goods and services) in the impact area including labor. It is a measure of Lincoln NF's contribution to the local economy.
- **Output** is the value of industry production in the impact area measured in producer's price. Producer's price is the amount received by a producer by selling one unit of goods or services produced minus any value added tax or other deductible taxes.

Forest Service data on expenditures and resources were used in IMPLAN to estimate the economic impacts of the Lincoln National Forest programs, resources, and uses. This economic contribution analysis includes recreation visitor expenditures, livestock grazing, mineral extraction, forest products, payments to states and counties, and Forest Service expenditures. Although most of the information presented in this chapter is based on the four-county area of influence, which includes Chaves, Eddy, Lincoln and Otero Counties, this section, the economic contribution analysis, also includes El Paso County, Texas because the economic contribution model shows economic linkages between Lincoln NF management and the El Paso County economy (Jaworski 2017).

There are approximately 517,739 jobs and \$25.1 billion in labor income in the five-county region. The five largest sectors, in terms of employment, in the regional economy include: 1) government, 2) transportation and warehousing, 3) health care and social assistance, 4) accommodation and food services, and 5) administrative and waste services. The extraction and consumption of forest products (e.g., timber and forage), recreation visitors, and forest expenditures (e.g., equipment and salaries) contribute to economic activity in the region (Jaworski 2017). Table 9 shows the contribution of activities on the Lincoln National Forest to regional employment and labor income, by sector (Jaworski 2017).

Table 9. Current contribution of the Lincoln National Forest to the regional economy, which includes Chaves, Eddy, Lincoln, and Otero Counties in New Mexico and El Paso County in Texas.

Sector	Employment ^a		Labor Income ^b (Thousands of 2015 Dollars)	
	Area Totals	Lincoln NF-Related	Area Totals	Lincoln NF-Related
Agriculture	5,228	273	\$355,012	\$3,792
Mining	12,402	4	\$1,048,568	\$319
Utilities	2,013	1	\$221,161	\$153
Construction	31,793	7	\$1,578,077	\$318
Manufacturing	21,788	11	\$1,377,698	\$540
Wholesale Trade	15,096	26	\$985,017	\$1,593
Transportation and Warehousing	55,248	28	\$1,669,422	\$1,318
Retail Trade	22,199	81	\$1,311,486	\$2,313
Information	6,684	4	\$365,698	\$243
Finance and Insurance	18,567	20	\$581,871	\$641
Real Estate, Rental, and Leasing	18,896	22	\$508,402	\$382
Professional, Scientific, and Technical Services	21,449	27	\$1,121,327	\$992
Management of Companies	1,746	2	\$72,231	\$76
Administrative, Waste Management, and Remediation Services	35,628	28	\$1,061,609	\$683
Educational Services	4,625	4	\$128,807	\$100
Health Care and Social Assistance	53,984	40	\$2,558,766	\$1,897
Arts, Entertainment, and Recreation	6,089	24	\$82,661	\$403
Accommodation and Food Services	43,688	148	\$829,140	\$2,720
Other Services	24,796	32	\$862,739	\$1,094
Government	115,818	207	\$8,377,893	\$11,972
Total	517,739	991	\$25,097,585	\$31,549
Lincoln NF as Percent of Total	--	0.19%	--	0.13%

^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.*

Market transactions attributable to activities on the Lincoln National Forest support an estimated 991 jobs and \$31.5 million in labor income in the regional economy. Forest Service activities on the Lincoln National Forest are responsible for approximately 0.19 percent of total employment and 0.13 percent of labor income in the five-county area. The Lincoln National Forest contributes the most employment and labor income to the (1) agriculture, (2) government, and (3) accommodation and food services sectors. The agriculture sector is also the most reliant on Lincoln National Forest activities. Approximately five percent of employment and one percent of labor income in the agriculture sector is attributable to activities on the Lincoln National Forest. Economic sectors do not precisely align with Forest Service management activities. For instance, while much of the employment associated with livestock grazing or timber harvesting on the Lincoln National Forest will be in the agriculture sector, these activities support jobs and labor income in a variety of sectors, including construction, manufacturing, transportation and warehousing, and professional, scientific, and technical services (Jaworski 2017).

The discrepancy between the relative contribution of the Lincoln National Forest to employment and labor income (0.19 percent of regional employment versus 0.13 percent of regional labor income) indicates that jobs related to activities on the Lincoln National Forest (e.g., livestock grazing, outdoor recreation) pay less than jobs related to other economic activities in the five-county area. The high concentration of Lincoln National Forest-related jobs in the retail trade, accommodation and food services, and agriculture sectors is consistent with the discrepancy. Many jobs in these industries are part-time and low-wage (Jaworski 2017).

Table 10 displays the economic contribution of Lincoln National Forest activities by program area. Among the seven program areas, grazing and Forest Service expenditures contribute the most to employment in the regional economy. Although livestock grazing supports the most jobs, Forest Service expenditures contribute nearly double the labor income of livestock grazing. This indicates that jobs directly associated with Lincoln National Forest expenditures (including agency employees, contractors, and suppliers) are more likely to be full-time and provide higher wages than jobs related to other economic activities on the Lincoln National Forest, such as recreation visitor spending and livestock grazing (Jaworski 2017).

Table 10. Current contribution of the Lincoln National Forest by program area

Program Area	Employment	Labor Income (Thousands of 2015 Dollars)
Recreation (non-local visitors)	255	\$7,171
Livestock Grazing	371	\$6,852
Timber	28	\$1,208
Minerals	2	\$68
Externally-Funded Ecosystem Restoration	13	\$509
Payments to Counties	60	\$2,856
Forest Service Expenditures	263	\$12,885
Total	991	\$31,549

Total Federal Land Payments

State and local governments cannot tax federally owned lands like they do privately owned lands; consequently, state and local governments receive federal land payments to help offset tax losses.

Federal land payments are funded by federal appropriations, such as the Payment in Lieu of Taxes (PILT) program, and from receipts received by federal agencies from activities on federal public lands (e.g. timber harvest, livestock grazing, and mineral extraction). These payments can represent a significant portion of local government revenue in rural counties with large federal land holdings.

Before 1976, all federal payments were linked directly to receipts generated on public lands, which could be unpredictable making it hard for counties to budget and plan accordingly. However, Congress funded the Payment in Lieu of Taxes (PILT) program with appropriations beginning in 1977 in recognition of the volatility and inadequacy of federal revenue sharing programs. Payment in Lieu of Taxes are federal payments made annually to compensate county governments for tax-exempt lands administered by the Bureau of Land Management, National Park Service, Fish and Wildlife Service, Forest Service, for federal water projects and for some military installations. The allocated amount is based on a maximum per-acre payment reduced by the sum of all revenue sharing payments and subject to a population cap (Table 11). Federal land payments to the counties are an important component of local government fiscal health since the county governments can incur a number of costs associated with activities taking place on or associated with federal lands, such as road maintenance and emergency services (Headwaters Economics 2017i).

Table 11. Fiscal year 2015 Payment in Lieu of Taxes (PILT) amounts received by the four counties within the Lincoln NF area of influence (Headwaters Economics 2017i).

Location	Payment	Eligible Acres of Federal Land
Eddy County	\$3,406,536	1,577,137
Chaves County	\$3,073,159	1,216,424
Lincoln County	\$1,711,259	921,816
Otero County	\$3,131,089	1,529,891
Area of Influence Total	\$11,322,043	5,245,268
New Mexico Total	\$37,803,317	22,470,290

Forest Service revenue sharing programs such as the Secure Rural School and Community Self-Determination Act (SRS), 25% Fund, and Forest Grasslands are the largest source of federal land payments to counties on a national basis. The Secure Rural School and Community Self-Determination Act (SRS) Act of 2000, reauthorized in April 2015, was enacted in fiscal year 2001 to provide assistance to rural communities affected by the decline in revenue from timber harvests on federal lands. The SRS Act has three titles that allocate payments for specific purposes, including: Title I – funds roads and schools; Title II – funds are retained by the federal treasury to fund special projects on federal lands; and Title III – funds are used to carry out Firewise Communities program activities, to reimburse counties for search and rescue and other emergency services, and to develop community wildfire protection plans. The 25% Fund shares revenues generated from the sale of commodities produced on public lands with the county in which the commodities are sold. Twenty-five percent of the value of public land receipts are distributed directly to counties and must be used to fund roads and schools. However, the counties are not entitled to receive funds from both the SRS program and the 25% Fund; they must elect to receive funds from one or the other.

As depicted in Table 12, all four counties within the Lincoln NF area of influence have elected to receive SRS program funds rather than 25% Fund revenues. This is likely due to the fact that SRS funds provide a greater and more stable source of revenue (Table 13), especially in an area where the value of commodities, such as timber, has been in a state of decline since 1998 (Headwaters Economics 2017i and

2017j). This trend is reflected in the total number of timber jobs within the area of influence, which suffered a 93 percent decrease from 1998 to 2015 (Headwaters Economics 2017j).

Table 12. Fiscal year 2015 Forest Service Revenue Sharing Payment amounts received by the four counties within the Lincoln NF area of influence (Headwaters Economics 2017i)

	Eddy County	Chaves County	Lincoln County	Otero County
Forest Service Total	\$57,845	\$38,033	\$321,757	\$584,381
Secure Rural Schools Total	\$57,845	\$38,033	\$321,757	\$584,381
Title I	\$57,845	\$38,033	\$273,493	\$496,725
Title II	\$0	\$0	\$25,741	\$46,751
Title III	\$0	\$0	\$22,523	\$40,907
25% Fund	\$0	\$0	\$0	\$0
Forest Grasslands	\$0	\$0	\$0	\$0

Table 13. Comparison of revenue from the 25% Fund and the Secure Rural School and Community Self-Determination Act programs for each of the counties within the Lincoln County area of influence

	25% Payments (Fiscal Year 2016)	SRS Payments (Fiscal Year 2015)
Chaves	\$3,219.22	\$37,694.28
Eddy	\$10,733.63	\$57,328.78
Lincoln	\$33,385.78	\$267,977.60
Otero	\$44,859.53	\$532,835.80
Total	\$92,198.16	\$895,836.46

In addition, funds provided through Title III of the SRS program - which allows counties to conduct Firewise Community program activities and develop community wildfire protection plans - would greatly benefit counties that have wildland-urban interface areas that are at significant risk of wildfire. Notably, Otero and Lincoln Counties are ranked first and third in New Mexico (out of 33 counties), respectively, for the risk of wildfire on lands already developed in the wildland-urban interface (Headwaters Economics 2017h).

Forest Service Gross Receipts from Commercial Activities

The Lincoln NF provides various economic opportunities to surrounding communities, which include timber harvesting, ranching, and providing recreation services to the visiting public. Figure 19 displays the inflation adjusted total gross receipts from 1986 to 2016; however, before 2001 the receipts were not identified by source. Figure 20 shows the gross receipts collected by the Lincoln NF by source from 2001 to 2014 (Headwaters Economics 2017k).

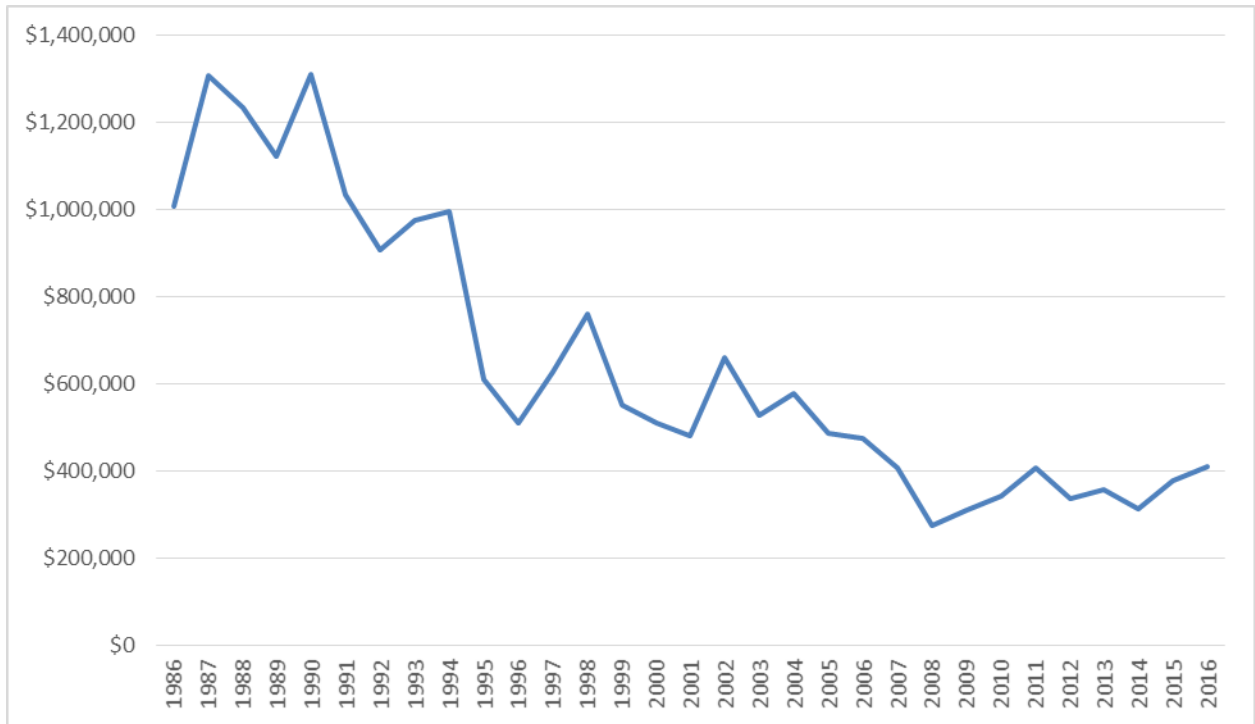


Figure 19. Inflation adjusted total gross receipts collected for the Lincoln National Forest from 1986 to 2016

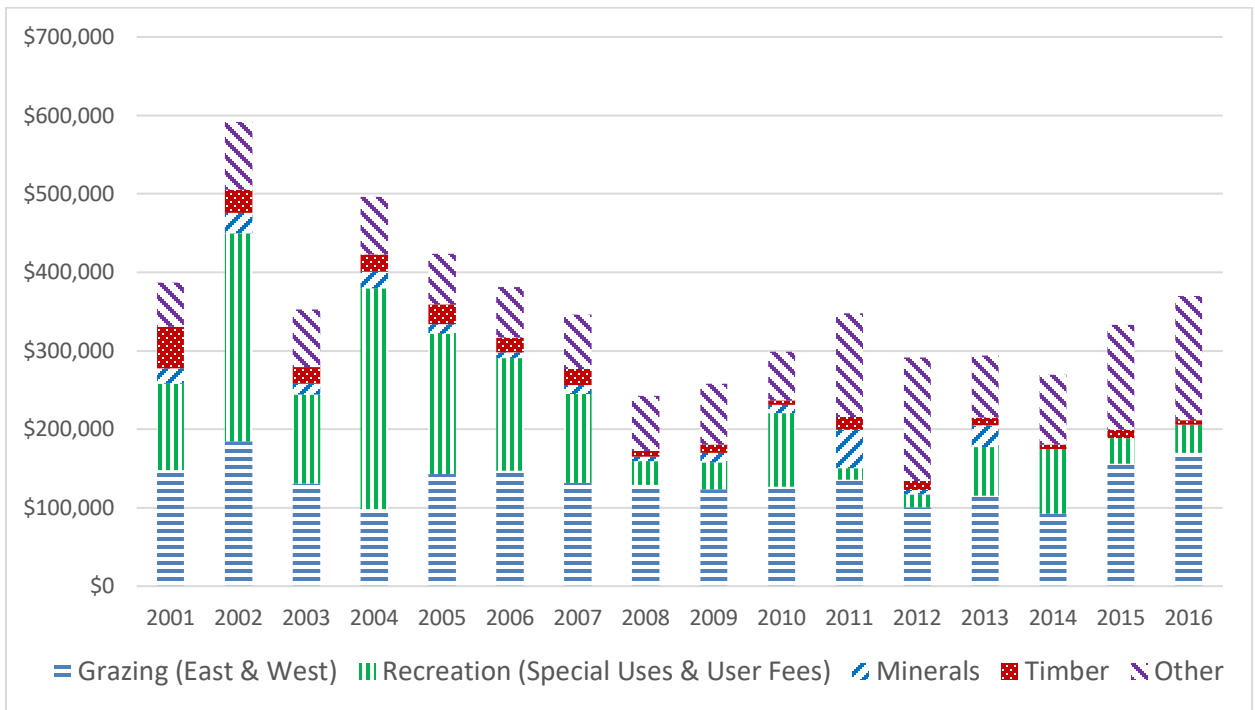


Figure 20. Inflation adjusted total gross receipts collected by source for the Lincoln National Forest from 2001 to 2016. Note: From 1986 - 2000 the U.S. Forest Service provides only total receipts. Beginning in 2001, receipts are broken out by source. These data do not include receipts deposited into special accounts and trust funds available to the Forest Service without additional appropriation by Congress.

Influence of the Lincoln NF on Social, Cultural, and Economic Conditions on the Broader Landscape

Hunting

Culturally, hunting is an important activity for the people of New Mexico. Early inhabitants hunted and lived off the land. Many of the people in rural areas and small towns in southwestern 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, off-highway vehicles, 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 Lincoln NF is known for its trophy animals, especially elk, which attract hunters from all over the country. Ranchers are taking advantage of the hunting opportunities by developing outfitting and guiding businesses. Outfitters and guides look to the Lincoln NF for special use permits that allow them to host tourist activities on Forest Service lands. Some rely on this as a main portion of their income.

Smokey Bear

Lincoln NF is the home of the famous Smokey Bear, the tiny black bear cub found after a human-caused forest fire in 1950. Smokey was later housed at the National Zoo in Washington, D.C. and became the well-known figure used to warn and educate the public about the dangers of forest fires. The burial site of Smokey the Bear is located at the Smokey Bear State Park in Capitan, New Mexico.

Nationally Significant Caves and National Register of Historic Places

The Guadalupe Mountains area, which includes the National Forest and National Park Service, is home to hundreds (if not thousands) of unique cave formations that draw visitors from all over the world. Most of the Guadalupe Ranger District's 130 primitive caves, located in the steep and rugged canyons of the district's southern third, are classified as "Nationally Significant Caves" by the National Park Service. Carlsbad Caverns National Park abuts the southeastern edge of the Guadalupe Ranger District, and contains more than 100 known caves, including Lechuguilla Cave – the nation's deepest limestone cave and fourth longest. Caves on the Lincoln NF provide unique and varied recreational opportunities ranging from first-time novice caving experiences to very experienced expedition-class cavers.

The Lincoln NF is also a culturally and historically significant area. It is estimated that the Lincoln NF contains between 12,000 and 15,000 sites of cultural, archeological, and historical interest. Four sites have been listed on the National Register of Historic Places, including: the Cloudcroft Trestle, the Bonito pipeline, the Wizard's Roost (a prehistoric solar observatory), and the Jicarilla Schoolhouse.

Stakeholder Input

Public comment and discussions have been ongoing in relation to forest plan revision since March of 2015 through presentations, meeting with working groups and many other venues. Between November 2015 and January 2016 the Lincoln NF conducted official public meetings to educate the public in our process as well as to hear what they had to say. As part of that effort, we conducted a survey to see what their issues or concerns were, asked about possible solutions to that issue and finally asked them to rate conditions of the issue to help us see what they saw the trend was. They were grouped into Areas of Interest (AOIs) based upon 15 AOIs for plan revision and then broken down into issues, issues

were then tallied for condition ratings. Following are extractions of these concerns/issues, recommendations, and conditions/trends.

Many of the comments received and compiled within land use are also associated with other chapter subjects such as travel management. Specific to land use are a number of comments on the problems between forest users and private land owner's properties. A number of trespass issues have occurred recently and seem to be on the rise. Another key issue is that of military use of Lincoln NF lands for training purposes. A number of stakeholders feel that the use is incompatible with the forest in general.

Concerns/Issues:

- Too much motor vehicle use and associated development on the Forest
- Management of the forest is weighted toward livestock grazing and ranching
- Fewer people using the forest
- Overregulation of springs and infringement/taking of water rights
- Discriminatory and illegal fees to use recreation sites and collect fuelwood
- Resource damage associated with out-of-state user groups (e.g., OHV/ATV)
- Invasive use of technologies and loss of natural values
- Closing of sawmills, schools, and local business due to shutting down of commercial logging by the Forest Service in the 1980s
- Loss of private timber production infrastructure due to agency decisions
- Lack of fisheries opportunities and tourism draw
- Too many agency employees without benefit to the public
- High costs associated with fighting catastrophic fires due largely to poor management of forests
- Not enough funding for projects to manage the forest
- Good communications and working relationships with the Forest Service
- Forest Service is disconnected from communities and their values/perspectives, does not ask what they want of their forest
- Agency is crippled by bureaucratic policies and decisions/actions take too long
- Agency has many conflicts with public and local communities
- Agency personnel are not held accountable for their decisions
- Employee turnover results in projects not being implemented
- Reduction of livestock use instead of increasing elk harvest
- Agency does not listen to forest users or consider their input
- Agency decisions are biased and its processes not transparent, resulting in abuse of authority and controversy
- Agency has a poor public image
- Poor reporting and transparency regarding forest plan effectiveness and budget expenditures
- Not enough public meetings or transparency
- Reports and documents that contain confusing language for the public
- Limited transparency w/ the public regarding the use of categorical exclusions, special use permitting, and similar actions
- Lack of communication with adjacent landowners regarding project status and, in particular, Wildland Urban Interface (WUI) projects
- Hazardous trees that need to be removed
- Hire fire risk to residential areas/WUI due to unburned and residual slash/piles, incomplete timber projects

- Limited management in the WUI
- No sharing/centralization of information or coordination with other agencies to benefit the public (i.e., Service First model)
- High flood risk to communities with little mitigation/prevention
- Campfires left unattended
- Lack of communication with adjacent landowners regarding project status, WUI/fire projects in particular
- Growth of towns and communities has increased fire risk and human safety
- Burning of slash/piles during drought periods
- Impacts from timber harvest operations such as roads and unburned and residual slash/piles
- Eroded routes, reduced egress/escape and high risk to human safety in the event of fire

Management Suggestions:

- Thin forests more to reduce risk of catastrophic fire and benefit communities
- Improve interagency communication and coordination with the military related to air space use and landing zones
- Work with NRCS and other partners to implement range improvement projects and maintenance
- Give livestock AUMs precedence over elk
- Recognize people's water rights
- Improve communications with White Sands, Fort Bliss, and Holloman and manage for air space use
- Emphasize landscape/stewardship projects to restore watersheds and forest health, create forest industry jobs, and provide forest products in the local communities
- Work with 4WD communities and clubs to provide for road and trail-based recreation
- Develop and promote mountain biking opportunities to benefit the local community and economy
- Support the agricultural economy through multiple use and sustained yield management
- Provide opportunities for cooperating agency involvement in the forest plan revision process
- Reactivate a Grazing Advisory Board for the forest
- Allocate and seek more funds and prioritize trail maintenance and improvement
- Support and protect private infrastructure and enterprises that make possible timber production and harvest to support agency needs and ensure forest health
- Secure water supplies for communities
- Use selective timber practices to harvest trees and safely "store" carbon loads
- Recruit volunteers to help manage the forest
- Communicate and engage with ranchers to establish positive working relationships and improve the agency's image
- Prioritize budgets and expenditures on thinning and burning of the forest to address high fire risk and heavy fuel loading
- Value and apply the local knowledge of long-time residents
- Follow the BIA/Tribal (Mescalero Reservation) model for timber harvest, forest health and management
- Listen to users of the Forest
- Evaluate the socioeconomic benefits of wilderness areas
- Local residents' concerns should be weighted more heavily than other public input
- Consider equally all citizen input/concern
- Stop spending money on new buildings and vehicles

- Compensate landowners from let-it-burn policies and resultant damage to private lands and resources
- Report forest plan effectiveness for various programs on a regular basis w/ the public
- Engage with New Mexico Soil and Water Conservation Districts for the plan revision: Carlsbad, Carrizozo, Chaves, Otero, Peñasco, and Upper Hondo.
- Work with Department of Defense to address radio frequency conflicts in and around the Lincoln NF
- Prioritize watershed restoration/improvement areas across the forest
- Outreach to universities and schools
- Ensure more local control in the planning process
- Thin forests and fuels more to reduce risk of catastrophic fire and carbon releases
- Find economical uses for slash and small diameter trees
- Coordinate and collaborate with communities to address risk of catastrophic fire and human safety concerns
- Use selective timber practices to harvest trees and safely “store” carbon loads
- Work closely w/ local volunteer fire departments and EMS
- Use fire crews in the off-season to reduce fuel loading
- Build retention ponds and similar flood control structures to protect downstream communities
- Establish an agreement with landowners to permit treating adjacent National Forest System lands to mitigate fire risk
- Do not let fires burn (“unplanned ignitions”) in an unhealthy forest, response should be immediate to protect communities and homes
- Allow use of feller bunchers to build firebreaks
- Thin forests first, then control burn including piles and slash
- Discontinue burning of piles/slash on site, have contractors remove the material from the site or use it for erosion control

Conditions/Trends

A total of 8 comments were gathered between November 2015 and January 2016. General recreation comments related to socioeconomics accounted for half of the comments received. All of the comments related to recreation rated existing conditions as poor (3) or fair (1). One member of the public said the trend is improving and one said socioeconomic trends were getting worse.

General, which is basically a miscellaneous category, also had 4 comments. Most rated current conditions as poor or fair, and all said the trend is getting worse or remaining the same.

Summary of Findings for Socioeconomic

In a social context, the Lincoln NF offers a unique setting in terms of history, diversity, and economic conditions. There are strong attachments to the land by the residents within the area of influence and traditional uses are held in high esteem. The area is experiencing a shift to recreation and tourism, which take advantage of the history, culture, and natural environment in and around the Lincoln NF.

In addition to the attachment people have to the land, there are also benefits derived from and demands placed on the Lincoln NF that the public communicated during the course of this assessment. Many of these include traditional benefits, natural resource oriented benefits, recreation benefits, and lifestyle benefits. The demands were generally expressed as concerns or desires. In summary, the public’s main interests were related to (a) roads, trails, and facility maintenance; (b) support for economic development; (c) ecosystem sustainability; (d) recreation; (e) fire and fuels management; (f)

diminishing water supplies; (g) wildlife habitat; (h) access and travel management; (i) invasive plants and animals; (j) drought and climate change; (k) wilderness; (l) more educational and volunteer opportunities; and (m) better communication with the Forest.

In general, the demographic profile of the four counties comprising the Lincoln NF area of influence is analogous to that of the United States. As a whole, the population is aging, more racially diverse, with higher educational attainment and increasing per capita incomes (UNM BBER 2007). The demographics of the area of influence reflect a culturally and economically diverse population. They also highlight some of the hardships people face, especially in terms of income. Approximately 17 percent of the population within the area of influence lives in poverty, which is lower than some areas of the state; however the poverty rate for certain racial and ethnic groups is much higher.

Most people in the area of influence work in the services industry or for local government, and wages tend to be lower compared to the State of New Mexico and the nation. There is little opportunity in the area of influence, and younger generations are perceived to be leaving the area in search of better jobs. Despite this, a number of indicators determine the economic health of a place. No single indicator should be used by itself. Rather, a range of indicators should be analyzed together to get a comprehensive view of the economy. Long-term, steady population growth, employment, and personal income are generally indications of a healthy, prosperous economy. Since 1970, the population, employment, and personal income within the Lincoln NF area of influence have all increased (Headwaters Economics 2017c). However, when considering the benefits of growth, it is important to distinguish between standard of living (such as earnings per job and per capita income) and quality of life. Recreation opportunities and the promise of a rural lifestyle has resulted in an influx of newcomers to the area, mostly retirees, which has resulted in increased housing development both within and adjacent to the forest.

The Lincoln NF also offers a demographic profile that provides economic benefits to the area of influence. Economic contributions from the forest provide benefits to the area of influence from direct, indirect, and induced impacts. Grazing, timber, oil and gas, and forest expenditures also provide economic contributions, though to a lesser extent. However, recreation and tourism contribute more than all of the other resource areas combined. The Lincoln NF also contributes to local counties through payments in lieu of taxes and the Secure Rural Schools program.

When considering the social context, the attachment people have, and the contributions the Lincoln NF makes, it is evident that the forest is not separate from the communities it serves, but is an integral part of them. Reliance on National Forest System lands in some form or another is part of the culture within the area of influence and will continue to be so for as long as the forest remains in place.

CHAPTER 3 - Cultural and Historic Resources and Uses

Introduction

This is an assessment of the current known historic properties, on the three ranger districts located on the Lincoln National Forest (Lincoln NF) (“the plan area”). The historic properties discussed here consist of cultural, historic and prehistoric resources and are often referred to as sites. Within this chapter we will be discussing social and economic conditions, resources, history, and trends.

The scale of this chapter is the ‘plan scale’ or lands within the forest boundary of the Lincoln NF. Information used to compile this assessment consisted of published sources, site and report records for the Lincoln NF, corporate geographic information system (GIS), and Natural Resource Management (NRM) databases for the Lincoln NF, State of New Mexico GIS, and New Mexico Cultural Resources Information System (NMCRIIS) database information.

Social and Economic Contributions of Cultural and Historic Resources and Uses

This assessment has been prepared to assist in identifying the need for change in the revision of the Lincoln NF’s existing 1986 land and resource management plan, and in developing components for the revised plan, including desired conditions, objectives, standards, guidelines, and suitability of lands. The assessment has been prepared as directed by 36 CFR § 219.6(a) and (b)(13), and in accordance with FSH 1909.12, ch. 10, secs. 11 and 13.8.

Ecosystem Services

The ecosystem services provided by cultural and historic resources and traditional uses of the plan area are by definition cultural services, in that these resources and uses provide social, psychological, spiritual, and emotional connections between people and the land. However, many of these cultural services are derived from provisioning services, regulating services, and supporting services. For example, fuelwood gathering is a provisioning service, but for many members of traditional communities within and adjacent to the plan area, both the act of gathering and the wood itself provides emotional and spiritual experiences that are cultural services. Likewise, the belief systems of many of those in traditional communities that utilize ecosystem services do not allow for the distinction between cultural services and other types of services. For example, in the view of the Native American groups affiliated with the plan area, primary services such as water quality and quantity are by definition cultural services, as in this view these two are intrinsically linked. Therefore, effects to the environment, both beneficial and adverse, are concurrently considered effects to the ability of the environment to deliver cultural services.

Contributions to Social, Economic and Ecological Sustainability

The plan area has been under the management of the Forest Service since 1902, more than 100 years. Native American, Hispanic, and Anglo-American communities continue to use the forest for economic, social, and religious purposes.

Cultural and historic resources and their uses in the plan area are important 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 communities are critical to maintaining the identity of these communities.

Tourists are attracted by the nature and significance of historic properties, and by the character of traditional communities, a character maintained by resources in and uses of the plan area. Historic properties also 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 and resource protection.

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 of 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 or 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. There are several themes in American history for which historic properties on the Lincoln National Forest can provide, or have provided, important information:

- Native American land use and cultural traits during the Archaic period (6500 B.C.-A.D. 500) (all districts)
- Land use and cultural traits of the Jornada Mogollon (A.D. 500-1150) (all districts)
- Land use and cultural traits of the Mescalero Apache (A.D. 1500-present) (all districts)
- The economic and social effects of commercial mining in the late nineteenth and early twentieth centuries (Smokey Bear and Sacramento Districts)
- The economic effects and environmental consequences of commercial logging during the late nineteenth and early twentieth centuries (Smokey Bear and Sacramento District)
- The economic effects and environmental consequences of railroads during the late nineteenth and early twentieth centuries (Smokey Bear and Sacramento Districts)
- The economic effects and environmental consequences of the Civilian Conservation Corps during the early twentieth century (All Districts)
- The economic effects and environmental consequences of ranching during the late nineteenth century to the present (All Districts)

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). 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.

Current Use of Historic Properties

The importance of historic and cultural places and characteristics of the plan area for maintaining the identity of traditional communities is well documented. For their importance to Native American traditional communities, see assessment for areas of tribal importance. 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 their use 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. In the plan area, there are a few historic properties that are interpreted and readily available for visitation by the public. There are interpretive displays in the supervisors' and district offices and at Sacramento Peak Observatory. Historic properties open to the public include the Mexican Canyon Trestle, associated with 19th and 20th century railroads and logging in the Sacramento Mountains, Monjeau Fire Lookout on Smokey Bear Ranger District, and Sitting Bull Falls built by the Civilian Conservation Corps on the Guadalupe Ranger District. 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. 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 within the plan area.

Scientific information generated from the study of historic properties 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, macro-botanical materials, soils, pollen, and other remains relevant to the reconstruction of patterns of ecological and ecological change over the past 12,000 years, and 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. 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.

Cultural and Historic Context of the Assessment Area

This section summarizes the Native American occupation and use of the plan area over the past 12,000 years. Contemporary uses of the plan area by traditional communities that are considered important to the cultural identity of those communities are discussed in the following section, Description of Cultural and Historic Resources of the Assessment Area.

The plan area contains historic properties that demonstrate human occupation and use for approximately 12,000 years. The occupation and use of the plan area by Native Americans (American Indians) with Pueblo and Athapaskan ethnic affiliations and groups ancestral to these ethnic affiliations has occurred over this entire time span. Occupation and use of the plan area by Europeans and their

descendants and other peoples from the Old World has occurred over approximately the past 500 years. The plan area has been under the management of the Forest Service since 1902. Native American, Hispanic, and Anglo-American traditional communities continue to use the plan area for economic, social, and religious purposes.

This history of occupation and use has been prepared from archaeological studies, which employ historical documents and records, and oral history and traditions from Native Americans and others. While this history incorporates information from Native American oral history, it is written from a Western archaeological and historical perspective. Traditional Native American oral history differs from Western history in its measurement of the passage of time and in the causality identified for the course of human events and historic processes. Despite these distinctions, scholars have found broad concordances in information regarding Native American history in the American Southwest between archaeology, historic records and documents, and Native American oral history for at least the past millennium. However, Native American oral tradition and Western scholarship differ regarding the ultimate origins of Native Americans in the region and in the Western Hemisphere. Western scholarship, using scientific evidence from archaeology, genetics, and linguistics, places the ultimate origins of Native Americans in northeastern Asia, with a migration to the Western Hemisphere sometime prior to 12,000 years ago and movement into the American Southwest soon afterwards. Archaeological, genetic, and linguistic evidence indicates that Pueblo people are descendants of these earliest migrants, while Athapaskan people are in part descendent from peoples that migrated to North America western Canada later, and entered the American Southwest, after migrating from Canada, as recently as 500 to 600 years ago. The oral traditions of both Pueblos and Athapaskans, however, place their ultimate and organic origin within the region itself.

Native American Occupation and Use to AD 1600

The Lincoln NF has been the setting of considerable human activity for thousands of years. Although limited evidence of Paleo-Indian occupations has been found, it is likely that all of the cultural periods from the Paleo-Indian, Archaic, Mogollon, and Apache through the modern historic are represented.

For virtually the entire span of human history in the plan area, Native Americans were the only people to occupy and use the land. 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 AD 1600, Native American history is divided into three broad periods:

1. **The Paleo-Indian Period** 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 Paleo-Indian occupants were nomadic hunters and gatherers.
2. **The Archaic Period** is a long span of time in the early and middle Holocene when environmental conditions stabilized and became approximately the same as contemporary conditions. The Archaic Period 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.
3. **The Pueblo Period** corresponds to the last millennium of Native American occupation prior to AD 1600. It is characterized by the advent of settled life, a shift to a reliance on farming for food, and significant population growth in the region. The origins of the modern ethnic identities of contemporary Pueblo peoples also lie within this era. Athapaskan groups colonize portions of the American Southwest during the end of the Pueblo Period, although initially as small bands of

hunters and gatherers. The Athapaskan groups that migrated to the Southwest are the ancestors of the Navajo and Apache.

The Paleo-Indian Period

The earliest occupation of the forest probably began during the Paleo-Indian Period, which dates from around 10,000 BC to about 5500 BC. In 1931, the first Clovis point found in the modern era was excavated *in situ* at Burnet Cave, New Mexico (Boldurian and Cotter 1999). The site is located just outside the plan area in the Guadalupe Mountains. This find predates the Dent Site, Clovis, and all others claiming to be the first *in situ* Clovis find in the Americas. Until about 1950, Burnet Cave was considered to be among the handful of truly reliable intact Clovis sites. This period is characterized by big game hunting supplemented with the gathering of wild plant foods. The distinctive lanceolate Clovis point is the most diagnostic artifact, two of which have been collected on the Forest. Most of the evidence for this period in surrounding areas comes from hunting related sites such as preparatory sites, processing sites, and base camps.

During the Paleo-Indian Period, the use of mountain areas may have been more limited than in other time periods. The Late Pleistocene climate was cooler and wetter, and resources of all types were more plentiful in all ecological and geological zones. However, topography does appear to have been a factor in site selection for members of the Folsom culture. The majority of Folsom sites in the lowlands of south-central New Mexico are found between 4,000 and 5,000 feet above mean sea level in basin, plain, and foothill settings. Evidence exists that suggests Folsom groups foraged into higher elevated areas, as sites have been found as high as 7,500 feet, and isolated occurrences of stone tools as high as 8,500 feet (Amick 1994).

In recent years, several Folsom sites have been discovered within the Tularosa Basin and Hueco Bolson. On the east side of the northernmost Franklin Mountains within Fort Bliss Military Reservation, there is a Folsom Period site (FB 1613) situated on a hill overlooking a large playa. Another Folsom site, located on Holloman Air Force Base, overlooks Rita's Draw and Lost River Playa to the north and west (Sale 1996). Two additional sites on McGregor Range were recorded on hilltops overlooking drainages to the north (Browning et al. 1998). Two Folsom sites were recorded at the base of the Sacramento Mountains on Holloman Air Force Base administered lands near Boles Wells, New Mexico (Mauldin and O'Leary 1994; Sale 1996). More investigation of this site type is needed in the region before a clear determination of Folsom Period land use in the project area can be made.

It appears that Paleo-Indian use of the forest was minimal. The deepest deposits in Fresnal Shelter have been dated to 6340-5980 B.C. and 6110-5770 B.C. (Miller and Kenmotsu 2004). Early dates on hearths found in levels with Pleistocene faunal remains have been obtained from the Guadalupe Mountains, but no firm associations between the faunal remains, the hearths, and human artifacts have been demonstrated. With the exception of rock shelters and caves in the 5000-6000 foot elevation range, Paleo-Indian sites seem to have clustered in the basin and at its edges where big game and other resources were more prevalent. More research is needed in areas presumed to have Paleo-Indian remains, and suspected Paleo-Indian sites need to be accurately dated.

The Archaic Period

Climatic changes throughout the Southwest began to occur about 6000 BC, resulting in drier conditions than the previous Paleo-Indian Period. This led to a reduction in big game populations and a change in the distribution of plant species. As environmental conditions changed, human adaptations to the

environment also changed (Huckell 1996, Oakes 2000). Hunting was increasingly supplemented with plant foods, obtained from a variety of environmental zones from the basin floors to the mountain slopes. This type of subsistence system necessitated the seasonal movement of groups of people depending upon the availability of specific floral and faunal resources. A broad-spectrum economy involving seasonal rounds lasted for thousands of years. By the late Archaic Period, population growth coupled with increasing socio-political complexity occurred. Corn and beans first appeared during the Archaic Period, but in general, domesticated crops played only a minor role in subsistence (Cordell 1984, Cordell and McBrinn 2012). The subsequent transition to a more sedentary existence with a greater reliance upon agriculture took several centuries.

A dramatic increase in the ring midden roasting pit feature type occurred during the Late Archaic Period in low hill environs. These features were likely used for roasting locally available succulent plants such as agave and sotol (Lowry 2000, Zier 1996). Late Archaic projectile point styles continue to be used well into the Formative Jornada Mogollon Period, creating problems with the temporal assignment of sites of this period.

A number of caves and rock shelters in the Sacramento and Guadalupe Mountains contain evidence of Archaic occupations underlying that of later periods. Fresnal Shelter is the most well-known, dates range from 6340-5980 BC, 6110-5770 BC, 1390-940 BC, and 1200 BC-AD 600 (Miller and Kenmotsu 2004, Tagg 1996), with a variety of cultural material including baskets, sandals, and ground stone tools. Although hunting still played an important role in the Late Archaic diet, there does appear to be an increased emphasis on small mammals. Open campsites are also found on the forest; many are found along major drainages and there are numerous open-air hearths in the Guadalupe Mountains. In general, Archaic sites seem to be located in environmental zones or ecotones that offer a variety of resources (Oakes 2000). The Archaic Period rock shelters are fairly well documented. However, a more representative sample of dated and excavated sites is needed before any interpretation can be made.

Kelley (1984) and Lehmer (1948) each developed a phase sequence for dating the Jornada Mogollon, dividing the northern and southern portions of the forest (Table 14). A subsequent modification to the phases have been suggested (Oakes 2000), but the phases do not reconcile the difference in dating from north to south, despite the Jornada Mogollon occupation of the entire plan area. Therefore, the Jornada Mogollon are discussed according to each Forest District.

The Jornada Mogollon tradition emerged sometime between 300 BC and AD 700 as regionally-distinctive cultural traditions developed in the Greater Southwest. The Mogollon tradition emerged from an Archaic hunting and gathering adaptation. The Jornada variant of Mogollon was defined by Kelley (1984) and Lehmer (1948) based on ceramic styles and architectural features.

Kelley's work in the upland areas of the Smokey Bear District led to the development of cultural phases for the Jornada Mogollon (1984). Kelley based the scheme on stone slab lined architectural features and pottery types. These phases are contemporaneous with Lehmer's (1948) phases, although Lehmer's phases have been used mainly in the basins and southern Sacramento Mountains of the Sacramento and Guadalupe Districts. Rather than competing interpretations of the Jornada Mogollon cultural sequence, they are complimentary, describing the sequence in different geographical parts of the planning area.

Table 14. Phase Sequences for the Jornada Mogollon

Lehmer 1948		Kelley 1966		Oakes 2000	
North	South	North	South	Forest Wide	
San Andres AD 1200-1400	El Paso AD 1200-1400	Lincoln AD 1200-1400	Late Glencoe AD 1100-1300	Type VI* Type V*	AD 1315 AD 1275
Three Rivers AD 1100-1200	Dona Ana AD 1100-1200	Corona AD 1100-1200		Type IV* Type III*	AD 1150 AD 1050
Capitan AD 900-1100	Mesilla AD 900-1100	Glencoe AD 900-1100	Early Glencoe AD 900-1100	Type II* Type I*	AD 1000 AD 450

* Type I-VI are cultural phases based on the sequential introduction of new ceramic types defined in the paragraph below.

Excavation and survey data collected since Kelley's classification has led to a reanalysis of her cultural sequence (Oakes 2000). Oakes (2000) bases her sequence on dates that correspond to the introduction of various ceramic types in the archaeological record. Oakes (2000) finds that the earliest Jornada brown wares of the Type I (Table 14) occupation prior to AD 1000, are found on simple pithouse site in the Rio Bonito area and north near Corona, New Mexico. In the Type II occupation A.D. 1000-1050, the addition of Chupadero black-on-white accompanies a spread of population to the Rio Peñasco near Mayhill and to the Ancho area. There is no other distinction in brown ware or site features indicating a Corona or Glencoe phase occupation. Type III ceramics circa AD 1050-1150 include the addition of El Paso Bichrome and San Andres Red-on-terracotta. Slab lined features appear more commonly but are not limited to the north as proposed by Kelley (1966). Type IV ceramics AD 1150-1225 include Ramos Polychrome, Playas Red Incised, Saint John's Polychrome and Corona Corrugated. Type V ceramics from AD 1275-1300 include Lincoln Black-on-red, Gila Polychrome and Heshotauthla Glaze Polychrome. Slab lined features continue through time, suggesting that there is no temporal constraint for this feature, though geographically, they do not extend south of the Smokey Bear District. Type VI occupations starting around AD 1315, are associated with Rio Grande Glaze I pottery. The Rio Peñasco area is abandoned at this time with occupation continuing in the Rio Bonito and Corona area.

The Pueblo Period

The Jornada Mogollon tradition overlaps both the late Archaic Period and the early Pueblo Period in the plan area. During the Classic Period from AD 1325-1600, large pueblos were constructed to the north of the Smokey Bear District. Pottery from these Classic Period sites can be found in a few locations on the northern part of the Smokey Bear District indicating trade, contact, or cultural affiliation. This was a period of cultural florescence in the Middle Rio Grande Valley and adjacent uplands (McEnany et al. 2001). This is the time period in which many contemporary Pueblo communities define their modern origins. Migrations from the south and west were largely complete, and the religious traditions practiced at the pueblos today are first seen in rock art and reflected in 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. Large pueblo villages dating to the Classic Period found north of the plan area include Chilili, Quarai, and Abo.

On the Smokey Bear Ranger District, late pueblo sites along the Bonito, Ruidoso, and Macho drainages are the best known. It has only been recently that earlier sites have been investigated. From the limited information available, it is possible to state that this area of the forest is characterized by the occupation

of high mountain valleys in the piñon and juniper zone. Artifactual evidence indicates interaction with other groups in New Mexico. Sometime between the late AD 1300s and early AD 1400s, the large villages appear to have been abandoned. A return to a more mobile existence with a reliance on hunting and gathering may have occurred. Such a shift in subsistence would be difficult to distinguish from earlier periods in the archaeological record since the adaption would have been more similar to the Late Archaic or early Jornada Mogollon.

There is still limited excavation data for the northern part of the plan area. Jornada Mogollon phase sequences developed for the southern Jornada Mogollon area (Miller 2005) do not generally include the northern portions. Given the advance in research and an increase in sample size, Oakes (2000) and Miller (2005) modified phase sequences may be more appropriate than Kelley's (1966, 1984) or Lehmer's (1948) for classifying sites on the forest. Most researchers routinely assign sites to the various phases based on relative dating with diagnostic artifacts like pottery or projectile points. Few absolute dates have been obtained on the forest for firm temporal placement of these phases or the accurate dating of the sites. A number of sites on Fort Bliss have had radiocarbon dating, which is helpful in characterizing the southern portion of the forest. Several Jornada researchers have pointed out the problems inherent in relying solely on relative dating and in overemphasizing phase sequences (Carmichael 1983, 1985a-b, 1986; Reed 1987; Upham 1984). Absolute dating of chronometric samples from more sites in the area is essential to substantiate, modify, or refute the frameworks that have been proposed.

Lehmer (1948) defined a three phase developmental sequence for the Jornada Mogollon with a northern and southern variant. The Southern variant on the Sacramento District will be discussed here. The Mesilla phase is defined by the first pottery and villages in south-central New Mexico. Diagnostics include small-scattered pithouse villages and plain brown ware pottery. The succeeding Dona Ana phase is a transitional phase. Polychrome pottery appears on historic properties and there seems to be less isolation from outside groups. The El Paso phase is considered the crystallization of the earlier phases and the peak of Jornada cultural development. Characteristics include well-designed pueblos along the edge of the basins, manufacture, and export of El Paso Polychrome pottery, and evidence for considerable contact with other regions.

The Jornada Mogollon occupation of the central and southern portion of the Sacramento Mountains, on the Sacramento Ranger District, has received little attention until recently. It appears that the area is characterized by generally low site density throughout the mountains at higher elevations with certain lower elevational areas exhibiting selective and intensive utilization (see the ERU discussion below). The majority of the sites at higher elevations are limited activity loci. Habitation sites are small and scattered. Pithouse villages do occur near the alluvial fans of the western escarpment or in the wider valleys leading into the mountains. Villages are known on the eastern slopes of the mountain near Mayhill, and suspected pithouse villages have been found along the southern tributaries of the Peñasco River. These sites are situated on broad terraces adjacent to streams or on ridges, which extend into the drainages. They occur at the upper end of the piñon/juniper belt or just within the transitional zone dominated by ponderosa pine. The evidence indicates that the villages in this area were abandoned somewhat earlier than the other Jornada areas, perhaps pioneering a return to a more mobile existence.

To fully understand the Jornada Mogollon one must look south and west off the forest for more in-depth analysis. It has long been acknowledged that the Jornada Mogollon phase sequence was in need of critical review. This was particularly needed given the long term debate surrounding the nature, timing, and even the existence of the Doña Ana phase, whether as originally defined by Lehmer (1948) or as defined through several alternative phase sequences (Miller 2005a, 2005b, 2005c). The intent was

to examine the sequence using the vast body of chronometric and contextual information compiled during the Fort Bliss inventory (Miller 1996) and ultimately to develop a sequence that could be used to compare prehistoric developments in the Jornada region with those across the southern Southwest. Based on an exhaustive review of over 1,600 radiocarbon and archaeomagnetic dates and the various temporal trends, Miller (2005a, 2005b, 2005c) has proposed a revised phase sequence for the Jornada Mogollon (Table 15).

Table 15. Proposed Revised Phase Sequence for a portion of the Jornada Mogollon area

Lehmer 1948	Miller 2005
El Paso AD 1200-1400	El Paso AD 1275/1300-1450
Doña Ana AD 1100-1200	Late Doña Ana AD 1150-1270/1300
Mesilla AD 900-1100	Early Doña Ana AD 1000-1150
Hueco AD 1-900	Late Mesilla AD 650-1000
	Early Mesilla AD 200/400-650

The sequence is based on distinctive trends and transitions in land use, subsistence, technology, and architecture. The proposed sequence serves to align developmental trends in the Jornada Mogollon region with those of adjacent regions of the Southwest and north-central Mexico.

According to Miller, on land south and west of the forest, the Mesilla phase was a time of slightly increasing population aggregation into small settlements comprised of two or three households. Mesilla phase sites were widely distributed throughout the Tularosa Basin. Distinct changes in regional land may have been occurring, particularly between AD 650 and AD 1000 (Maudlin 1986, 1995, 1996; Maudlin et al. 1998; Miller 2002). During the latter part of the Mesilla phase population movement may have been restricted by population growth outside the region (Miller 2002).

It was not until the early and late Doña Ana phase that the restriction was pronounced (Miller and Kenmotsu 2004). Excavations at the Doña Ana phase sites of Gobernadora (Miller 1989; Shafer et al. 1999) have helped to re-define the period. Miller (2005) states that the Doña Ana phase has often been misunderstood. A population move is found from the small dispersed households of the Mesilla phase to site locations on the higher surfaces of alluvial fans (Miller and Kenmotsu 2004).

The Late Formative Period or Classic Period occupation, known as the El Paso phase, is distinguished from the preceding Doña Ana phase by settlement in pueblos, the continued development of locally made painted pottery (El Paso Polychrome). Regional survey data suggest that the most intensive prehistoric use of the region may have occurred during the El Paso phase. This period is marked by more and larger sites, greater artifact densities, and a clustered pattern (Carmichael 1985b, 1986; Whalen 1977, 1978). Pueblos are present along the Rio Grande, and both the western and eastern margins of the Hueco Bolson have large El Paso phase settlements. Whalen suggests that settlements in well-watered areas indicate an agricultural focus during this period (1977, 1978). While agriculture becomes important during this period, though wild plants and animals, including fish, continued to play an important role (Bradley 1983; Foster et al. 1993; O’Laughlin 1977).

In contrast to the other parts of the plan area, historic properties in the Guadalupe Mountains indicate temporary or seasonal use for hunting and food processing. Rock shelters provide the only evidence of possible permanent habitation sites. Structural remains have not been found. Historic properties include caves and rock shelters, mescal roasting pits or ring middens, open camps and rock art sites. The general subsistence pattern is one of hunting and gathering with an increasing exploitation of vegetal products in later prehistoric times (Wills 1995). Miller and Kenmotsu (2004) note that the human use and adaptation to the Guadalupe Mountains and eastern Trans-Pecos area are more like that of the Archaic Period. The dominant settlement pattern is one of dispersed temporary camps located along drainages or on ridge tops. The limited number of diagnostic artifacts and the lack of absolute dates have made it impossible to assign temporal periods to many sites on the district.

The Jornada Mogollon villages and sites located in the overall plan area were largely abandoned in the late 1300s and early 1400s. Whether this indicates that the entire area was abandoned or the people returned to a more mobile and less visible existence is not clear. Whatever occurred, there is no known evidence in the archaeological record for occupation of the forest for over 200 years.

While the Mogollon period is better known than the other prehistoric periods represented on the forest, most of the research has focused on the larger sites. As a result, little is known about the smaller limited activity sites. As with all the periods, a more representative sample of the sites and accurate dates are needed. Only then can questions concerning the relationship between the mountain sites and the villages on the basin floor, the interaction between northern and southern portion of the plan area, and the abandonment of the area begin to be answered.

The Pueblo Period: The Apache and the Athapaskan Migration into the Southwest

Apache occupation of the forest may have occurred around AD 1500 although some experts estimate that the semi-nomadic Apaches were in New Mexico as early as the 13th century. The Apache are noted to have entered the plan area following the Jornada Mogollon.

The Apache were well established in the Southwest at the time of Spanish exploration (Opler 1983). The Navajo and Apache made up the largest non-Pueblo Indian group in the Southwest. These two tribes led semi-nomadic lifestyles and spoke a similar language (Sanchez 2014). The Sacramento and Guadalupe Mountains of the plan area were Apache homelands (Seymour 2003).

Prehistoric and Protohistoric Apache sites on the forest are difficult to identify even when historical documents give the general locations for camps, trails, and hunting and gathering areas. Historical documents consist of early US military, Spanish and Mexican reports, along with oral histories and ethnographic studies. A number of references exist concerning Apache camps in the Tularosa Creek and Hondo valley areas, but no definite Apache sites have been located in those areas (Basehart 1967, 1973, 1974, Opler 1983).

An Apache hearth in the Guadalupe Mountains has been carbon dated to 270+ 40 BP, falling AD 1600-1760. The analyses of the hearth remains suggests prickly pear cactus was roasting in the feature (Puseman and Cummings 2010). No other materials were found on the site to suggest a cultural affiliation. Apache sites in the plan area have been generally identified based on brown ware pottery, metal arrow points, and metal cone tinklers. Roasting pits and stone wikiup rings have also been associated with Apache use. Apache sites have been located in the area of the western escarpment of the Sacramento Mountains. This area is mentioned in historic records as being near trail systems leading to and from Dog Canyon. Dog Canyon was an Apache stronghold during the Indian War period. The

Guadalupe District is another area of the forest that is identified as being occupied by Mescalero Apache. Two Indian War period occupation sites have been documented on the District. These two sites consist of Apache villages where skirmishes were fought with the US military. Other documented sites include rock cairn lookouts and ring midden roasting pits for processing agave. Overall, Apache sites without metal artifacts are difficult to identify due to their similarity with older Jornada Mogollon or Archaic Period occupations.

Occupation and Use after A.D. 1600

Spanish explorers, accompanied by other Old World peoples and Native Americans from Mesoamerica, first entered the Southwest in the 1530s. There is no firm evidence or documentation suggesting that the Spanish visited the plan area during this early period of exploration. In August of 1680, the Rio Grande pueblos organized the first unified, large-scale rebellion against Spanish governance and succeeded in removing the Spanish from New Mexico for 12 years (AD 1680-1692). The early Spanish occupation of New Mexico was tenuous and vulnerable. The occupation was disconnected from the larger Spanish empire and was largely confined to a thin strip along the Rio Grande Valley (Knaut 1995, Schroeder 1979, Weber 1982, 1999). 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 nineteenth century. Episodes of conflict continued, however, between the Spanish colony and Pueblos on one side and Athapaskans (Navajo and Apache) on the other. The early eighteenth century saw protracted military conflicts between Apache groups and the Comanche on the high plains. Spanish and Pueblo communities were also attacked. This increased level of warfare limited Spanish use of the plan area from 1700-1821.

The Spanish Crown (followed by the Mexican government after 1821) issued grants of land to individuals and communities to settle and use along the margins of the Spanish colony. However, no land grants were issued in the plan area (Reeve 1959).

In the late 1700s, Mescalero Apache raids on the Spanish and Pueblo settlements were a problem leading to Spanish campaigns against the Apache. These campaigns are rumored to have entered the mountains contained in the plan area but no physical remains have been found. In AD 1810, the Spanish entered into a treaty with the Mescalero Apache that lasted through 1842. However, after 1842 Mexican and American settlers and their military forces continued to experience difficulties with Apache raids (Bannon 1970; Hyde 1959).

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 United States' annexation of Texas, the United States invaded Mexico in 1845, and seized New Mexico by military force the next year. 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 into the territory, and the Hispanic population remained a majority. In AD 1850, New Mexico applied for statehood soon after its annexation by the United States, but was rebuffed due to its Hispanic majority. The territory formally attained statehood in 1912.

Very little of the forest was settled by non-Indians prior to the 1850s. La Placita (Lincoln), located in the Rio Bonito Valley, was founded in 1849, representing one of the first non-Indian settlements in the area. Tularosa, on the west side of the Sacramento Mountains was settled in the 1860s.

Fort Stanton, named for Captain Henry W. Stanton, was established in AD 1855 and operated as a military fortification through 1896. The Fort was built in 1855 by soldiers of the 1st Dragoon and the 3rd and 8th Infantry Regiments to serve as a base of operations against the Mescalero Apache. Troops rode out from the Fort to search for and fight the Apache during numerous campaigns from 1855-1880s (<http://fortstanton.org/history/the-military-years/>). The Fort was seized by Confederate forces in 1861. The Confederates moved to Mesilla, abandoning and burning the Fort as they left. In 1862, New Mexican Volunteer forces under Kit Carson reoccupied the fort.

Using the fort as an operating base, US troops removed the Mescalero Apache people to Bosque Redondo where they joined the Navajo. Most of the Mescalero were collected at the fort before making the “Long Walk” to the Bosque Redondo Reservation. Later, the fort served as the reservation for the returning Mescalero Apache until 1873, and was actively used in the 1880s, during the Chiricahua campaigns and accompanying disturbances among the Mescalero Apache. The Mescalero Apache Reservation was originally established on May 27, 1873, by Executive Order of President Ulysses S. Grant, and was first located near Fort Stanton. The present reservation was established in 1883.

In 1886, all the Warm Springs and Chiricahua Apache were sent to and imprisoned at Fort Pickens and Fort Marion, Florida. Peaceful and hostile Apache people alike were taken to Florida, including the scouts who took the oath to serve the United States under the flag at Fort Apache, Arizona Territory. Approximately 512 women, children and men were imprisoned. While in Florida 112 children were sent to the Indian school at Carlisle, Pennsylvania. Nearly one-third of them died at Carlisle. Many prisoners died due to the unhealthy conditions in Florida. The prisoners were then transferred in 1888, to Mount Vernon Barracks, Alabama. In October 1894 they were brought to the Fort Sill Reservation in Oklahoma Territory. This land was given for the permanent settlement of the Apache Prisoners of War by the Kiowa, Comanche, and Kiowa-Apache tribes. In 1913, a larger group of the Apache prisoners of war (or Fort Sill Apaches) moved to the Mescalero Apache Reservation in New Mexico and were released from prisoner of war status. (<http://www.fortsillapache-nsn.gov>).

In the mid-to-late 19th century, permanent settlements were established near Fort Stanton. The fort offered markets for farmers and ranchers. It also afforded protection from hostile Apache. After 1875, soldiers at the fort, including Buffalo Soldiers of the 9th Cavalry, provided effective law enforcement. Three times in the 1870s, the Fort’s garrison marched out to put down local disturbances that threatened to explode into civil war and in the process the Army determined their outcomes. The first two (the Horrell War and the Tularosa Ditch War) were conflicts between Anglo ranchers and Hispanic farmers, and the third was the famous Lincoln County War.

With the protection of troops at Fort Stanton, homesteading in the Hondo and Ruidoso valleys and the base of the Capitan Mountains grew. The Homestead Acts from 1860 through 1876 led to the development of small farms across the plan area. Ranching became a major economic activity. Mayhill and Weed were founded in the late 1800s and a large cattle industry developed throughout the mountain valleys and on the eastern and western flanks of the mountains. By the 1890s, the Apache threats had ceased, the Army’s need for Fort Stanton ended and it was abandoned.

The discovery of gold in Jicarilla and White Mountains during the 1870s also had an important impact on the area. Gold mining towns in Nogal and White Oaks were established in 1879 and other settlements soon appeared in the Sierra Blanca and Jicarilla Mountains. Coal was mined west of Capitan, and the town of Coalora was established. Iron was located north of Capitan and copper and lead were important for the

economy of High Rolls from about AD 1900-1945. The end of the mining boom came in phases as mines or markets played out. Most mining ended after World War II.

Logging also was a major economic resource. Alamogordo was established in 1898 as a railroad town with the "Cloud Climbing Railroad" running into the mountains to the east. Numerous spur lines were built in the mountains to gain access to the timber. Saw mills and small railroad and logging camps were established. By World War II, increased logging costs and the construction of highways through the mountains made railroad logging unprofitable and the tracks were taken up. Trucks used for logging came to the fore in the 1940s-1950s.

Railroads assisted logging and were another important historic economic venture in the plan area. A railroad route from El Paso, TX to Capitan, NM (The White Oaks Route) was established and in full operation in 1899. The ultimate goal of George B. Eddy's El Paso and Northeastern (EP&NE), aside from reaching the mines of White Oaks and the coal of the Salado Flats, was to connect with the Rock Island Railroad. With this combined route, freight from Chicago could be shipped through Kansas City and El Paso to Los Angeles. In June of 1898, the EP&NE reached what is now Alamogordo, NM, where Eddy decided to both continue north to Capitan, and to climb up into the Sacramento Mountains for the rich supply of timber he would need for the rail ties and bridge timbers. This branch line (the Alamogordo and Sacramento Mountain Railway) reached and established the resort town of Cloudcroft in 1899, providing a respite from El Paso's summer heat for many. This famous line has been christened the "Cloud Climbing Railroad," and the Lincoln NF has been able to preserve the iconic Mexican Canyon Trestle, one of the 58 railroad bridges needed to make the climb to Cloudcroft. The last train came down the mountain in 1947.

The Forest Service did not play a role in the history of the area until the 20th Century. The Lincoln NF was established in AD 1902 with an office in Capitan, New Mexico. Eventually five separate Forests or Forest reserves were formed. These were combined over the years until AD 1917, when the entire area became known as the Lincoln NF.

The initial establishment of Forest Service jurisdiction over the plan area likely had an impact on its use by Anglo, Hispanic, and Native American communities, with the greatest effect being the regulation of cattle, sheep, and goat grazing along with fuel wood cutting. Many small operations were granted free-use grazing permits by the agency, but this practice was phased out after World War II with a negative impact on small ranch operators (deBuys 1985; Raish and McSweeney 2008).

The Great Depression was the worst economic disaster the United States has ever experienced and marked a turning point in American history. Young people just 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 AD 1933, President Roosevelt introduced the New Deal program to the American people. The New Deal was a combination of short-term strategies designed for immediate relief, and longer-term strategies designed to promote 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 fifty 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 the Works Progress Administration (WPA).

The Lincoln NF received its first three CCC companies in May 1933. The three camps were Sacramento, Raton Ranch, and Weed. The primary jobs of these CCC companies were erosion control, road construction, telephone installation, general forestry, and fire suppression and pre-suppression. Another New Deal program established on the forest was the Works Progress Administration's, National Youth Administration, Unemployed Girls Education Camp that operated between 1935 and 1940 as Camp Capitan, at the former camp location of the CCC camp at Raton Ranch (Camp Saturnino Baca). Then in December 1941, what was Camp Baca and Camp Capitan became the Old Raton Ranch detention camp for the entire Japanese-American population (railroad workers and their families) of Clovis, NM. Today the site is open to the public as the Baca Campground. In March 2017, a commemorative sign was installed at the campground entry by the New Mexico Department of Transportation.

As the railroad era in the Sacramento Mountains ended, a new era of scientific advancement began, spurred by competition with the Soviet Union. The focus of this advancement was in two areas, Astrophysics (specifically solar) and Rocketry. Prior to the United States' entrance into WWII, and during the US military's research partnership with the United Kingdom, the scientific community became aware of the mysterious and unpredictable power of the Sun to disrupt radio communications and related electromagnetic waves in Earth's upper atmosphere. Research into these phenomenon began in earnest by 1947 with the establishment of the High Altitude Observatory: Sacramento Peak Station (SPS) of Harvard University and the University of Colorado, contracted by the US Air Force for "seeing" studies; and, the White Sands Proving Ground of the US Army for the study of captured V-2 rockets from Germany and their use in delivering instruments into the upper atmosphere. From 1948, SPS was utilized as a triangulation point for all V-2 launches along with the Mule Peak Observatory site below. The location at Sunspot was selected for two reasons. First, the US Air Force originally selected the site because it offered them an unobstructed view shed of the White Sands Missile Range in order to observe and film test flights of captured German V-2 rockets. It was later selected as the location for the solar telescope because of the number of clear days per year that provide for unobstructed views of the sun from a high elevation.

The facility campus is located on 9,200 ft. Sacramento Peak. The location was scouted out in August of 1947 by Colorado Native Rudy Cook, whose only shelter was an old abandoned boxcar left by the then defunct railroad. In 1950 the US Airforce followed up with a contract which established the site as it is today, and formed a joint venture with Harvard University and the University of Colorado. At this time the site became known as the Upper Atmosphere Research Station and fell under the Air Force Cambridge Research Laboratories (AFCRL) in their Geophysics Research Directorate (GRD). After two years of development in relative secrecy, Sacramento Peak Observatory (SPO) was made public, and from 1952 on, tourist trips to the facility began. A scientific community began to grow at the station and in 1953 a post office was established. Once again there was a name change, and "Sunspot" was added to its moniker.

Responsibility for the Sunspot Solar Observatory was transferred from the US Air Force to the National Science Foundation (NSF) in 1976 which included another name change. The facility, now known as the National Solar Observatory (NSO), has hosted solar scientists from around the world; and, for many years was the premier facility for the study of our nearest star. The NSO is being replaced as the preeminent solar observatory in the continental United States by a new facility on the island of Maui, and the NSF is currently working on a plan to transfer operation of the NSO facility to a consortium of universities. However, the fate of the facility is still unclear due to funding uncertainties.

Description of Cultural and Historic Resources of the Assessment Area

Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). In accordance with Section V, D. 3. of the Region 3 Programmatic Agreement, properties for which eligibility is not established (“undetermined” properties) are treated as if 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 54 U.S.C. Subtitle III, Division A, Subdivision 2, Chapter 3021 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 determined not eligible are also considered here.

Traditional cultural properties (TCPs) are a subset of historic properties. TCPs are historic properties that are in the main or in part eligible to 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 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.

Inventory of Historic Properties

On the Lincoln NF, the opportunity for the discovery, location and description of historic properties is determined by the amount of inventories conducted for the identification of those properties. Inventories are typically termed cultural resources inventories or surveys. Such inventories have been conducted systematically since the early 1970s as part of the Section 106 (NHPA) process. Additional surveys have been conducted by the Forest under Section 110 (NHPA) and by other entities for research purposes unrelated to forest management.

As of January 1, 2015, approximately 396,360 acres within the plan area have been inventoried or 36 percent of its total area. Of this, approximately 328,520 acres are considered to have been inventoried to current standards, equaling 30 percent of the total plan area. Inventory not to current standards include activities like horseback survey or reconnaissance. Inventory has not been conducted evenly across or within the three districts due to specific land management activities. Acres inventoried by district are listed in Table 16.

Table 16. Proposed Revised Phase Sequence for a portion of the Jornada Mogollon area

Acres Inventoried	Smokey Bear	Sacramento	Guadalupe	Total
Not to Standard	16,000	39,390	12,944	68,334
To Current Standard	112,882	160,985	54,653	328,520
Total	128,822	200,375	67,597	396,854
Total District Acres	423,416	548,865	288,539	1,094,639
Percent of Forest Inventoried	30%	36.5%	23%	36%

Because the vast majority of inventory within the plan area has been conducted for Section 106 (NHPA) purposes, the amount of inventory on each district is a consequence of the extent of land management activities performed over 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 over story types. The surveys do not represent a statistically valid sample of the forest. What biases this introduces into the data are not known, but it is expected that the data are not representative of all areas on the forest. Some areas of the forest are in need of some additional survey. A few areas remain essentially un-surveyed, including the wilderness areas on the Smokey Bear District and portions of the Guadalupe District. As a result, the basic knowledge of what types of historic properties are present, where they are located, and what the site density is for those specific areas of the forest is inconsistent. Based on knowledge of surrounding areas, general statements on the cultural resources can still be made.

A total of 3,435 historic properties, including properties determined not eligible to the NRHP, have been recorded in the plan area as of January 1, 2015. The distribution of historic properties and their densities are listed in Table 17 *Number of Historic Properties by District*.

Table 17. Number of Historic Properties and National Historic Register Eligibility for the Lincoln NF

Historic Properties	Smokey Bear	Sacramento	Guadalupe	Forest Wide
Listed, Eligible or Undetermined - NRHP	804	1,034	1,108	2,946
Not Eligible – NRHP	174	209	95	478
Total Number	978	1,243	1,203	3,435

While the spatial distribution of survey inventories is not representative of the whole plan area and has biased our understanding of the location and distribution of historic properties, there is enough information to describe their nature and cultural affiliation. Overall, of the 3,424 documented properties forest-wide, prehistoric sites are most common. Table 18 shows the number and density of sites with the Guadalupe Ranger District having higher than average site density (mostly pre-historic) and the Sacramento and Smokey Bear Ranger Districts being below average in site density.

Table 18. Density of Historic Properties by District

Cultural Resources	Smokey Bear	Sacramento	Guadalupe	Total
Density/100 acres surveyed	0.7	0.6	1.81	1.03
Density/mile ² surveyed	4	3.28	10.51	5.6
% of surveyed land identified as Cultural Resource	1.22	2.12	3.33	2.43

Table 19. Number of Sites of Historic Property Types for the Lincoln NF

Historic Property Type	Smokey Bear RD	Sacramento RD	Guadalupe RD	Lincoln NF
Prehistoric	633	809	1,058	2,500
Multicomponent	79	93	91	263
Historic	266	341	54	661
Grand Total	978	1,243	1,203	3,424

In general, unknown prehistoric composes the largest category at 1,415 sites forest-wide. Unknown prehistoric represents a group or category of site that do not have diagnostic surface artifact or features that allow for dating and designation to a specific cultural group. This group of sites is forest-wide and there has been very little testing of these sites to help identify their affiliation. Mogollon makes up the next largest category followed by Anglo/Euro-Americans (Table 20).

Table 20. Cultural Affiliation by the Number of Sites for the Ranger Districts of the Lincoln NF

Cultural Affiliation	Smokey Bear RD	Sacramento RD	Guadalupe RD	Lincoln NF
Anglo/Euro-American	257	328	51	636
Apache	10	6	14	30
Archaic	61	92	74	227
Hispanic	1	1	0	3
Mixed Mogollon/Anasazi	2	2	0	4
Mogollon	320	209	301	830
Multicomponent	79	93	91	263
Paleo-Indian	1	1	1	3
Unknown Historic	5	11	2	18
Unknown Prehistoric	242	500	669	1,411
Grand Total	978	1,243	1,203	3,424

Smokey Bear Ranger District

We can also look at district specific historic properties by quantity and affiliation to examine similarities and differences. On the Smokey Bear District, there have been a number of large-scale surveys since the late 1990s. These have added substantial data on historic properties outside the wilderness areas. The Smokey Bear District has 128,822 acres of survey (Table 16) and 978 sites (Table 19). The density is .7 sites per 100 acres (Table 18)

Portions of the district have higher site density than others. For example the district has historic mining sites, these have a higher occurrence in the Jicarilla, White Oaks, and Bonito areas where gold and other minerals have been discovered. All other sites, tend to be in the lower elevations on the district including Mogollon.

Sacramento Ranger District

Large areas of the Sacramento District have been surveyed for timber sales, vegetation treatment, and prescribed fire projects. Many of these activities have been at higher elevation mountain ridges focusing on timber. More recently, lower elevation activities have led to survey in the pinon juniper. The Sacramento District has 200,375 acres survey (Table 16) and 1,243 sites (Table 19). The estimated density is .6 sites per 100 acres (Table 18).

To characterize historic properties on the district one can look at the specific resources there, such as timber. Many of the Anglo/Euro-American sites are railroad and logging related. Logging sites are located at higher elevations. Historic mining related sites have been located on the district in areas with copper and lead located south of High Rolls, New Mexico. Historic ranching and homesteading sites are found throughout the district, often in areas with pasture or water. Prehistoric site affiliation includes Archaic Jornada Mogollon and Apache. These tend to be located at lower elevations

Guadalupe Ranger District

Large portions of the Guadalupe District have not been surveyed for cultural or historic sites. The numerous road surveys on the Guadalupe District compensate somewhat for the lack of area survey, providing at least a sample of historic property site types common to that area and across the landscape. The Guadalupe District has 67,597 acres of survey (Table 16) and 1,203 recorded sites (Table 19). The density is 1.8 sites per 100 acres (Table 18). The Guadalupe District not only has a higher site density, many of the sites are larger than those on the other two districts, often encompassing 30 acres or more.

Historic Period sites on the district are primarily homesteading or ranching in nature. The district does have CCC related properties like the picnic area pavilions at Sitting Bull Falls. Site types like rock art and rock shelter will occur more often on this district. Apache sites have been found on the southern portion of the district in areas that they traditionally occupied. Archaic and Jornada Mogollon sites occur across the district (Table 20) Cultural Affiliation Guadalupe District.

The information on historic property distribution and cultural affiliation forest-wide is fairly accurate considering that some areas have little survey. Forest-wide, unknown prehistoric composes the largest category while Mogollon makes up the next largest category followed by Anglo/Euro-Americans. The Guadalupe Ranger District does tend to have more prehistoric sites than the rest of the forest, despite having less survey overall.

Characteristics of Cultural and Historic Importance

The National Register of Historic Places (NRHP) authorized by the National Historic Preservation Act (NHPA) is the means or metric that the Forest uses to measure or determine the cultural or historic importance of an historic property. It is the official method for evaluation and listing of districts, sites, buildings, structures and objects deemed worthy of preservation. In 1992, an amendment to the NHPA allowed for a new designation of property type, that of the traditional cultural property (TCP). The amendments established that properties affiliated with traditional religious and cultural importance to a

distinct cultural group, such as a Native American tribe or Native Hawaiian group, were eligible for the National Register. TCPs are not only associated with Native American communities; they may be affiliated with historical-period groups as well, including ethnic communities, specific occupational groups (logging, mining, or ranching), and/or special interest groups (solar physicists). TCPs include the built and natural locations, areas, or features considered sacred or culturally significant by a group or people.

The five general categories for NRHP properties are: building, structure, object, site, and district. While TCPs are closely associated with Native American Cultures, a site need not be associated with a Native American cultural group to qualify as a TCP for the purposes of the NRHP.

For a property to be eligible for the National Register, it must meet at least one of the four National Register criteria and retain integrity.https://en.wikipedia.org/wiki/National_Register_of_Historic_Places - cite note-bulletin-22 Information about architectural styles, association with various aspects of history and commerce, and ownership, for example, can be all integral parts of the nomination. Each nomination contains a narrative section that provides a detailed physical description of the property and justifies why it is historically significant with regard either to local, regional, or national history. The four National Register of Historic Places criteria for eligibility are the following:

- **Criterion A:** "Event," the property must make a contribution to the major pattern of American history.
- **Criterion B:** "Person," is associated with significant people of the American past.
- **Criterion C:** "Design/Construction," concerns the distinctive characteristics of the building by its architecture and construction, including having great artistic value or being the work of a master.
- **Criterion D:** "Information potential," is satisfied if the property has yielded or may be likely to yield information important to prehistory or history.

If a property is found to be eligible under one or more of the four criteria, it must also exhibit integrity of location, design, setting, materials, workmanship, feeling, and association in order to be eligible. The plan area contains properties and 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 described in the Areas of Tribal Importance chapter.

As with other inventories based on forest activities, there has been no systematic attempt to inventory TCPs within the plan area. There are many previously-recorded and unrecorded historic properties within the plan area that may be eligible for listing in the NRHP as TCPs. Property types that are potential TCPs include, but are not limited to: village sites, shrines, rock shelters, caves, rock art including pictographs and petroglyphs, springs, mountains, mountain-top localities, trails, geological formations, quarries, plant collection areas, and trails.

Inventory for characteristics and properties of importance to non-Native communities has also been limited. The most important resources cited by community members is water for irrigation and livestock, followed by forage, wood for fuel and construction, and game for food and sport, and wild plant products for food. Property types that have potential to be important include but are not limited to historic buildings and structures, homesteads, sawmills, mines, landmarks, internment camps, administrative sites, and grave sites. Some properties are listed individually and others are listed as part of a multiple nomination based on a theme.

Of the 3,435 historic properties recorded in the plan area, approximately half have had evaluations made of their eligibility to the NRHP (Table 21). Many historic properties in the plan area lack diagnostic artifacts or features for dating and identification. Of the properties that have been evaluated, 70 percent have been determined eligible for NRHP listing. For management purposes, the Forest Service treats unevaluated properties as if they are eligible until a determination of eligibility can be made for that property.

National Register Sites

The forest has a total of 21 NRHP listed properties and 1,209 eligible properties. These include multiple properties which are listed under one title, for example ‘Lincoln Phase Sites’ and are counted as one.

Table 21. National Register Eligibility sites by ranger district

National Register Eligibility	Smokey Bear	Sacramento	Guadalupe	Total
Designated/Listed	11	7	3	21
Eligible	345	336	528	1,209
Unevaluated	448	691	577	1,716
Not Eligible	174	209	95	478
Total Evaluated	530	552	626	1,708
Total	978	1,243	1,203	3,435

National Register-listed sites on the Smokey Bear District include: the **El Paso and Southwestern Railway Water Supply System**, also known as the **Bonito Pipeline**. The pipeline consists of a metal wrapped wood stave pipeline jointed with steel bell-and-spigot joints. It was built in 1908. At the time, it was the longest railroad water pipeline in New Mexico, extending for 50 miles from the South Fork of Bonito Creek to Coyote, New Mexico. This wooden pipeline was in use until 1927, when it was replaced by a metal pipeline.

The Jicarilla Schoolhouse is a standing one-room log structure built in 1907 from hand-hewn logs to serve the Jicarilla Placer Mining District. The wooden school building served as a community center, church, and gathering place as well as a school. This site represents the efforts of early settlers and miners working together as a community, and stands as an example of the development of public education in New Mexico. The Schoolhouse has some deferred maintenance such as dry rot found in the sill logs.

Wizard's Roost is located at an elevation of 10,000 feet near Sierra Blanca. The property consists of a complex of rock pile features situated at the end of a ridge. The site is believed to be a solstice alignment observatory or shrine, built during the late Archaic or early Mogollon Period. It demonstrates that the Jornada Mogollon had knowledge of solstices and the ability to predict them. The site no longer functions as a solstice observatory; the site was vandalized and stone at the site was rearranged prior to the mid-1990s.

Aguayo Homestead was built in 1917. It consists of a three-room adobe house, a log chicken coop, the remains of a root cellar, wooden shed, and outhouse, and several collapsed stonewalls. This site is located in the White Mountain Wilderness on the Smokey Bear District. It is considered significant for its potential to yield information on historic homesteads of the early 1900s.

All of the **Forest's lookout towers** were nominated under a thematic nomination of lookout towers in Region 3 (Monjeau, Ruidoso, Wofford, Bluewater, Weed, and Carrissa). Also included are the associated structures such as cabins and storage sheds. These sites are significant examples of the history of fire detection and prevention. Many were built by the CCC in the 1930s. The period of significance for the thematic nomination was 1905 to 1942. Several of the lookouts suffer from occasional vandalism.

Lincoln Phase Sites nomination, including the Nogal Mesa Kiva site has the remains of masonry room blocks. These three sites contain numerous potsherds and lithic artifacts, along with several mounds representing the remains of three or more pueblo rooms. There has been evidence of occasional looting episodes at these sites.

Corona Phase Sites nomination, includes three sites in the Jicarilla Mountains. The sites contains numerous slab outlined rooms, lithics, sherds and ground stone.

The Hopeful Lode nomination includes Parsons Mine, a complex associated with the Nogal Mining District. The site contains the remains of an ore separator, three boilers, a collection pond, cyanide waste dumps, foundations, four adits, and two prospect pits. Historic photographs circa 1910 depict over a dozen wooden structures at the site, including a boarding house, bunkhouse, stockroom, assay office, water tank, sawmill, crushing plant, cyanide plant, and amalgamation plant.

On the Sacramento District, National Register listed sites include; the **Mexican Canyon Trestle** built in 1899 as part of the Alamogordo and Sacramento Mountain Railroad. It is located just west of Cloudcroft, New Mexico, in Little Mexican Canyon. It was used until the 1940s, when railroad logging was abandoned. The trestle is 323 feet long, and rises 52 feet above the canyon floor. This site is an important symbol of the early years of logging activities in the Sacramento Mountains, and the founding of the village of Cloudcroft. Extensive stabilization efforts at the trestle in 2008-2010 cost approximately \$2 million. A roadside pull-off and interpretive overlook was constructed on Highway 82 next to the trestle. It opened in 2011 and today is one of the most visited places on the LNF.

Rock shelters of the Sacramento Mountains consist of three rock shelters dating primarily to the Archaic and Jornada Mogollon periods. Fresno Shelter is the most renowned site of the group, containing Archaic period remains, early cultigens, and perishable artifacts like sandals and basketry. These rock shelters have undergone extensive excavation and data recovery.

Railroad logging sites in the Sacramento Mountains includes three sites: **Hay Canyon Logging Camp** contains two tent platforms, a small dugout, domestic trash, two depressions, the base of a railroad water tank, a circular fire pit constructed of stone and mortar, a small rock pile, and several sidings or spurs off the Hay Canyon switchbacks. **Hubbell Canyon Log Chute** contains two log chutes. The feature was at one time constructed with logs that have since decayed. **Wills Canyon Spur Trestle** consists of a wooden railroad trestle with five bents spanning approximately 22 meters (72 feet). A few ties remain on top of the structure. The only artifacts present are a couple of rusted metal drums.

Mayhill Administrative Site is a CCC complex built in the 1930s with five historic buildings, including a rock house known as the Ranger House, the Rock Office or Mayhill Ranger Station, barn, chicken house, and pump house. The location was also used as the CCC base camp F-24-N in 1933. It was initially a tent camp. Then from 1943-1946, the CCC camp was converted to a World War II prisoner of war camp. The administrative site is built on top of a prehistoric site.

The Guadalupe District contains the following National Register listed sites; **Last Chance Canyon Apache – US Cavalry Battle Site** contains the remains of an Apache camp including stone wikiup rings, domestic items like metal cone tinklers, glass beads, and metal tools along with U.S. Cavalry items. The site was the scene of a documented winter engagement between the Apache and Cavalry, in which the Apache camp was destroyed. This property is considered a TCP for the Mescalero Apache, but no formal nomination has been done.

Dark Canyon Apache Rancheria - Military Battle Site contains the remains of an earlier Apache camp with domestic items including metal cone tinklers and metal tools. The site also has US military items. The site was the scene of an undocumented engagement in which the Apache camp was presumably destroyed. This property is a TCP for the Mescalero Apache, but no formal nomination has been done.

Ring Midden Sites of the Guadalupe Mountains includes three sites with multiple ring middens (roasting pits) and associated artifact scatters that includes brown ware pottery, lithics, tools, and ground stone.

Sitting Bull Falls Recreation Area is a CCC-constructed rustic masonry complex with a dam, picnic shelter and group picnic shelter. Workers from Camp F-37-N built the site. It was constructed in 1940 with rough-cut limestone and sandstone from Last Chance Canyon.

The most recent nomination, **Rock Art Sites of the Guadalupe Mountains**, includes five sites that date from the Late Archaic to the Proto-Historic Period with several containing small but intricate paintings of prehistoric hunting.

The proportions of historic properties evaluated as eligible, not eligible, or unevaluated on each district is roughly the same as those proportions forest-wide. An exception to this is the higher proportion of properties on the Guadalupe District that are determined eligible. Many of the sites on the Guadalupe District have agave roasting pits that contain datable carbon, along with macro-botanical remains that make them a potential source of data for studying human adaptation, population distribution, demographics, and climate. During the past few years, the LNF has nominated sites to the National Register annually and plans to continue this work.

Historic Properties Relative to Ecology

Long before the Lincoln NF and its ranger districts were established, humans occupied the landscape in the plan area, using the natural resources of the forest. Rather than defining historic properties by their location on current ranger districts in the plan area, human occupation and use can be examined by looking at the distribution of historic properties relative to the ecological response units (ERU) across the plan area. ERUs are map unit constructs, including groupings of finer scale vegetation classes from the National Vegetation Classification system. Each ERU combines finer scale vegetation classes that share similar ecosystem processes and successional dynamics, as well as potential vegetation under historic disturbance regimes. The reader is referred to Volume 1 of the Environmental Assessment for a description and definition of the ERUs used in this chapter.

Initially, historic properties will be compared to the more general system types; forest, woodland, grassland, shrubland, riparian, and other. Where there are a substantial numbers of historic properties or relationships, comparison will be made at a finer scale. Below are listed the ERU System Types and the constituent, finer scale, ERU Classes.

- **Forest:** ERUs represented include

- Spruce-Fir Ecological Response
- Mixed Conifer with Aspen
- Mixed Conifer—Frequent Fire
- Ponderosa Pine Forest
- Ponderosa Pine—Evergreen Oak
- **Woodland:** ERUs represented include
 - PJ Evergreen Shrub
 - Juniper Grass
 - PJ Woodland
 - PJ Grass
 - Madrean Pinyon-Oak Woodland
- **Grassland:** ERUs represented include
 - Montane/Subalpine Grassland
 - Semi-Desert Grassland
- **Shrubland:** ERUs represented include
 - Gambel Oak Shrubland
 - Mountain Mahogany Mixed Shrubland
 - Chihuahuan Desert Scrub
- **Riparian**
- **Other**
 - Cropland
 - Sparsely vegetated
 - Open Water

Historic Properties, Systems and ERUs

On the Lincoln NF, 3,435 historic properties have been identified as of January 1, 2015. Approximately 55 percent of the historic properties have a known cultural affiliation. Two are identified as Anasazi, two mixed Mogollon and Anasazi, one is Hispanic, one is Spanish colonial, two Paleo-Indian, 769 Anglo Euro-American, 38 Apache, 228 Archaic, and 843 Mogollon. The remaining 1,549 site affiliations are unknown. The majority of the unknown affiliations may be Archaic or Mogollon but lack diagnostic artifacts for cultural identification. While there are historic properties across the plan area that date to all periods of human occupation, there are ERUs with properties that correspond to specific time periods and/or with specific cultural affiliations (Table 22).

When looking at the data in Table 22, Historic Property Affiliation Types by System, one may perceive patterns of association, both positive and negative. For example, prehistoric sites occur most frequently in the woodland system and historic sites least frequently occur in scrubland. In part, these numbers are related to the amount of survey done in the systems. Quite a bit of survey has been done in the forest system related to logging projects. In some instance more survey in a system does equal more sites, in other systems it does not. A further breakdown of the property affiliation types associated with ERU system types can be seen Table 23.

Table 22. Archaeology Sites (property affiliation types) by ERU System types

Vegetation System	Historic	Prehistoric	Multi	Unknown	Total	Percent
Forest	331	495	62	1	889	24
Woodland	274	1,947	115	0	2,336	61
Grassland	139	23	8	0	170	4
Scrubland	28	178	27	0	233	6
Riparian	55	57	20	0	132	3
Other	13	74	4	0	91	2
Total	840	2,774	236	1	3,851	

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.

Prehistoric properties have been shown to occur frequently in woodland systems. Approximately 30 percent of prehistoric properties in woodland systems are Mogollon. We estimate that an additional 335 of the unknown prehistoric properties are Mogollon. This information could be used to estimate how many additional Mogollon properties occur in unsurveyed woodland areas.

Table 23. Historic Property Cultural Affiliations by ERU System Type

Component Culture	Forest	Woodland	Grass-land	Shrub-land	Riparian	Other
Paleo-Indian	0	2	0	0	0	0
Archaic	55	175	3	11	10	2
Mogollon	136	712	9	37	14	15
Anasazi	0	2	0	0	0	0
Mixed Mogollon/Anasazi	0	2	0	0	0	0
Unknown Prehistoric	300	1,004	8	133	32	52
Unknown Multicomponent	23	36	0	14	10	2
Unknown Historic	15	18	9	7	32	3
Apache	7	29	1	5	4	2
Spanish Colonial/Mexican	0	1	0	0	0	0
Hispanic	0	0	0	1	0	0
Anglo/Euro-American	353	355	140	25	60	14
Total	889	2,336	170	233	162	90

Note: columns total to greater than the number of total properties on each district and on the forest, because some properties have multiple cultural components.

Displayed in Table 24 is a summary of ERU System Type and ERU class showing how much has been surveyed and how much is currently identified as having historic properties. Most ERUs have a fairly large amount of non-random sample survey, ranging from about 20 to 57 percent. The average percentage of Historic Properties in a ERUs is 3.01 with a standard deviation of 2.32. Therefor there is a positive association found in an ERU with 57 percent survey and 6.13 percent of the area occupied by

Historic Properties. That ERU has a significantly higher than average number of historic properties. An ERU with 30.51 percent survey and .06 percent historic properties has a significantly negative relationship with properties. That ERU has a lower than average number of Historic Properties. Five ERUs had less than 20 percent survey, which is considered here to be less than adequate to establish an association with historic properties.

Table 24. Percentage of historic properties per ERU, including percent of survey

System Type	ERU Class	Percent of ERU Identified As Historic Properties	Percent of ERU Surveyed
Forest	Spruce-Fir Forest (SFF)	0.06	30.51
Forest	Mixed Conifer w/ Aspen (MCW)	1.08	56.93
Forest	Mixed Conifer - Frequent Fire (MCD)	1.06	38.89
Forest	Ponderosa Pine Forest (PPF)	1.17	35.11
Forest	Ponderosa Pine – Evergreen Oak (PPO)	6.13	49.35
Woodland	PJ Evergreen Shrub (PJC)	2.81	28.55
Woodland	Juniper Grass (JUG)	5.08	22.26
Woodland	PJ Woodland (PJO)	2.26	29.26
Woodland	PJ Grass (PJG)	3.44	37.13
Woodland	Madrean Pinyon-Oak Woodland (MPO)	3.69	25.19
Grassland	Montane/Subalpine Grassland (MSG)	4.99	45.71
Grassland	Semi-Desert Grassland (SDG)	3.59	9.34
Shrubland	Gambel Oak Shrubland (GAMB)	0.63	15.08
Shrubland	Mountain Mahogany Mixed Shrubland (MMS)	0.76	11.04
Shrubland	Chihuahuan Desert Scrub (CDS)	3.33	8.76
Riparian	Riparian	8.98	46.17
Other	Other	2.17	9.62

The ERU vegetation communities with the highest associated with historic properties are riparian, ponderosa pine – evergreen oak, juniper grass, and montane/subalpine grassland, respectively (see Table 25). These vegetation communities are not the most prevalent types of vegetation in the plan area. Interestingly, the riparian and ponderosa pine evergreen oak ERU area is one of the smallest in the plan area. The ERUs with higher than average historic property numbers appear to have characteristics that people have been drawn to in the past.

Table 25. Number of Sites by Affiliation with Key ERUs

Affiliation	MSG	JUG	PPO	Riparian
Anglo/Euro-American	124	7	11	53
Apache	1	1	2	3
Archaic	3	3	12	10
Mogollon	8	6	27	13
Multicomponent	11	3	28	17
Unknown Historic	2	0	0	1
Unknown Prehistoric	11	26	130	34
Grand Total	160	46	210	131

Additional observations can be made, looking first at Riparian which has the highest associations with historic properties. Riparian areas on the forest tend to be limited. The forest does have several rivers including the Rio Ruidoso, Rio Bonito, Rio Peñasco, and the Sacramento River, along with numerous streams and intermittent washes. Both prehistoric and historic properties occur in association with riparian areas. Historic Period properties tend to be farming and ranching related on the Smokey Bear and Sacramento Ranger Districts. Railroad grades in the Sacramento Mountains tend to follow drainages and sawmills are often located on the banks. Prehistoric sites are most often found in association with little walnut ponderosa pine, little walnut chinkapin oak, and little walnut desert willow. All of which are found on the Guadalupe District.

In the ponderosa pine – evergreen oak, the association of historic properties with the vegetation found in this ERU has been noted in the Southwest and Texas in general. This ERU occurs on the Guadalupe Ranger District and is occupied by prehistoric and Apache ring middens and roasting pit sites. It is useful to compare the distribution of burned rock middens to the distribution of woody vegetation, especially oak, which can be the dominate fuel wood found in burned rock middens (Greaves 2002; Weston and Mauldin 2003).

The juniper grass ERU occurs on all three districts. The vegetation tends to occur along washes and gradual slopes. The historic properties found in the area are both historic and prehistoric, with prehistoric sites predominately. The juniper grassland areas may have been larger in the past as Juniper encroachment has increased over the past 100 to 200 years.

The montane sub-alpine grassland ERU occurs on the Smokey Bear District. This vegetation type is found in the White and Capitan Mountains. The most common historic property type here is related to mining. Other attributes in this area, including minerals, may have influenced site locations. However, mountain meadows in this area may have been preferred for habitation given the rugged topography.

A few general observations can be made of systems and ERUs like forest and woodland with average site numbers. Within the forest ERU system, historic properties associated with Anglo/Euro-Americans area most often found in the mixed conifer-fire ERU, perhaps associated with logging and railroading that was common from the late 1800s to 1940. Within the woodland ERU system the most common area for Anglo/Euro Americans is the piñon juniper woodland.

Most of the properties in the plan area are found within piñon-juniper woodland community. The actual number of properties in this vegetation community, however, is probably larger than what is reflected in the data. Past inventories across the plan area have disproportionately focused on conifer forest and ponderosa pine forest areas, biasing the data to reflect a greater association between ponderosa pine forests and historic properties. Prehistoric properties are found most often in the PJ woodland, PJ evergreen shrub, and PJ grassland.

As noted above, spruce-fir forest has adequate survey and a very low association with Historic Properties. Two other areas, the Gambel oak shrubland and mountain mahogany mixed shrubland, have a low association with historic properties but also a low percentage of survey. These two areas could be the focus of future surveys to collect data in order to determine their association with historic properties.

There are apparent relationship with prehistoric properties and ERUs. Sites are found more often in one or more of the ERUs. Additional survey is needed in some parts of the forest to determine if those areas have or do not have an association with historic properties. This methodology could lead to better

predictions as to the presences and quantity of historic properties on the forest. Currently, threats to the integrity of historic properties appear to be no greater or no less based on the ERU in which the property is located.

Findings for Cultural and Historic Resources

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 historic properties have changed over the past half-century. Very little documentation occurred prior to the late 1980s. From 1977 to around 2000, the Forest Service 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 (LA) form. These forms used somewhat different methodologies for assessing site condition.

The Forest Service CRAIS database was abandoned on the Lincoln NF around 2000 in favor of the New Mexico Cultural Resources Information System (NMCRIS) database. In 2008, NMCRIS data was migrated to the Forest Service NRM database, but NRM data management and input was not largely supported on the Forest prior to 2010. As such, any determination of the condition of historic properties from this data will be qualitative and judgmental.

For properties and characteristics of importance to traditional communities, their condition is based on the perceptions of those traditional communities, regardless of the objective conditions of those resources and characteristics, assuming such objective conditions can be measured (for example, the availability of natural resources for collection, the intrusion of noise pollution, or a diminution in the quality of viewsheds).

Data on current conditions for historic properties cannot be examined from the recording and monitoring of historic properties over the past 40 plus years due to inconsistency in recording forms and databases. Data on site condition notes the presence of a disturbance but not necessarily the degree of damage. Some sites have no data, while others have observations on one or more impacts or disturbance. At the time of this analysis there were 3,431 sites in the database. Overall, 49 percent of sites have no data on condition. Bioturbation accounts for 37 percent of disturbance (Table 26). Bioturbation includes impacts from feral hogs, cattle, elk and deer grazing, and damage from rodents, insects, and other wildlife. Water erosion, including sheet wash, rill erosion, drainage formation, and arroyo down-cutting, is noted on 33 percent of sites. In most cases, water erosion on Historic Properties consists of sheet wash erosion. Construction, which also includes land development activities such as mining and logging in addition to road construction and other activities, has affected 14 percent of sites. Land development impacts can be slight, but construction activities involving heavy equipment often result in severe impacts to properties. Vandalism, a category that includes looting, the defacement of standing structures and other features (such as rock art), and the collection of surface remains such as pottery sherds, projectile points, and bottles, is one of the least prevalent disturbance category noted during visits, having been observed in 2 percent of recording events. This is encouraging but potentially under estimated because surface collecting can go undetected over time. Vandalism impacts can often be severe.

Table 26. Number of Sites by Site Damage Types

	Wind Erosion	Water Erosion	Bioturbation	Vandalism	Roads	Construction	Fire Suppression	Burned	Other	No Data
Sites	191	1,133	1,271	77	2	485	6	6	32	1,683
Percent	5%	33%	37%	2%	0%	14%	0%	0%	0%	49%

As noted in Table 26, 49 percent of sites had no data on condition. Another avenue to examine historic property condition as it relates to erosion is through the use of soil sheet wash and rill data. Rills are narrow and shallow channels which are eroded into unprotected soil by hillslope runoff. Rills may form when bare soil is left exposed. Rills are easily visible when first incised, so they are often the first indication of an ongoing erosion problem. Unless soil conservation measures are put into place, rills on regularly eroding areas may eventually develop into larger erosional features such as gullies or even (in semi-arid regions) into badlands.

Unfortunately, the considerable effect rills have on landscapes often negatively impact human activity. Rills have been observed washing away archaeological sites. They are also very common in agricultural areas because sustained agriculture depletes the soil of much of its organic content, increasing the erodibility of the soil.

- **Slight erosion hazard** indicates the maximum soil loss does not exceed the threshold¹, and therefore, the loss of the soil production potential is of low probability.
- **Moderate erosion hazard** indicates that the loss in soil production potential from erosion is probable and significant if unchecked. Moderate rills indicate clear evidence of removal of surface horizons with the original biotic functions partly destroyed
- **Severe erosion hazard** rating indicates that the loss of soil production potential from erosion is inevitable and irreversible if unchecked (Lane et al. 1995). Severe rill areas are described as having soil surface horizons that is completely removed with subsurface horizons exposed. The original biotic functions of these areas are largely destroyed.

The location of historic properties and areas of the forest with severe and moderate soil rills was compared. Currently 39.5 percent of historic properties are located in or partially in areas with severe soil rills and 54 percent are located in or partially in areas with moderate rills. Although rills can be small, they transport significant amounts of soil each year. Some estimates claim rill flow has a carrying capacity of nearly ten times that of non-rill areas. In a moderate rainfall, rill flow can carry rock fragments up to 9 cm (3.5 inches) in diameter downslope.

Given the limits of the NRM data, it is difficult to address trends in impacts to historic properties over time. However, impacts appear to be a consequence of actual change. Erosion impacts are nearly ubiquitous across the plan area, and may be a consequence of increasing juniper woodlands, loss of grasslands, or drought conditions within the region. These forces would cause a decrease in the prevalence of understory vegetation and increase the erosion impact of severe storms and strong winds. Damage to historic properties from erosion is a concern given its widespread effects. The increase in bioturbation impacts may be related, as grazing related erosion becomes more severe in drought and climate change conditions. Construction impacts may be a consequence of increasing forest use and an increase in the urban interface, and the development of inholdings within the forest.

¹ Thresholds for each soil-type have been calculated and modeled by ERU for the Lincoln NF

There have been no consistent efforts to record impacts to resources and characteristics important to traditional communities, other than those observed for those that are historic properties (traditional cultural properties). For the general consideration of resources and characteristics important to Native Americans, see the assessment for 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.

Stakeholder Input

As directed by 36 CFR § 800.2, 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, were contacted to request information regarding the plan area. A letter was sent to interested parties on October 24, 2012, and other activities were conducted to contact interested parties. For a description of the activities used to contact American Indian tribes, see the [Areas of Tribal Importance chapter](#). For a description of activities used to contact traditional communities, see the assessment for Social, Cultural, and Economic Conditions. Twenty-four scientific researchers, professional organizations, and avocational societies were specifically identified as having information regarding the nature, condition, and significance of cultural and historic resources and uses in the plan area. Follow-up calls soliciting information were made to the researchers and organizations between December 1, 2012 and January 15, 2013.

Beginning in March 2015 through January 2016, comments were received from the public in the form of letters, emails and responses to official surveys put forth by the Lincoln NF. Below is a summary of their issues or concerns, any management suggestion that they may have put forward and the general condition and trend of their issue.

Beginning in November of 2015 and concluding in January 2016 the Lincoln NF provided survey forms to assess the stakeholder's opinions on the 15 Areas of Interest. The response data was compiled and assigned both an Area of Interest (AOI) as well as an Issue grouping. Only one comment was received in reference to Cultural and Historical resources in these surveys. The comment was pertaining to communication, with the trend remaining the same.

Issues/Concerns

- The one comment received regarding historic properties criticized the Forest for a lack of communication regarding the importance of cultural/heritage resources on the Forest

Summary of Conditions and Trends for Cultural and Historical Resources

Conditions and trends are key to move into the next phase of our plan revision process because it tells us what may need to change and what may be working fine under current management direction.

Conditions and the associated data suggests that we will have continued difficulty in identifying the cultural components of prehistoric sites that lack ceramics, often not being able to tell if they are Archaic or Apache. A majority (61 percent) of all sites, both historic and prehistoric, are found in woodland ERUs, while another 24 percent of the sites are found in the forest ERUs. Riparian areas are also highly likely to contain sites, but represent a much smaller portion of land in the plan area. This information can help the Forest develop predictive models to better assess the costs associated with survey needs for future projects.

Regarding the condition of historic properties, water erosion caused or causes 33 percent of the damage reported and bioturbation (including feral hogs, cattle, elk, and deer, as well as burrowing rodents) caused or is causing 37 percent of the damage reported, while vandalism and looting account for only 2 percent of the damage reported. The overall trends section following this contains bulleted quick references to the trends. For further detail, please refer to the chapter sections for these subjects.

Trends

- Cultural tourism is increasing slightly (Mexican Canyon Trestle and Billy the Kid Scenic By-Way)
- The loss of grasses in woodland areas is increasing the likelihood of site damage due to erosion
- Based on current data, the ERUs most likely to contain cultural resources are the woodland and riparian system types, suggesting that future Section 110 surveys should be weighted towards identifying sites in these ERUs.
- Damage is continuing to occur to sites because natural processes such as water erosion or bioturbation, but protection of these sites remains problematic

CHAPTER 4 - Areas of Tribal Importance and Tribal Uses

Introduction

The Lincoln National Forest (Forest) maintains a governmental relationship and routinely consults with three federally-recognized tribes based in New Mexico and Arizona: the Pueblo of Zuni, the Hopi Tribe, and the Mescalero Apache Tribe (MAT). The Lincoln NF consults with them on policy development, proposed plans, projects, programs, and Forest activities that have the potential to affect tribal interests or natural or cultural resources of importance to the tribes. The Lincoln NF developed a consultation program in the late 1990s and continues to build and enhance its working relationship with these tribes.

All three tribes have expressed some level 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 Forest as part of their aboriginal or traditional use areas and acknowledge contemporary use of these lands for traditional cultural and religious activities.

The Lincoln NF works closely with the MAT because not only do we manage their ancestral lands, the Smokey Bear District is located on the north side of their reservation and the Sacramento District is located on the south side of the reservation. We have cooperated on joint fuel reduction projects, hired their crews to implement LNF projects, and supported their Summer Youth Academy. We continue to work with them closely on ecosystem management, both on the Forest and the Mescalero Apache Reservation.

Social and Economic Contributions of Cultural and Historic Resources and Uses

Ecosystem Services

The vegetation that contributes to timber, firewood, and special forest products provides many ecosystem services on which humans and other life forms depend. Supporting ecosystem services of timber and forest products at the most basic level convert sunlight and carbon dioxide into oxygen and carbohydrates (primary production). Regulating ecosystem services of timber and forest products are key to soil formation and stability, thermoregulation (shading and evaporative cooling), nutrient and hydrologic cycling, carbon sequestration, and energy flow. Provisioning ecosystem services of timber and forest products provide wildlife habitat (cover, nest sites), food (piñon nuts, mesquite, and agave for humans and other animal species, browse for wildlife), and fiber (lumber, paper, fuel). Cultural ecosystem services of timber and forest products (e.g., Christmas trees, botanical remedies, and aesthetics) are especially important to humans and society.

Contributions to Social, Economic and Ecological Sustainability

Plant products, including firewood, timber and other building materials, as well as special forest products (e.g., Christmas trees, teepee poles, and transplants/wildings) are important resources available from the Lincoln NF. Firewood is the sole source of heat for the homes of many people within the area of influence, largely because it provides economic savings over propane, natural gas, and electricity. Gathering firewood and Christmas tree cutting are often family events. Other wood products, such as lumber, posts, poles, and traditional building materials (e.g., teepee poles), are culturally and economically important as well. The Forest has increased the number of forestry treatments it

implements, to improve forest health, reduce potential for uncharacteristic wildfire, and make forest products more available. The Forest has an agreement with the MAT authorizing them to remove as many as 4,400 trees per year to use as teepee poles for ceremonial purposes. The MAT and the Forest work closely to ensure that the trees removed by the MAT provide a beneficial effect to overall forest health.

Cultural and Historic Context of the Assessment Area

The previous chapter contains a section titled Cultural and Historic Context of the Assessment Area. The reader is directed to this portion of Volume II for the appropriate context.

Areas of Known Tribal Importance

Lands managed by the Forest have been used and continue to be used by 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, hunting game and birds, religious pilgrimages, and to visit 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 Lincoln National Forest. For example properties of cultural and religious significance, which 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 where specific forest products are gathered for ceremonial use.

The tribes consider all of these types of locations to be traditional cultural properties (TCPs). Some locations such as shrines, caves, springs, and resource collection areas have long-standing and ongoing historical, cultural, and religious significance. The Forest has formally documented three of these locations as traditional cultural properties, some of which have been determined eligible for the National Register. These consist of site-specific locations. Other locations remain minimally documented, but clearly meet the criteria of a TCP. Existing information regarding TCPs is based on published sources as well as the results of project-level consultation conducted by the Forest over the last 15 years. The locations of archeological sites is not revealed in public documents because it is protected information under 36 CFR § 296.18

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. The importance of place names in Apache culture may stem from the fact that the Apaches relay their history through oral tradition rather than written means (Ball 2002, Nevins 2008). Silko (1996) adds that in such cultures, people place less value on the timing of certain events and more value on the stories and lessons that can be learned from their predecessors. Sierra Blanca, the Guadalupe Mountains, Three Sisters Mountain, and Oscura Mountain Peak represent the direction of everyday life for Apache people. The Capitan Mountains also have associated stories important to Apache culture.

The importance of places and stories is demonstrated in the following examples: The Guadalupe Mountains are sacred to the Mescalero people. According to tradition, "the Mescalero gathered at the summit of El Capitan during a great flood that submerged the world. It was one of the few locations left, then the Gahe [or mountain spirit] dancers came from above, and they brought food to the Apache people. Indian bananas were the first food, the second food was mescal, and also all the nuts and

berries” (<http://marfapublicradio.org/blog/nature-notes/apache-mescal-roast-at-guadalupe-mountains/>).

Sierra Blanca and the other peaks are rooted in the history and traditions of tribes (Ball 2000). It is central to their cultural practices as living communities and is critical to the maintenance of their cultural identity (Samuels 2001). They are places that figure prominently in oral traditions regarding origin, place of emergence, and migration, and play a vital role in their cosmology and religion. The cultural and traditional use of locations within these mountain ranges is sporadic but ongoing, and is dictated by the cycle of cultural activities. For more distant tribes, such as the Hopi and Zuni, which are currently based in Arizona and western New Mexico, some of these mountain ranges served as a distinctive landmark or way point to aid in travel.

Tribal and Traditional Use of Plants

Many tribes also rely on the Forest for products for personal, commercial and ceremonial use (Table 27 and Table 28). Plants are used for food, medicine and items like cradle boards or brush structures. Piñon nuts are one example of a forest product commonly gathered for both personal and commercial use. The collection and sale of piñon nuts is important because tribal members may rely on the nuts for income. Firewood is another forest product that is widely collected by tribal members for personal and ceremonial use. This includes juniper, pinyon, oak, and ponderosa pine. There is also a heavy reliance on forest products for traditional and cultural purposes.

Table 27. Common Usage of Traditional Materials

Common and Botanical Name	Use
Douglas-fir, <i>Pseudotsuga menziesii</i>	teepee poles, alternative arbor brush (when oak has no leaves)
Gambel's oak, <i>Quercus gambeli</i>	small/large stalks for cradleboard, arbors (frame and brush cover), cooking sticks, staffs, preferred cooking wood for ceremonials
Cattail, <i>Typha latifolia</i>	stalks for big teepee carpet and pollen for ceremonial use
Blue grama, <i>Bouteloua gracilis</i>	grass stalks for ceremonial use
Sotol, <i>Dasylirion wheeleri</i>	cradleboard back, sun sticks, fire "maker"
Yucca, <i>Yucca elata</i>	leaves for string (big teepee arbor) & roots for soap
Banana yucca, <i>Yucca baccata</i>	leaves for string (big teepee arbor) & roots for soap
One-seed juniper, <i>Juniperus monosperma</i>	stringy bark for ceremonial use, leaves for "smoking"
Alligator juniper, <i>Juniperus deppeana</i>	leaves for smoking; preferred firewood
Piñon, <i>Pinus edulis</i>	young pliant saplings for cradleboard frame
Apache plume, <i>Fallugia paradoxa</i>	stems for cradleboard head cover
Sumac, <i>Rhus trilobata</i>	stems for baskets
Osha, <i>Ligusticum porteri</i>	roots for numerous medicinal uses and in tobacco
Sages, artemisia, salvia and other species - silver sage	tobacco, smudging (found in desert, such as White Sands)
Sage, lightning weed, ghost weed	protection from lightning, especially at top of teepees
Ponderosa pine, <i>Pinus ponderosa</i>	preferred wood for ceremonial crown dancer's fire
Mountain laurel, <i>Broussonetia secundiflora</i>	Witch Beads (found in the Guadalupe Mountains)

Table 28. Lesser Usage of Traditional Materials

Common and Botanical Name	Use
Mountain mahogany, <i>Cercocarpus montanus</i>	stalks for staff
Mint	(several species used) – bathing and deodorant
Coyote willow, <i>Salix exigua</i>	baskets
Mullein, <i>Verbascum thapsus</i>	leaves for tobacco
Quaking aspen, <i>Populus tremuloides</i>	medicinal use, original big teepee poles
Broom snakeweed, <i>Gutierrezia sarothrae</i>	medicinal use
Mesquite, <i>Prosopis glandulosa</i>	long straight roots for cradleboard
Ponderosa pine, <i>Pinus ponderosa</i>	needles for medicinal use
Peyote, <i>Lophophora willaimisii</i>	ceremonial and religious use
Bear grass, <i>Nolina microcarpa</i>	moist grass on top layer of mescal pit
Yarrow, <i>Achillea millefolium</i>	medicinal use
Stemless daisy, <i>Townsendia exscapa</i>	medicinal use
Food Plants	
Watercress, <i>Nasturtium officinale</i>	leaves
Indian tea, <i>Ephedra</i> sp	plant top
Yucca, <i>Yucca elata</i>	flowers
Banana yucca <i>Yucca baccata</i>	fruit
Mint	leaves for tea
Nodding onion, <i>Allium cernuum</i>	bulbs
Indian spinach/Lambsquarters, <i>Chenopodium alba</i>	leaves
Elderberry, <i>Sambucus neomexicana</i>	berries
Raspberry, <i>Rubus neomexicanana</i>	berries
Strawberry, <i>Fragaria bracteata</i>	berries
Gamble's oak, <i>Quercus gambelli</i>	nuts
One-seed Juniper, <i>Juniperus monosperma</i>	berries
Alligator juniper, <i>Juniperus deppeana</i>	berries
Locust, <i>Robina neomexicana</i>	Pods
Prickly pear, <i>Opuntia basilaris</i>	fruit and pads
Walnut, <i>Juglans nigra</i> or <i>major</i>	nuts
False flax, <i>Camelina microcarpa</i>	seeds
Sunflower, <i>Helianthus annuus</i>	seed
Vetch, <i>Vicia melilotoides</i>	Pods
Wild pea, <i>Lathyrus leucanthus</i>	Pods

Land Ownership, Access, and Multiple Use

Changing conditions have and are continuing to influence tribal use of the forest and affecting areas of tribal importance. Some of these include: changes in land ownership, degradation of forest health and watershed conditions, changing technologies and energy development, population growth, urban pressures, expanding recreation use, and the development of private lands. Forest health and watershed condition are subjects relating directly to the ecological part of this assessment but should be mentioned here as they pertain to tribal lands use since many of these societal needs are intrinsically linked to these natural elements.

Land Ownership

Tribal access and use of the lands and resources now managed by the Lincoln NF, as well as the general landscape, has been altered over time due to a number of factors. The primary factor is the change in land ownership and jurisdiction. Historically, resources on the land were widely available to tribes, and they had nearly unfettered access to these lands for hunting, acquiring construction material, gathering fire wood, and collecting resources for food, medicine, and ceremony. There were often well-established travel routes between locations and prescribed routes to specific areas of tribal importance. As the Spanish, Mexicans, and Americans moved into the area, recognition of private land ownership became increasingly important. Establishment of the Mescalero Apache Reservation in 1873 and removal of the Mescalero, Lipan, and Chiricahua Apache to the reservation severely curtailed Indian access to non-reservation land. In fact, reservation land was encroached upon by non-Indian peoples for decades after the establishment of the reservation. Access to and use of resources continued to change with the establishment of the Forest in the early 20th century along with the gradual development of environmental policy. This resulted in the passage of federal laws and regulations and in greater federal oversight slightly modifying the use.

Access

In some cases, access to culturally significant locations has been severely restricted or eliminated altogether in places where the land has become privately owned. While the Forest Service has the ability under a variety of authorities to assure tribes access to sacred sites on National Forest land, and to allow for tribes to conduct cultural activities in privacy, few tribes have exercised their rights on the Lincoln NF 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. The Forest works closely with the government and staff of the Mescalero Apache Tribe to ensure access to resources needed by traditional practitioners and available sustainably on the Lincoln NF

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, has all contributed to complicating the tribes' ability to do resource collection and to visit areas of traditional cultural and religious significance. Land ownership can affect how tribes approach areas of tribal importance. Ownership and development of private land has led to a greater reliance on national forests, however, tribes will sometimes limit where and how they use the national forest for traditional, cultural and religious activities. Instead, they will opt, where they can, to obtain these resources on their own lands, or will travel to national forest lands that are closer to their reservations.

Special Use

As a multiple use agency, the Forest Service permits a wide variety of activities on National Forest system lands. Activities such as ski areas, communication sites, mineral exploration and extraction, and construction of transmission or utility lines can affect areas of tribal importance through the damage to and destruction of archaeological sites, or because construction on sacred locations may adversely affect the integrity of the viewshed. Some permitted activities have the potential to impact tribal use of the Forest, but they can be helpful in promoting Tribal sovereignty, too.

For example, the Ski Apache recreation area is located on Sierra Blanca, adjacent to the White Mountain Wilderness and is a popular attraction. The ski area operates under a special use permit to the MAT. Ski Apache is a highly successful and popular sports and recreation area run by the Tribe. Ski Apache offers skiing in the winter and hiking, mountain biking, and zip lines in the summer. The Forest has been

assisting the MAT in rebuilding Ski Apache following the Little Bear Fire, through planning and consultation. The Forest has worked closely with the Ski Apache to authorize the reconstruction of ski area infrastructure. In addition, the Forest and tribe have been working on building mountain bike trails and zip lines to increase developed recreational use of the area.

Population Growth, Urban Pressures and Expanding Resource Use

Recreational use of the forest is on the rise. The increase in certain types of activities is reflective of the country's aging population and greater urbanization of our society. Some of the most popular activities involve day use (such as picnicking and hiking), driving for pleasure and scenic beauty, and wildlife viewing. Urban populations seem more comfortable recreating in closer quarters, and this often results in concentrated uses on some parts of the forest, particularly those that are within easy driving distance of urban centers such as Las Cruces, NM; El Paso, Lubbock, and Amarillo, TX.

It should also be noted that the agency is proactive in its efforts to draw underserved populations to the outdoors to foster an appreciation for the environment, and an understanding of the value of National Forests and the role it can play in people's lives. Many areas of the Forest are popular for dispersed recreation including camping and picnicking. As recreational use on the forest increases, potential conflicts between traditional practitioners and other forest visitors can be expected to increase. Potential conflicts may be mitigated through close coordination between the Tribes and the Forest Service in order to promote and protect Native American gathering and ceremonial use of the Forest from intrusion or interference by non-Native Forest users.

Development of Private Land

While increasing populations and urbanization outside of the Forest bring additional users, the population of those living inside official Forest boundaries is also increasing due to the development of private inholdings, which are located within every unit of the Lincoln NF. 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 for some of the same reasons as development outside of the Forest: increasing use of the Forest for recreation, more electrical distribution lines and communications facilities to service larger populations, a higher risk of human-caused wildfire, and the expansion of informal trail systems. These are concerns expressed by the Mescalero Apache.

Forest Health and Management

Forest health is of great concern to the MAT due to the extensive boundary between the Lincoln NF and the MAT Reservation. The Lincoln NF and the Mescalero Apache Tribe work closely on projects related to forest health both on the reservation and in the plan area. This includes consultation and collaboration on timber management, watershed restoration, fire management, habitat improvement, and tribal youth engagement in natural resource management.

Plant Collection

Tribes that rely on the Forest for collecting plant resources for personal and ceremonial use have noted that some plant species are more difficult to find than they were in the past. Some of this difficulty is due to restricted access to areas that were used in the past, as discussed above, and may also be due to the general degradation of watershed conditions and forest health.

Restoration

In response to the degradation of watersheds and ecosystems, the Forest Service has focused on ecosystem restoration. Restoration means restoring the ecological functions associated with healthy forest ecosystems—systems that remain resilient under drought conditions, despite assault by fire, insects, and disease—systems that remain capable of delivering the ecosystem services that Americans want and need, even in an era of climate change. Restoration is designed to improve wildlife habitat, reduce and remove invasive species, improve watershed health, increase water quantity, improve water quality, and meet our goal of healthy, resilient landscapes in which fire plays a natural role.

One of the vehicles used currently by the US Forest Service in ecosystem restoration is the Tribal Forest Protection Act of 2004 (Public Law 108-278) which allows tribes to propose projects on National Forest System lands to protect their own trust resources. The Tribal Forest Protection Act (TFPA) authorizes the secretaries of the USDA and USDI to give special consideration to tribally-proposed stewardship contracting or other projects on Forest Service or BLM land bordering or adjacent to Indian trust land to protect Indian trust resources from fire, disease, or other threats coming off of Forest Service or BLM land.

The Forest shares a common boundary with the Mescalero Apache Reservation. The Forest managed a TFPA project with the Mescalero Apache on the Sacramento Ranger District: the 16 Springs Stewardship Contract. This contract was entered into under the authority of the Tribal Forest Protection Act (TFPA) (P.L. 108-278). The Lincoln NF and the Mescalero Apache Tribe have successfully used this contract under the TFPA. The efforts to address issues and find solutions, demonstrates a shared spirit of stewardship. This partnership will serve as a model for other tribes and federal partners as they enter into similar relationships. It can be reasonably expected that the Forest will enter into more agreements or contracts to develop projects that are mutually beneficial and work across boundaries and enhance landscape-scale work.

Another vehicle with which to accomplish ecosystem restoration is the Collaborative Forest Restoration Program (CFRP). Two collaborative forest restoration projects) were funded through 2015, for collaboration and fuels treatments on the Lincoln NF and Mescalero Tribal lands. Both project proposals were recommended for funding by the CFRP panel and signed in August 2013, by the Secretary of Agriculture. These projects involve many collaborator meetings with the Mescalero Tribe. These meetings and continued efforts in communication keep the Mescalero Apache Tribe involved on planning and implementation of the projects.

The CFRP project for thinning in Mexican Spotted Owl (MSO) Protected Activity Centers (PAC's), involves mechanical thinning on the Sacramento Ranger District and Mescalero Tribal lands. The project implements mechanical treatments within MSO habitat on 491 acres of National Forest land. It will also implement mechanical treatment and prescribed fire to treat 330 acres of Tribal lands. This project was originally proposed as part of the Rocky Mountain Research Station (RMRS) work on Forest Service land. The post treatment monitoring will allow the pre-treatment data collected by RMRS to be utilized to help evaluate the efficacy of treatments within PAC. The Forest Stewards Guild of Santa Fe, New Mexico, fills the role of Conservation Partner for this project.

The other CFRP proposal, submitted by the South Central Mountain Resource Conservation and Development Council (SCMRC&D), is the Ruidoso Wildland Urban Interface (WUI) Interagency Fuel Reduction and Prescribed Fire Implementation Project. This project will treat over 1,000 acres in the Ruidoso WUI of the Smokey Bear Ranger District, using mechanical thinning and prescribed fire. Fire

operations will be conducted on 800 acres of National Forest land, 120 acres of New Mexico State land, 50 acres of Village of Ruidoso land, and 150 acres of Mescalero Tribal land. Mechanical treatments will be conducted on 60 acres of State land and 60 acres of Village land.

Both CFRP projects provide funding to the MAT for employment and training of Tribal fire crews. The Tribal lands thinned will also be used for fuel wood, providing economic benefits. The resulting benefit to the Forest and MAT is continued collaboration and management of forest ecosystems across administrative boundaries.

The Reserved Treaty Rights Land (RTRL) program is another grant program that can be used to treat Forest land adjacent to reservations. The MAT and the Forest, in collaboration with the Bureau of Indian Affairs (BIA), have developed a five year plan that builds on the TFPA contract in 16 springs.

Technological and Energy Development

In recent years, there has been a greater emphasis on alternative forms of energy development such as wind, solar, and nuclear power. While many tribes support the development and use of wind and solar power, there is also recognition that these types of energy development result in a large footprint on the landscape and often impact the scenery. As of yet, there have been no proposals for the development of wind or solar energy sites on forest or private lands immediately adjacent to the Forest. Evidence of past mineral exploration for gold, lead, iron, coal, silver and copper is still evident today on the Smokey Bear and Sacramento Ranger Districts. The agency has only recently begun to address the remediation of older mines on the forest. Oil and gas exploration and development has moved closer to the boundary of the Guadalupe Ranger District and there has been some interest in the northwest areas of the Sacramento Ranger District.

Changes in telecommunication technology over the past century resulted in a proliferation of communication sites developed on the forest, most located on high points such as mountain tops. These constructed features are a mixed blessing for the tribal communities. While communication sites make certain technologies readily available to all, they are perceived to cause impacts on the landscape, on wildlife, and tribal traditional use of the land. For example, radio communication sites contain towers that can be seen for great distances, and if greater than 200 feet in height, will be lit at night per FAA requirements. Those tribes that have expressed their opposition to the development of new communication sites have encouraged co-location of users to the maximum extent feasible.

Tribes have expressed concern that the installation and build-out of such sites will exacerbate the visual, audible, and atmospheric interference, further disrupting and displacing prescribed traditional activities that take place in that area. The potential effect of electromagnetic radiation (EMR) emitted from the high power facilities upon humans (and wildlife) is a concern, especially when traditional practitioners and contemporary users are within the proximity of the towers. Impacts created by the presence of towers or any other highly visible man-made objects, obstruct the “line of sight” from the physical location of the ceremony to a given location. This can interfere with the practitioner’s accuracy of diagnosis and proper treatment of patients. These visible impacts represent an intrusion to the traditional experience and the ability to properly conduct prescribed cultural practices. The continued permitting and development of electronic facilities, particularly on or near the higher mountains, disallows the meditative atmosphere, tranquility, and privacy necessary for traditional cultural activities. Additional vehicle traffic associated with the use and expansion of these types of facilities is also a concern from the standpoint of intrusion and interference with traditional and religious practices.

Large and intrusive development projects have 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 a traditional practitioner's ability to conduct traditional cultural activities in the area will render medicine and healing ceremonies less effective.

Some tribes are located in areas with significant renewable energy resources, including woody biomass, biomass waste resources, solar, and wind. While geothermal and hydroelectric are also considered renewable energy resources, there is no potential for these on the Forest. Renewable energy can be developed to meet a tribe's needs for sovereignty, energy independence and diversification, environmental sustainability, and to strengthen the tribal economy.

Title V, Section 503 of the Energy Policy Act of 2005 (Public Law 109-58) and Indian Mineral Development Act of 1982 (Public Law 97-382) provide increased flexibility for tribes to develop energy resources. A number of tribes in the region are currently developing energy under the provisions of the Energy Act of 2005. According to the Department of Energy, Tribal Energy Program website, https://apps1.eere.energy.gov/tribalenergy/projects_state.cfm/state=NM there are 10 energy related projects in New Mexico.

The Forest shares a common boundary with the Mescalero Apache. It can be reasonably expected that the Forest could receive additional requests for special use permits to cross National Forest land. This would include requests to transmit electricity or natural gas across National Forest land by the Department of Energy and the Department of Interior, working on behalf of tribes to develop their resources.

Findings for Areas of Tribal Importance and Tribal Uses

There are numerous opportunities to work with Tribes, given the Forest Service's trust responsibilities for government to government consultation, coordination of land and resource management plans, and actions to promote the health of ecosystems. These include respecting Tribal connections to the land and places for history, identity, and beliefs. Many tribes also rely upon the national forest for forest products for personal, commercial, and ceremonial use.

The Lincoln NF is working with the Mescalero Apache Tribe on a number of initiatives designed to help both parties. We are helping to return the landscape to a more natural state, while providing, sustainably, for the traditional use of plants. The Forest Service is also working with the MAT to determine if a supply of timber is available from the LNF to help support commercially viable businesses in the area which may employ or otherwise benefit Tribal members.

The Lincoln NF is working with Tribal youth to educate them in the management of natural resources and their ancestral lands, while also encouraging further education and careers in the natural and social sciences.

The Lincoln NF also consults with the Hopi, Zuni, and Mescalero regarding the effects of undertakings on historic properties in order to fulfill our obligation under Section 106 of the National Historic Preservation Act of 1966, as amended, and Executive Order 13175.

We are working together to ensure Tribal access to and protection for areas of cultural sensitivity based on ceremonial, ritual, and economic importance. Most important, we continue to maintain open communications with the MAT on issues of concern to both parties.

Stakeholder Input

Many members of the public 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. Historical resources and ancestral places help make the forest a unique place. However, participants also expressed there is a certain lack of communication and understanding (noted in the [Historical and Cultural Resources chapter](#)) regarding the importance of cultural and heritage resources on the Forest and there is limited medical uses of forest resources.

Beginning in November of 2015 and concluding in January 2016 the Lincoln NF provided survey forms to assess the stakeholder's opinions on the 15 Areas of Interest.

Issues/Concerns

- Limited medical uses of forest resources

Management Suggestions

- Provide for more medical use of forest products

Condition/Trends

Within the official survey period there were no issues received regarding tribal importance and/or uses, however, outside of this period one comment was brought to our attention. This one comment is listed above and refers to the limited use of medicinal materials on the forest. Overall conditions are summarized below.

Summary of Conditions and Trends for Cultural and Historical Resources

The Lincoln National Forest continues to consult with the Hopi, Zuni, and Mescalero Apache on the effects of individual undertakings on historic properties. The Lincoln NF maintains contacts with these Tribes in order to ensure open and full communication. The Forest tries to avoid any adverse effects to historic properties, but when they do occur, the Forest works closely with the Tribes and the State Historic Preservation Officer to insure that necessary mitigation is undertaken for compliance with all Federal laws and regulations.

The Lincoln National Forest is working in cooperation with the Mescalero Apache Tribe to restore forest health as a way to protect resources from destructive wildfire, ensure a supply of clear water, maintain biodiversity, and supply forest products to traditional Native American practitioners.

We continue to engage Tribal youth in educational and experiential programs designed to teach them about responsible land management, encourage them to set career goals, and continue their education, regardless of their interests.

Trends

- The Lincoln National Forest is continuing to work closely with the Mescalero Apache Tribe, finding ways to cooperate on projects, providing educational opportunities to Tribal youth, and ensuring access to traditionally used resources
- The Lincoln NF is continuing in its efforts to maintain meaningful and substantive communication with all interested Tribes about the management of public lands

CHAPTER 5 - Multiple Uses

Introduction

Volume I of this Assessment provides information on different habitat types that form the basis for healthy ecosystems. This section begins with a synopsis of the human benefits derived from those ecosystems and the management efforts that oversee this use. The Multiple Uses chapter within this Socio-Economic volume will present data associated with rangeland resources, timber/forest products, water, and fish, wildlife, and plant resources. Data within this chapter differs from that found within Volume I by presenting only the social and economic aspects of these areas, not the direct ecological aspects of these natural uses and resources.

Key Concepts and Definitions

There are two different scales of analysis for this chapter. In discussing rangeland and timber resources, we will be analyzing and presenting data based upon the “plan area” or forest boundary. For water resources, the principle scale of analysis will employ hydrologic unit code (HUC) levels 4 through 6, namely the sub-basin (HUC 4), watershed (HUC 5), and sub-watershed (HUC 6) levels (see Water section). The main source for the numbers will be from the Lincoln NF’s corporate Geographic Information System (GIS) geospatial database as well as the Natural Resource Manager (NRM) forest database unless otherwise noted.

Social and Economic Contributions of Multiple Uses

Within this section we will be discussing general and overarching social and economic contributions of the four types of multiple uses, which include: rangelands, timber/forest products, water, and fish, wildlife, and plants.

Ecosystem Services

The overall ecosystem services represented by the multiple uses analyzed in this chapter are summarized below.

Rangeland

From a provisioning standpoint, rangelands on the Lincoln National Forest offer a variety of benefits to local communities. The herbaceous forage produced on rangelands has sustained ranching operations for generations. Many of these operations are dependent upon forage produced on National Forest lands. Rangelands on the Lincoln generate income for local ranching families and provide for production of food products for our local communities and our nation. Rangelands also provide opportunity for local jobs and commerce for local business that are needed to sustain ranching operations.

From a cultural standpoint, rangelands provide the basis for sustaining the custom and culture of our rural lifestyle and provide a connection for future generations to natural resources. Ranching and livestock grazing are traditional cultural values in the rural communities adjacent to the Lincoln NF. There is a long history of ranching and farming beginning with Spanish settlers and later melding with European cultures 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. A local example of this includes the legend of Billy the Kid whose exploits took place throughout the Lincoln NF and adjacent lands.

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. A working ranch lifestyle, even in limited scale, carries tangible family and cultural benefits. 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.

Rangelands provide open space and recreational opportunities such as; hunting, hiking, camping and many other activities. The waters developments needed to provide the water required for livestock operations, also provide benefit to many wildlife species. Development and maintenance of these water sources would be greatly reduced without the livestock operations.

Timber and Forest Products

Support systems of timber and forest products at the most basic level convert sunlight and carbon dioxide into oxygen and carbohydrates (primary production). Provisioning services provide wildlife habitat (e.g., cover and nest sites), food (e.g., piñon nuts for humans and other animal species and browse for wildlife), and fiber (e.g., lumber, paper, and fuel). Cultural ecosystem services of timber and forest products (e.g., Christmas trees, botanical remedies, and aesthetics) are especially important to humans and society.

Cultural ecosystem services of timber and forest products are especially important to humans and society. They may include family traditions of gathering Christmas trees, medicinal plants and pine cone gathering as just a few examples. Regulating services are key to soil formation and stability, thermoregulation (i.e., shading and evaporative cooling), nutrient and hydrologic cycling, carbon sequestration, and energy flow.

Water

Provisioning services include products obtained from ecosystems. Principal watershed services from forests include freshwater supply for domestic, agricultural, commercial, industrial, and other uses. This section discusses some of the provisioning services in and adjacent to the Lincoln NF: water rights and uses, water supply, and known infrastructure and water-related uses.

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.

Fish, Wildlife and Plants

Fish and wildlife of all sizes have ecological roles and niches in many supporting and regulating services discussed in Volume I, from cycling nutrients to creating soil. Certain species also, of course, have offered key provisioning and cultural services to humans across southern 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 nonmaterial benefit.

The Lincoln National Forest is successfully providing habitat for 10 legally hunted big game or trophy species, multiple small game 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 Lincoln National Forest, 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 (except aquatic species), these underlying ecosystem services are currently mostly stable on the Lincoln National Forest but as particular Ecological Resource Units increase in departure from reference condition (see Volume I) the stability of that Ecological Resource Units may decline.

Rangelands

Grazing of the rangelands are an economic driver for local communities in the four counties that encompass the Lincoln. The grazing program on the Lincoln contributes jobs, labor income, and economic outputs to the four county area. Indirect economic impacts include businesses that support the logistical needs of ranching operations. Most ranching operations in New Mexico are family owned businesses. Livestock are a very important part of the culture of the small communities surrounding the forest. Historically, livestock grazing has been the primary economic driver for settlement of the west and still is the primary industry in some rural communities. Many of the Forest's permittees and their families have grazed these lands for generations and for many permittees, grazing on national forest lands is important not only as a source of income, but as a part of their cultural identity and family history.

The land that comprises the Lincoln NF has been grazed by domestic livestock much longer than the Forest, as an administrative entity, has existed. The Lincoln NF and surrounding lands have been grazed by domestic livestock since the Spanish first settled the area around 1700. Initially, cattle, sheep, swine, horses, and goats grazed indiscriminately across the landscape. The amounts and types of livestock grazing on federally administered lands has dramatically decreased since the establishment of the grazing permit system. Currently the Lincoln NF is grazed primarily by domestic cattle, with limited grazing by horses and sheep.

As part of the agency's mission, the Lincoln National Forest (Lincoln NF) authorizes domestic livestock grazing under a permit system. The permit system administers livestock grazing to be compatible with other multiple-use objectives and provides desired economic and cultural benefits to communities.

Current Condition of Rangeland

The Forest Service uses a permit system to administer livestock grazing of National Forest System (NFS) lands. Rangelands are divided up into grazing units called allotments. These allotments vary greatly in size from the Acrey allotment on the Guadalupe RD as 414 acres to the Sacramento allotment on the Sacramento RD at 111,167 NFS acres. Allotment boundaries typically follow topographical features such as ridgelines or creeks and may be fenced entirely or have topographic features that serve as natural boundaries. Grazing permit holders, or permittees, own the livestock that graze the allotment and additional private "base" property that serves as basis for the permit. The permits are held by individuals, families, partnerships and corporations.

Most allotments on the Lincoln NF have only one permittee each, although a few have more than one permittee sharing the same allotment. Allotments are further subdivided into pastures, and most allotments (except for very small allotments) follow some kind of rotational grazing system where cattle are moved through different pastures as the year progresses. Allotment and pasture boundaries can be adjusted administratively as needed. Many allotments have been merged or combined over the years, while other pastures have been split or exchanged between allotments.

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 New Mexico 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 percent 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.

Nearly the entire Lincoln NF is either within an active, vacant or closed grazing allotment with a few exceptions such as administrative sites and designated watershed areas. Currently, the Lincoln is divided into 120 grazing allotments of which horses are also permitted on 10 (strictly permitted for administrative use on the allotment) allotments and sheep on 2 allotments. The remainder of the allotments only permit cattle use. There are 102 active allotments, meaning they have a current active permit issued to a permittee. One allotment is vacant (the permits were waived back to the forest without preference, and new permits have not been issued). Seventeen allotments were formally retired from grazing and are currently listed as closed. Some active allotments have entire pastures or areas that are in non-use for various reasons ranging from permittee personal convenience to fire or drought. Table 29 displays allotment acres by status and Figure 21 shows a map of these areas.

Table 29. Comparison of active, vacant and closed allotments in the Lincoln NF

Status	Number of Allotments	Total Acres
Active	102	946,773
Vacant	1	13,439
Closed	17	153,614

Table 30 details the various numbers associated with grazing for the three Ranger Districts and the entire Lincoln NF (source: NRM). Data includes a summary of grazed acres both on NFS lands and also on private or other lands, numbers of permittees, and permitted and authorized Head Months of use.

For Informational purposes regarding livestock management, the following terms are defined:

1. Head Month (HM) is month's use and occupancy of rangeland by one weaned or adult cow, bull, steer, heifer, horse, 5 sheep or 5 goats. Head months are used for grazing fee calculation and collection purposes.
2. Permitted numbers represent the total number of livestock pairs or individuals permitted through a Term Grazing Permit on a given grazing allotment.
3. Authorized numbers are expressed in head months and represent the year to year actual stocking on the allotment, based on forage and water availability, condition of the range improvements, climatic conditions, personal convenience for the permittee, or resource protection non-use.

Table 30. Grazing Data for the Lincoln NF 2015 (Source: NRM Database)

Grazing Attributes	Smokey Bear Ranger District	Sacramento Ranger District	Guadalupe Ranger District	Total
NFS Acres Grazed	243,081	397,183	306,509	946,773
Total Acres Grazed*	251,238	405,436	312,158	968,832
Active Allotments	46	39	17	102
Permittees	46	31	14	91
Permitted Head Months (HM)	41,352	43,000	41,348	125,701
Authorized Head Months (HM)	32,146	34,198	37,572	103,916
Head Months (HM) Non-use	9,206	8,802	3,776	21,784

The Lincoln range program staff currently use adaptive management to adjust livestock numbers, class (cow/calf, yearling, bull, dry cow), pasture timing, and grazing intensity to respond to changing environmental, social, and economic needs. In some years, full permitted numbers are authorized, and other years less numbers are authorized to respond to changed conditions such as drought or fire. Annual meetings with all permittees are scheduled each year. Annual Operating Instructions (AOIs) are developed through these annual meetings. These include; numbers grazed, season of use, and planned improvement maintenance or new development.

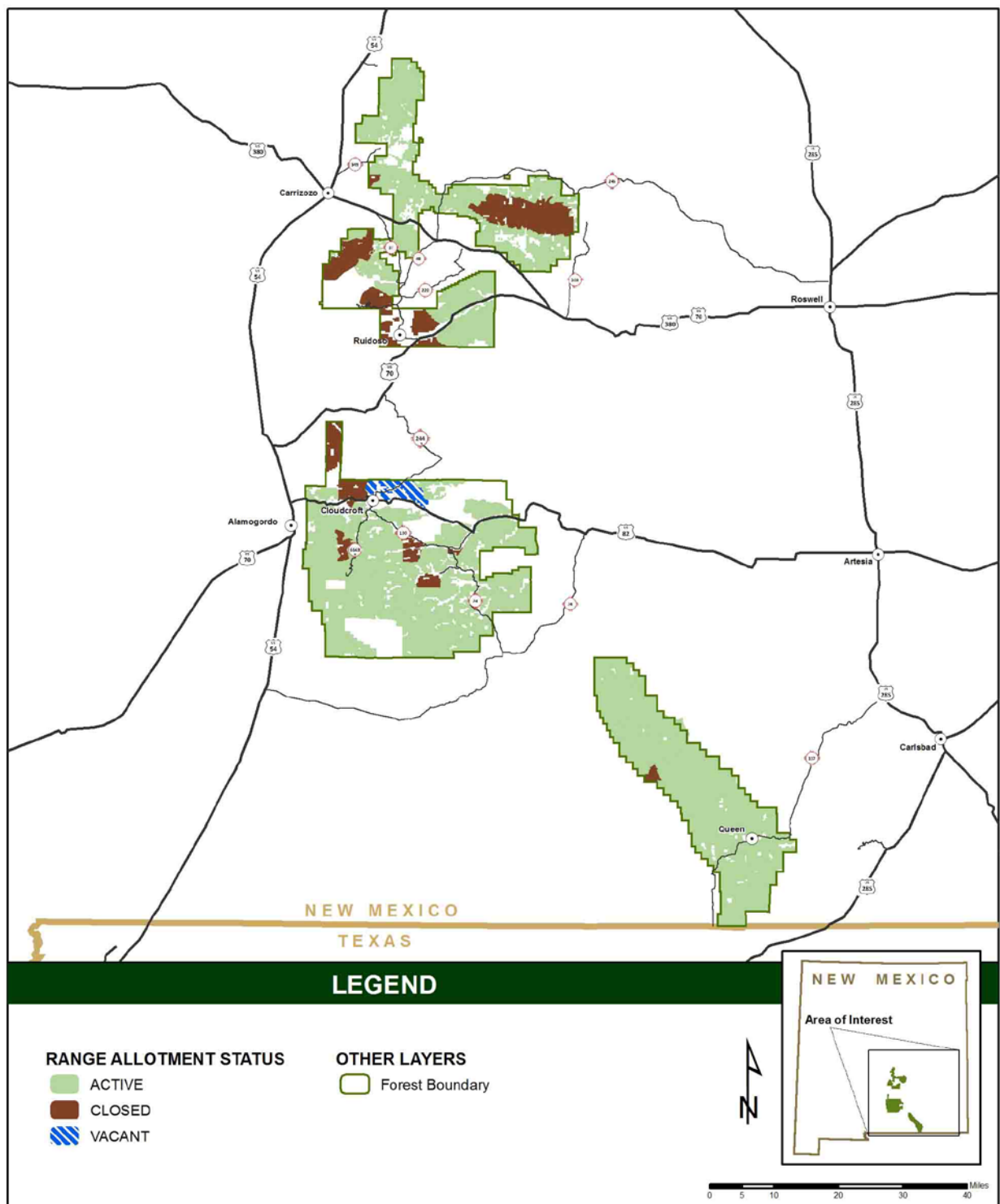


Figure 21. Range allotment status on Lincoln NF

According to NRM, 12,081 cattle, 53 horses and 1,330 sheep were permitted to graze on the Lincoln NF in 2015 (Table 31 and Figure 22). Annual authorization of livestock numbers can vary from the actual

permitted number due to adaptive management actions taken to deal with drought and herbaceous forage availability.

Table 31. Permitted livestock numbers permitted in 2015 (rounded)

Type of Permitted Use	Number
Cattle	12,081
Horses	53
Sheep	1,330

Authorized grazing use is normally somewhat lower than permitted grazing use. In 2015, authorized use was only about 78 percent of permitted animal unit months due to the reasons listed above. These figures do not include the potential capacity of the vacant allotment. The Lincoln NF is unique in that it is one of the few national forests in the west that permits a high percentage of year-long grazing. The Lincoln also has several summer and winter allotments allowing livestock to graze on National Forest System lands year-round at different elevational ranges. Livestock are transported or pushed to the summer allotments (high country) in early summer once the snow has melted. In the fall the reverse happens and livestock utilize the low country on the Forest. The remainder of the allotments permit livestock grazing activities for the entire year.

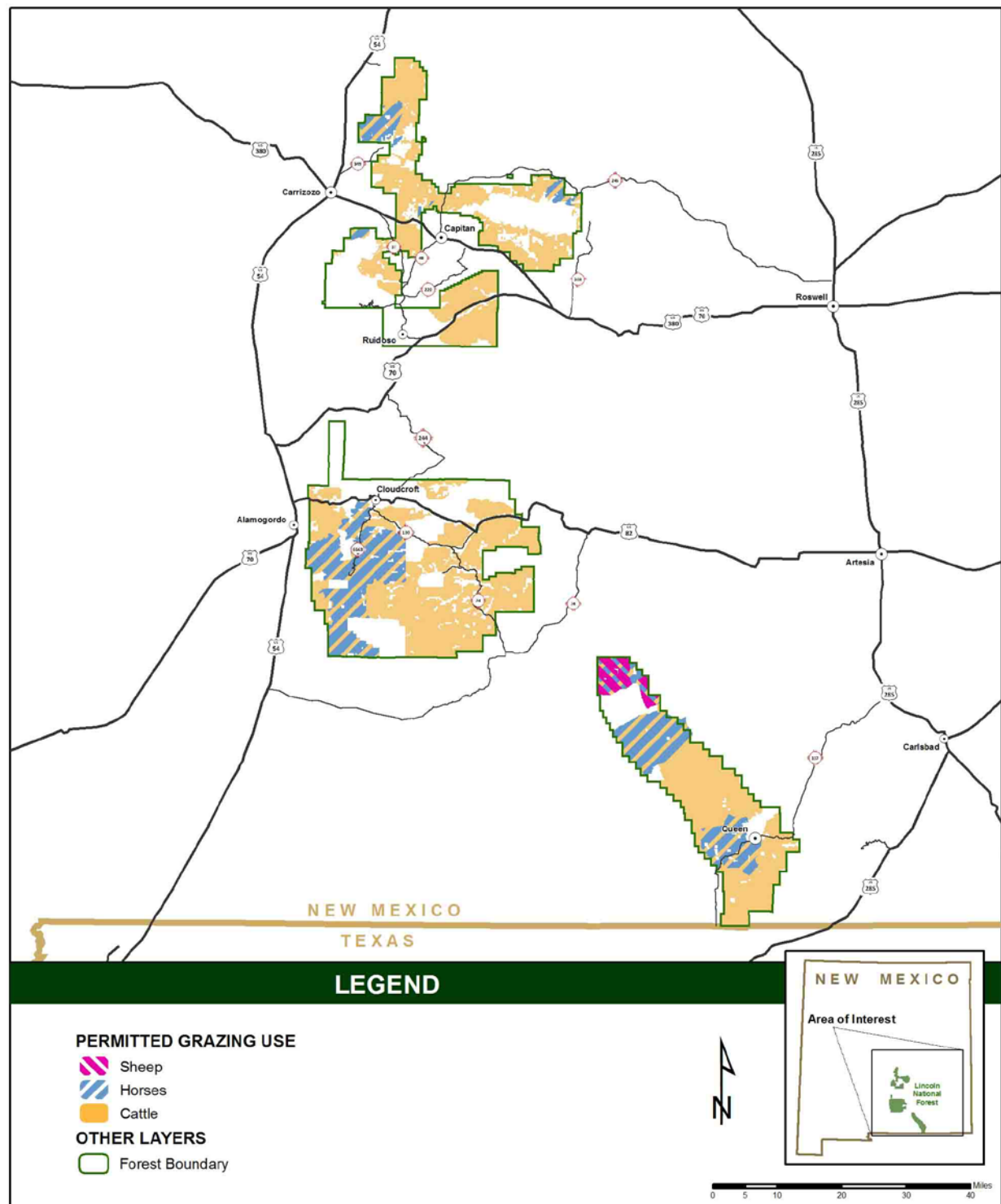


Figure 22. Distribution of Types of Grazing Use

Figure 23 shows trends of authorized use in animal unit months from 2006 to 2015. Short-term and long-term drought conditions impact authorized use levels. In 2006, 2008, and 2011 the Lincoln NF closed for short periods of time due to extremely severe fire danger. Although, permittees were not required to remove their livestock from the forest, conditions were severe enough that many

permittees temporarily reduced their livestock numbers. Differences in elevation and seasonal precipitation vary greatly across Smokey Bear, Sacramento, and the Guadalupe Ranger District. In recent years, large wildfires have occurred on all three districts impacting forage availability and impacts to structural range improvements.

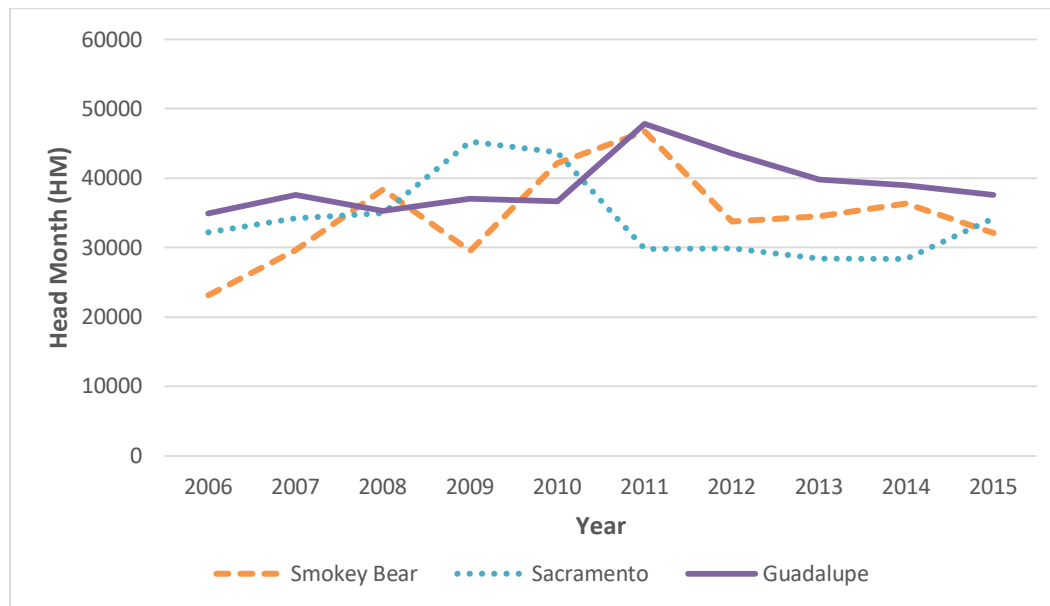


Figure 23. Trends of authorized animal unit months (AUMs) from 2006-2015.

There are currently 91 grazing permittees on the Lincoln NF. This number can vary as permits are waived and transferred. Several of the permittees hold more than one grazing permit and run multiple herds or use one allotment for part of the year and move to another allotment later.

The types of livestock operations permitted on the forest are primarily cow-calf ranches, operations where a permanent herd of mother cows and bulls are kept by a rancher to produce weaned calves for later sale. Some permits have yearling carryover (meaning additional forage is authorized once a calf has reached 6 months old but has not been sold yet) and/or yearling stocker options (when additional forage is available, the rancher may purchase additional young cattle to graze and fatten). Some permits also include small numbers of ranch horses or mules used for the management operations of the allotment. All grazing permits are tied to privately-owned “base property” which the Lincoln NF has defined as a minimum 80 acres of fenced land with livestock handling facilities and available water.

Livestock grazing is permitted on all vegetation types found on the Lincoln NF. About 65 percent of the forest are classified as capable to sustain livestock grazing activities, with the remaining 35 percent being classified as incapable for grazing activities due to steep slopes exceeding 40 percent or because the herbaceous vegetation produced is insufficient to sustain livestock grazing. For areas with grazing concerns, rangeland managers and grazing permittees work cooperatively to resolve management issues. This usually involves a combination of structural and non-structural range improvements and adjustment in grazing season and pasture rotations. These determinations are made through the allotment management planning process.

Other factors affecting current grazing management and resource condition include increasing concerns with spread of invasive plant species, feral hog impacts, encroachment of woody vegetation, and drought. These factors all lead to reduced forage availability either in the short or long term.

Vegetative Management of Rangeland

Vegetative management of rangeland to improve soil condition and forage production has varied throughout its history. In the early 1990s, the Lincoln NF hired a range manager to specifically test treatment types within what was called the Carrizo Pilot Project. This location, west of Carrizo Peak, saw a number of different types of efforts to reduce pinyon juniper densities and increase grass production, to good success. Along with this project was the partnering and working with the local ranchers in the area. Within two years, springs that had been dry for years flowed again and water tables began to rise.

Range vegetative treatments generally came about from other projects such as fuel reduction thinning and prescribed burns for wild fire hazard reduction treatments. For example; the Lincoln NF monitoring report from 2015 shows a total of 4,409 acres of thinning treatments and 6,478 acres of prescribed burns. In 2014 there were 2,499 acres of thinning treatments and 2,849 acres of prescribed burns.

Socioeconomic Contributions of Livestock Grazing on the Lincoln NF Area of Influence

The Lincoln NF grazing program contributes approximately 371 jobs and \$6.9 million to labor income. These jobs and income are not only from direct grazing activities such as ranching, but also include indirect effects. For instance, when a rancher purchase machinery, veterinary services, fuel or groceries, these economic contributions are also included in the labor income figure.

Grazing and Forest Service expenditures are the two program areas that contribute the most to employment in the regional economy, which includes the four-county area of influence and El Paso County, Texas. Although livestock grazing supports the most jobs, the labor income of livestock grazing is less than some of the other program areas, which may indicate that jobs directly associated with livestock grazing are more likely to be part-time or provide lower wages than jobs related to other economic activities on the Lincoln National Forest. Refer to [the Social, Cultural, and Economic Conditions Chapter](#) for more details about economics within the Lincoln NF area of influence.

Table 32. Cattle number, number of farms and ranches producing cattle, total number of farms and ranches in New Mexico, and cash receipts from cattle production for New Mexico and counties within the Lincoln NF area of influence (NMDA 2013 and USDA 2014). Note: values shown in () are percent of the four counties relative to the state value.

	Cattle Number	Farms & Ranches with Cattle	Total Number of Farms & Ranches	Cash Receipts from cattle/calves
New Mexico	1,354,240	12,796	24,721	\$1,425,375
Chaves County	167,048	259	595	\$170,194
Eddy County	52,623	315	551	\$46,803
Lincoln County	27,829	259	362	\$30,316
Otero County	17,357	266	486	\$15,956
Total	264,857 (19.5%)	1,099 (8.5%)	1,994 (8.0%)	\$263,269 (18.4%)

The vast majority of ranching operations in New Mexico are family businesses, and also the socioeconomic baseline for many rural communities in the state (Table 32). There are approximately 6,800 beef and sheep producers in New Mexico. Among the beef producers, approximately 67 percent own less than 50 head of cows. Small-scale cattle ranchers stress the quality of life that ranching

provides them and their families. Owning livestock is important as a way of reaffirming ties to their ancestral lands and heritage. Preserving this working relationship with the land so it can be passed to their children along with a feeling of self-sufficiency is a cornerstone of their values. Generally speaking, the more rural and remote the community, the more important ranching becomes (Eastman and Gray 1987).

Historically ranching has been a part of the traditional social and economic structure of the counties surrounding the Forest. The area in and around the Lincoln NF became a popular settlement area in the late 1800s, because it was a good place for raising stock and had large tracts of land available. Tularosa was established in the 1860s as a ranching community on the west side of the Sacramento Mountains while communities such as Mayhill and Weed on the eastern slopes of the Sacramento's were established in the mid-1880s. Today, many members of rural communities have historical ties to ranching, and many families continue to carry on the profession both for livelihood and to retain cultural/traditional values. Therefore maintaining and protecting the traditions of ranching and the associated economic contributions to families and communities is important to all of the counties located within the Lincoln NF area of influence.

Summary

Livestock grazing has important economic and cultural value to communities surrounding the Lincoln NF. Many livestock operations rely heavily on the use of public lands to remain viable. Resource conditions are directly affected by stocking levels and range management practices.

Timber and Forest Products

Timber provides many ecosystem services on which humans and other life forms depend. At the most basic level, timber tree species convert sunlight and carbon dioxide into oxygen and carbohydrates. Timber tree species are also partially responsible for the formation of soils and soil stability, thermoregulation through shading and evaporative cooling, the cycling of nutrients and carbon, hydrologic cycling, and energy flow. Timbered areas provide wildlife habitat, food, and browse for a variety of animal species and humans, and fiber in the form of lumber, paper, fuelwood, and biomass. Especially important to humans are the social and cultural ecosystem services that timber provides to society: Christmas trees, botanical remedies, and aesthetics.

The ability to gather firewood for heating and cooking is important for many of the families and communities around the assessment area. Firewood gathering is often a family social event, but more importantly, firewood from the Lincoln is how many people heat their homes at a large economic savings over propane, natural gas, and electricity. Other wood products that come off the Lincoln NF, such as Christmas trees, transplants, nuts, and plant materials, are also important cultural and social products gathered from the forest. This section discusses the current condition and trends of timber and special forest products on the Lincoln NF by identifying and evaluating:

- Current condition of suitable timber areas within the plan area;
- Current timber and special forest product production in the plan area and broader landscape;
- Contribution of timber management to ecological sustainability;
- Trends influencing supply and demand of timber and special forest products coming from the plan area; and
- Contributions the plan area makes to economic and social sustainability.

Background and History

Since the late 1980s, New Mexico's timber harvest has declined dramatically, caused largely by decreases in harvest off of National Forests. New Mexico's National Forest timber harvest has followed a pattern similar to that of many western states. The decline of harvest levels on National Forests in the early 1990s was due to a combination of pressures related to threatened and endangered species, appeals and litigation directed at federal timber sales, market demand and federal budget levels. In New Mexico, the listing of the Mexican Spotted Owl had a profound impact on national forest harvest levels. Consequently, total harvest for industrial products in New Mexico dropped from about 200 million board feet from all ownerships in the late 1980s to a low of 61 million board feet in the mid-1990s (Keegan, et al., 2001). This caused New Mexico's timber processing capacity, output, and value of products to be reduced substantially. However, there has been some diversification to the local industry because of these changes. Since 1990, approximately 72,000 acres or 7 percent of the Lincoln NF has been treated through pre-commercial thinning (FACTS).

Figure 24 represents cut and sold volumes from 1986 to present. There are differences between what is sold and harvested for any given time period. This occurs primarily because the timber sold may not be harvested for one or more years following the award of the timber sale contract. In addition, adjustments to the sales are sometimes made during timber harvest, and these adjustments would be included in the volumes and values reported as harvested, but not for those sold. Thus, the volumes and values of the timber sold may be more or less than the volumes and values of the timber at the time it is harvested. It is also important to realize that the volumes and values reported as sold are not necessarily coming from the same sales as the volumes and values harvested. It may be that the volumes and values currently being harvested were reported as sold one or more years ago.

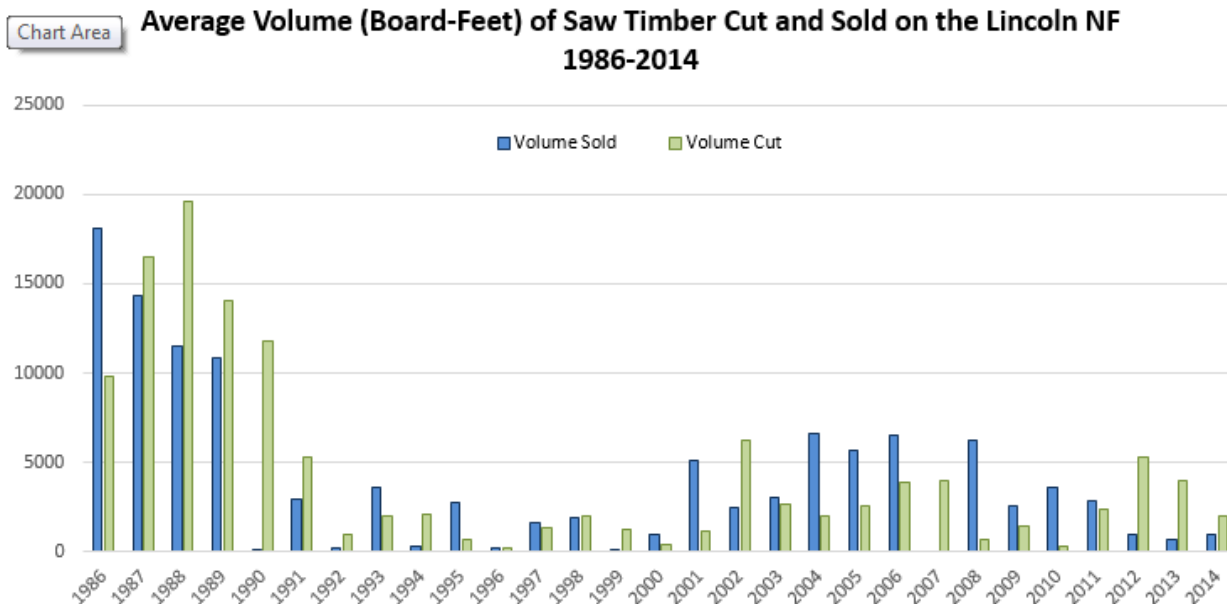


Figure 24. Average total volume of saw timber cut and sold on the Lincoln NF, 1986-2014

There are also differences between where we log and why we log. These differences began approximately in 2000 due much in part to increased wild fire activity. From that point out, timber volume harvested was a byproduct, not the main goal. Activity focused on thinnings and reduction of fire hazard rather than pure volume. The main goal was to reduce fire hazard nearby population centers such

as Ruidoso and Cloudcroft NM and to create a more resilient vegetative ecosystem through healthy forest initiatives.

Contributions to Social, Cultural, and Economic Sustainability

To understand the potential impact of proposed land management practices, it is important to grasp the relative size of the timber industry and its components, how these have changed over time, and how local trends compare to trends in other geographies. Some important issues to consider are whether a proposed management action would stimulate growth or decline in the industry, whether some geographies would be affected more than others, and given the relative size of the industry if changes to it will affect the broader economy.

Table 33 displays the economic effects of logging with the Lincoln NF which generated an average annual revenue from logging between 1970 and 1989 of approximately \$11,000,000 per year with a high year of almost \$24,000,000 in 1972. Analyzing this average of \$11,000,000 the total direct, indirect and induced impacts to regional economy from the logging industry were calculated to be upwards of \$17,000,000 per year until 1990. (Seawolf, Ashcroft Jr., & Fowler, 2007) Between 1990 and 1999 logging revenues decreased 86 percent to approximately \$1,500,000 per year. The impact on the four counties over those years was an estimated economic loss of \$14.7 million. These losses are directly related to the listing of the Mexican Spotted Owl as an endangered species, beyond that economic fluctuations are a result of budget fluctuations within the Forest Service. There is currently an economic study being done by the University of Montana on the economic benefit of logging on the Lincoln NF, the final document is expected to be published in 2017.

Table 33. Economic effect of logging on the Lincoln NF

	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Logging 1970-1989	\$11,000,000	\$3,649,186	\$2,409,651	\$17,058,836
Logging 1990-1999	\$1,500,000	\$497,616	\$328,589	\$2,326,205
Difference	\$9,500,000	\$3,151,570	\$2,081,062	\$14,732,631

On a broader scale, sales from New Mexico's primary wood products industry in 2012 totaled slightly over \$37 million (Table 34), including finished products and mill residue. Other products and mill residues accounted for 61 percent (\$22.7 million) of total sales. Lumber, timbers and other sawn products accounted for 29 percent of sales (\$10.7 million) and vigas and latillas accounted for 10 percent (\$3.7 million). Other products can include chips, particle board, shavings, and paper. According to the North American Industry Classification System there are about 2,300 workers directly employed in the primary and secondary forest products industry in New Mexico during 2012 (Bureau, 2016).

Table 34. Finished product sales of New Mexico's primary wood products

Products	1986	1997	2002	2007	2012
Lumber and Sawn Products	\$125,422,000	\$57,996,000	\$42,514,000	\$13,774,000	\$10,708,000
Vigas and Latillas	\$4,862,000	\$13,707,000	\$5,704,000	\$3,438,000	\$3,712,000
Other Products*	\$6,077,000	\$6,271,000	\$9,612,000	\$11,029,000	\$22,670,000
Total	\$136,361,000	\$77,975,000	\$57,830,000	\$28,241,000	\$37,090,000

Since 1908, 25 percent of Forest Service revenues from timber sales, mineral leases, recreation, grazing and other sources have been shared with states and counties in which national forest lands are located through the Secure Rural Schools and Community Self-Determination Act (USDA, 2012). This revenue sharing primarily helps fund schools and roads but in recent years has helped support Firewise Community programs, reimburse counties for emergency services on national forests and helped fund the development of community wildfire protection plans. In the late 1980s, due largely to declines in timber sale receipts, payments to qualifying states began to drop significantly and fluctuate. Over the years since then Congress has responded by initiating amendments to the act that allow for more enhanced and stabilized payment to states. Table 35 shows the payments made to the four counties from revenues generated on the Lincoln NF in 2015.

Table 35. Payment receipts for 2015 from the Lincoln NF's revenue (Headwaters Economics)

County	Acres	Total Payment	Average Payment Per Acre
Lincoln	361,529	\$267,977.60	\$0.74
Otero	560,228	\$532,835.80	\$0.95
Eddy	134,032	\$57,328.70	\$0.43
Chaves	40,311	\$37,694.28	\$0.94
Total	1,096,100	\$895,836.46	\$0.82

Christmas Trees

Christmas tree cutting in the Lincoln NF is a popular winter pastime for many. Pinyon pine, juniper, Douglas fir, ponderosa pine, Engelmann spruce, and southwestern white pine are commonly collected. Trees may be cut forest wide, except in wilderness areas. Permits are required, and the public is asked to cut trees as close to the ground as possible and to not take just the tops of trees. The Lincoln NF sold an average of 2541 permits per year to families between 2010 and 2014. Transplants are also collected on the forest, often for landscape decorations. From 2011-2014, over 170 permits were issued for transplant collection. Currently, it appears that the trend is stable for Christmas tree permits.

Plants Gathered for Medicinal and Ceremonial Use

A wide variety of plants on the Lincoln NF are used in traditional medicines and ceremonies by tribal members or other members of the public. Permits are required for both personal and commercial collection of plant material, though type and cost can vary depending on purpose, species, population numbers, or habitat impacts. Species that are collected on the Lincoln include piñon nuts, cacti/ yucca, and other seed and plant materials.

Current Conditions and Trends

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 Lincoln NF has also changed. During the late 1970s and 1980s, the majority removed was saw logs. 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 Lincoln 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; lack of

industry processing facilities; and transportation costs. 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 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.

Current Timber Harvest and Production

The Lincoln NF currently has an annual timber target of 4.25 million board feet per year down from 6 million board feet per year from previous years. This volume is sold and removed through conventional timber sale contracts, stewardship agreements and contracts, service contracts, fuelwood sales both commercial and personal use, and through sales of miscellaneous forest products. Timber targets can only be met when certain criteria described in the current forest plan are met. Factors that affect targets are limitations within the planning area as outlined in the forest plan which includes land suitability, wildlife, botany, and heritage resources. Another factor is decreasing budgets, over the past 5 years there has been an overall decrease in mandatory appropriations within the Forest Service of 20 percent, 9 percent of that falls under the National Forest System trust which funds timber sale programs (Hoover, 2016).

The Lincoln NFs target of 4.25 million board feet per year can be broken down into product classes; convertible and non-convertible. Convertible products are all products that can be converted into the volume measure thousand board feet, while non-convertible products cannot be converted into a volume measurement. Convertible products include saw timber, pulpwood, and fuelwood; non-convertible products include Christmas trees, transplants, boughs, cones, nuts, etc. Saw timber and fuelwood for both personal and commercial use currently make up the majority of volume removed from the Lincoln NF.

Trends Driving Supply and Demand

The supply and demand for timber is driven by regional, national, or global forces. Local drivers are small in scope and scale and generally have inconsequential effects on the overall market for timber and lumber products. Demand for woody material from the Lincoln NF is largely driven by saw timber and fuelwood needs. Fuelwood harvest has recently outpaced saw timber harvest rates. This demand is evident by the proportion of volume sold as fuelwood. The need and desire for firewood by families and communities has remained stable to slightly increasing over the last five years.

Currently, there are five active small production sawmills in Otero County, multiple firewood processors throughout the four counties, and one full production pallet mill in Canutillo, Texas.

Local sawmills and processors currently produce products such as:

- Architectural Beams
- Framing lumber

- Pallet stock and cants
- Railroad Crossties
- Oil well and equipment mats and oil well cribbing
- Utility poles
- House Logs
- Bagged dried shavings
- Firewood

The Forest Service recently acknowledged the critical need to increase the pace of restoration, to address a variety of threats including fire, climate change, and bark beetle infestations (USDA Forest Service 2012b). Across the nation and in the Southwest, there is broad public support for actively managing forests to be more resilient to these threats. In response, the Lincoln NF, after a ten-year period of passive management and a decline in timber sale activities, is generally shifting planning and implementation efforts to primarily encompass forest ecosystem restoration and management of larger landscapes. This broad recognition is piquing local and regional interest in the feasibility of commercial use of traditionally sub-merchantable materials, such as small-diameter, dimensional lumber and wood-based energy production. Potential local markets include Biochar and Pellets.

Biochar

Biochar is produced using a technique called pyrolysis, in which biomass is heated within a chamber in the absence of oxygen to temperatures between 300-800 degrees Celsius. There are three major outputs produced from the pyrolysis process, a solid (biochar), a liquid (oil) and a gas (syngas).

The primary application of biochar is to be used as a soil amendment in agriculture. Along with this pyrolysis of biomass produces two primary byproducts: syngas and oil. Both byproducts can be used as fuel, providing clean, renewable energy. (Baranick, McElwee, & Zazycki, 2011)

Biochar can also be pelletized, in which the primary application is to be used as residential or commercial energy production. This pelletized biochar can be used as either a direct heat source or as an input to produce steam for electricity.

Pellets

Pellet fuels (or pellets) are biofuels made from compressed organic matter or biomass. Pellets can be made from any one of five general categories of biomass: industrial waste and co-products, food waste, agricultural residues, energy crops, and virgin lumber. Wood pellets are the most common type of pellet fuel and are generally made from compacted sawdust and related industrial wastes from the milling of lumber, manufacture of wood products and furniture, and construction. Other industrial waste sources include empty fruit bunches, palm kernel shells, coconut shells, and tree tops and branches discarded during logging operations.

Pellet production can be done on various scales from mass production to small production using mobile pellet mills.

Suitable Timber and Sustainability

Within NFS lands, 21 percent of the Lincoln NF is considered suitable timber lands which include spruce fir, mixed conifer, and ponderosa pine forest types. Current stand conditions are generally overly crowded with trees of young and mid-aged trees, often with moderate to high levels of dwarf mistletoe and root rot, creating conditions more prone to insect outbreaks and greater susceptibility to crown

fires. There is a need on the Lincoln NF to treat timberland areas in a way that will move the existing structure toward a more diverse and resilient forest structure by creating a range of age classes, size classes, habitat complexity (diversity) and disturbance patterns that more closely emulate natural mixed severity disturbance. Shifting tree composition over the landscape in managed areas would help trend the area toward or maintain desired habitat conditions and would make these habitats more resistant and resilient to change agents such as insect, disease, and fire.

Historical logging practices and fire suppression have created a landscape that is more homogenous than what would be expected than what would occur under the frequent fire regime that vast majority of these forest types developed. Age structures are concentrated in the mid-aged trees and trees densities are many times greater than historical conditions, forming nearly continuous vertical and horizontal canopy. Some of this has been due to a shift to greater shade tolerant species. Habitat structure and patch sizes of young forests are simplified and smaller than what would have been created through natural disturbance. Increasing structural diversity within previously harvested areas will begin to restore long-term habitat quality for sensitive and old growth associated species.

Furthermore, there is a shortage of uneven-aged forest structural stages on the Forest. Age classes are dominated by even-aged middle-aged and closed forest states. Forest management has the potential to increase structural diversity by managing or maintaining uneven-aged forest stand conditions in the frequent fire forest types.

Timber Suitability, Condition and Trend

The Lincoln NF encompasses approximately 1.1 million National Forest Service (NFS) acres – 286,802 acres (21 percent) of which is considered suitable for timber within U.S. Forest Service lands (Figure 25). This suitability also takes into consideration the removal of suitable timber types within wilderness areas. Suitable timber is comprised mostly of industrial wood species including wet mixed conifer, dry mixed, aspen, mixed conifer with aspen and pine (predominantly ponderosa pine).

Condition and trends within suitable timber areas is predominantly linked to healthy vegetative types. Two principle threats to the suitable timber lands are stand replacing wild fires and insects and diseases to trees.

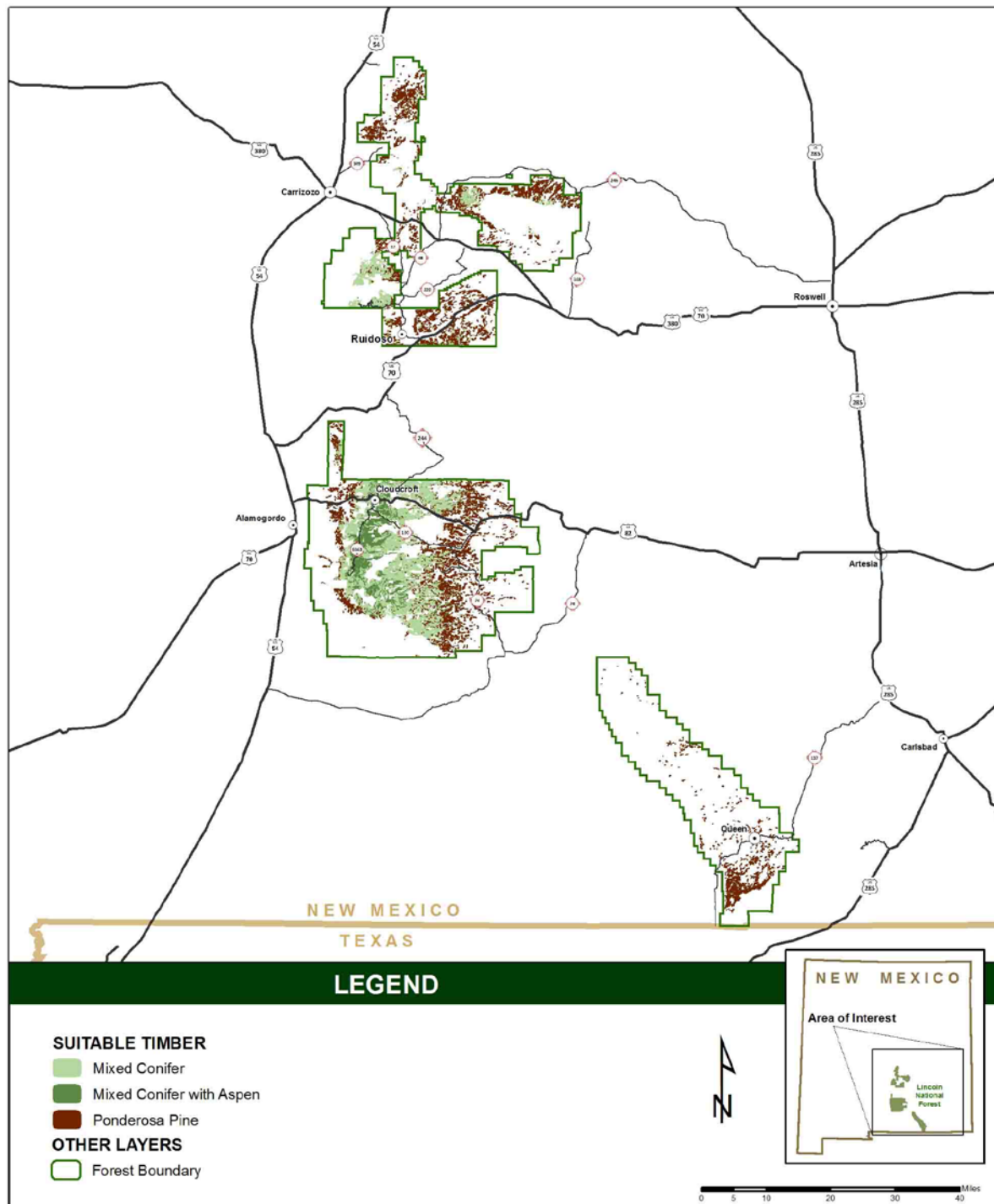


Figure 25. Suitable Timber Types (Wilderness Area Vegetation Removed)

Threat from Wild Fires

Stand replacing wild fires are those stands (mid-scale sized units of like timber types) that burn severely enough to change the vegetative types within the area for long periods of time, usually more than 100 years. The source for the data being presented in this section is from Burned Area Reflectance

Classification (BARC) which is generated through comparing reflectance data in satellite imagery. It basically highlights exposed soil.

Looking at the BARC data from 2000 to present we can see the portions of suitable timber lost to wild fires is a total of 2 percent for all timber types. There are some simple conclusions about the current condition that can be inferred from this analysis:

- Suitable timber lands affected the most are dry mixed conifer and pine, both because they are simply dryer and at lower elevations respectively, and are most departed in terms of tree density and fuel accumulation.
- Wet mixed conifer is slightly impacted with less than 1 percent having burned.
- Overall impact to suitable timber has been slight for stand replacing events

Threat from Insects and Disease

Associated with plan revision was a 2016 study conducted by the SW Regional Office to estimate and predict the probability of basal area loss from 2013-2027 due to insect and disease infestations (Ryerson 2016). There are three main categories which are broken down into 0 to 24 percent, 25 to 40 percent and greater than 40 percent possible basal area loss (Figure 26). When comparing predicted loss with the suitable timber map it can clearly be seen that the areas at greatest risk is the wet and dry mixed conifer, aspen and mixed conifer mixed with aspen. Table 36 shows the acreage at risk for probable basal area loss greater than 40 percent. A total 8 percent of the suitable timber may be impacted by the possible insect and disease within the next 14 years.

It is clear that insect and disease potentially causing the loss of suitable timber is a greater direct threat than wild fire however it must be noted that this can be a cause and effect type of relationship as well. Damaged and stressed timber from the insect and diseases can easily lead to higher fire hazard.

Table 36. Suitable Timber, Fire Mortality (2000-2012) and Insect & Disease (2000 to 2016)

Vegetation Type	NFS Suitable Timber Acres (%)	NFS Acres Affected by Fire Mortality (%)	Acres Affected by Insect and Disease
Dry Mixed Conifer	96,817 (9%)	14,598 (1%)	34,604 (3%)
Wet Mixed Conifer	70,782 (25%)	4,986 (2%)	43,071 (15%)
Ponderosa Pine	101,203 (9%)	10,742 (1%)	5,806 (0.5%)
Total	286,802 (25%)	30,326 (2%)	83,481 (8%)

Note: NFS refers to National Forest Service acres only.

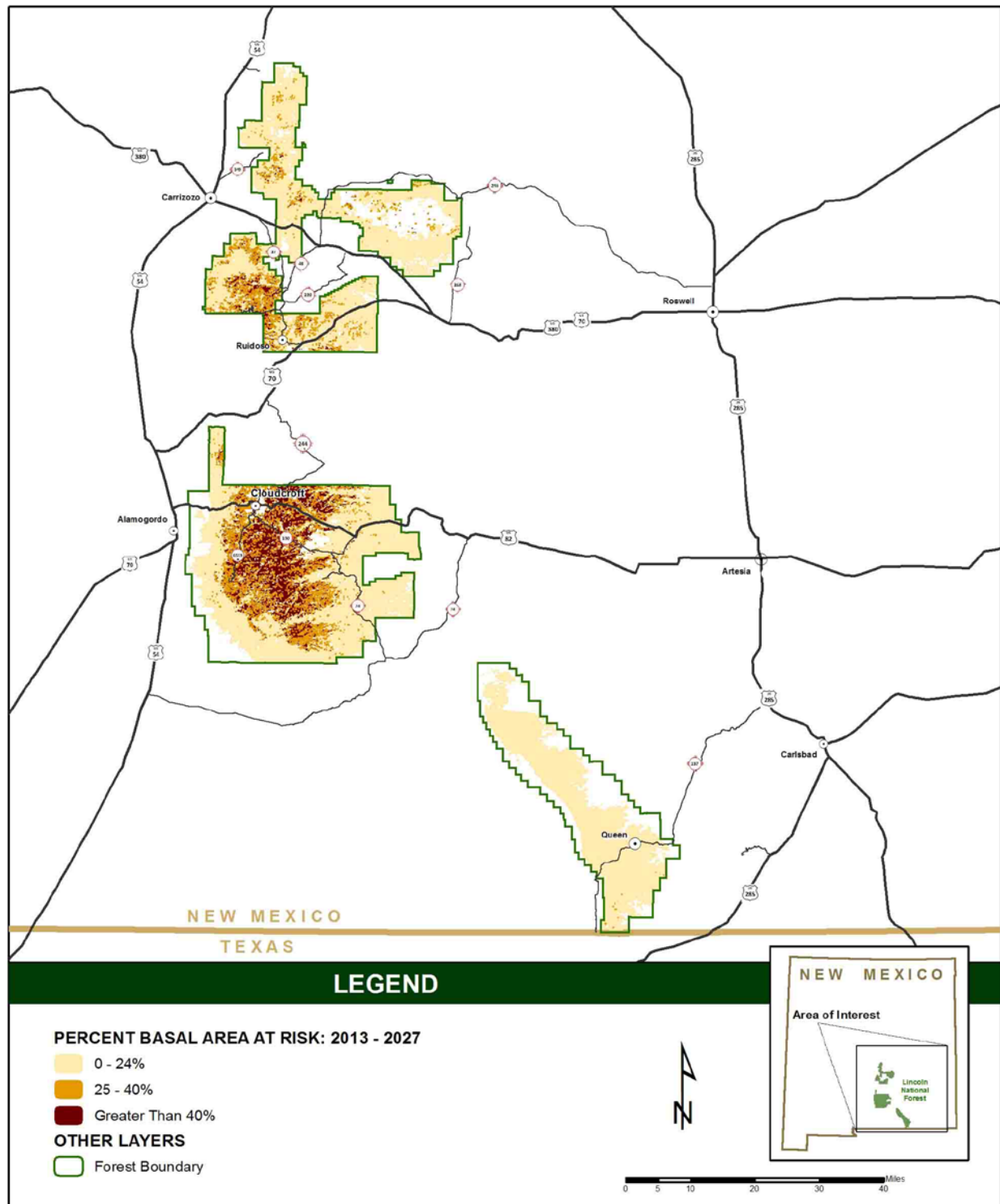


Figure 26. Predicted Basal Area Loss due to Insect and Disease (2013-2027)

Summary

The Lincoln NF's primary contributions of timber and forest products is saw timber, which has been due to emphasis on fuel reduction and timber management and fuelwood for local communities' economic

savings on their heating and cooking needs. The increased emphasis in forest ecosystem restoration projects should allow the continued ability to contribute to both timber and fuelwood demands. An increase in forest restoration projects will be vital to help sustain forest and watershed health, prevent uncharacteristic wildfire, reduce insect and disease outbreaks, and improve or maintain wildlife habitat, and contribute to local economies.

Trends

- Selling timber has become a greater challenge since the closure of the local timber mills due to increased transportation costs.
- New development markets include pellets and biochar
- Change from past to present from product based to urban interface protection and general forest health improvement

Water

The important regulatory and supporting ecosystem services provided by water resources are discussed in detail in Volume I, Chapter 7-Water Resources, while this section provides an overview of the water resources on the Lincoln NF as they relate to social, cultural, and economic sustainability. Topics covered in this section include: water resources and uses on the Lincoln NF, water rights, water supply and demand, current conditions and trends, and socioeconomic contributions of water resources.

Key Concepts and Definitions

Water resources are described in terms of hydrologic units. These hydrologic units are nested within each other and are categorized from the largest geographic area (i.e., region) to the smallest (i.e., sub-watershed). 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, signifying a distinct geographic area (Seaber et al. 1987). The entire United States is divided into twenty-one regions, which are successively divided into sub-regions, basins, sub-basins, watersheds and sub-watersheds. The Lincoln National Forest is located in the Rio Grande region, which encompasses a small portion of south-central Colorado, the vast majority of New Mexico, and a portion of west Texas. Table 37 gives an example of how each Hydrologic unit is numbered, with the Rio Grande Region (2 digits) being the largest unit and the Cox Canyon-Rio Peñasco sub-watershed (12 digits) being the smallest unit. For the purposes of this assessment, the 4th through 6th level HUCs, namely the sub-basin, watershed, and sub-watershed levels, respectively, will be used to describe water resource conditions because they provide the most appropriate scales for analysis.

Table 37. Hydrologic unit codes (HUCs) are nested within each other from largest to smallest geographic area and are represented by a two to twelve digit number

HUC Number (# of Digits)	Level	Hydrologic Unit	Hydrologic Unit Code (HUC), name of Hydrologic Unit
02	1	Region	13 represents the Rio Grande region.
04	2	Sub-region	1306 represents the Upper Pecos sub-region.
06	3	Basin	130600 represents the Upper Pecos basin.
08	4	Sub-basin	13060010 represents the Rio Peñasco sub-basin.
10	5	Watershed	1306001003 represents the Upper Rio Peñasco watershed.

HUC Number (# of Digits)	Level	Hydrologic Unit	Hydrologic Unit Code (HUC), name of Hydrologic Unit
12	6	Sub-watershed	130600100302 represents the Cox Canyon-Rio Peñasco sub-watershed.

The Lincoln NF boundary encompasses approximately 1.1 million acres that lie partially within six sub-basins including the Tularosa Valley, Arroyo Del Macho, Rio Hondo, Rio Peñasco, Upper Pecos-Black, and Salt Basin (Figure 27). These six sub-basins will be referred to as the “Context Area” because this broad scale analysis sets the context for the contributions the Lincoln NF makes to water resources. Although these sub-basins include large areas outside of the Forest boundary, water resources of these outlying areas are greatly influenced by the condition and trends of water resources located within the Lincoln NF boundary, as will be discussed later in this section.

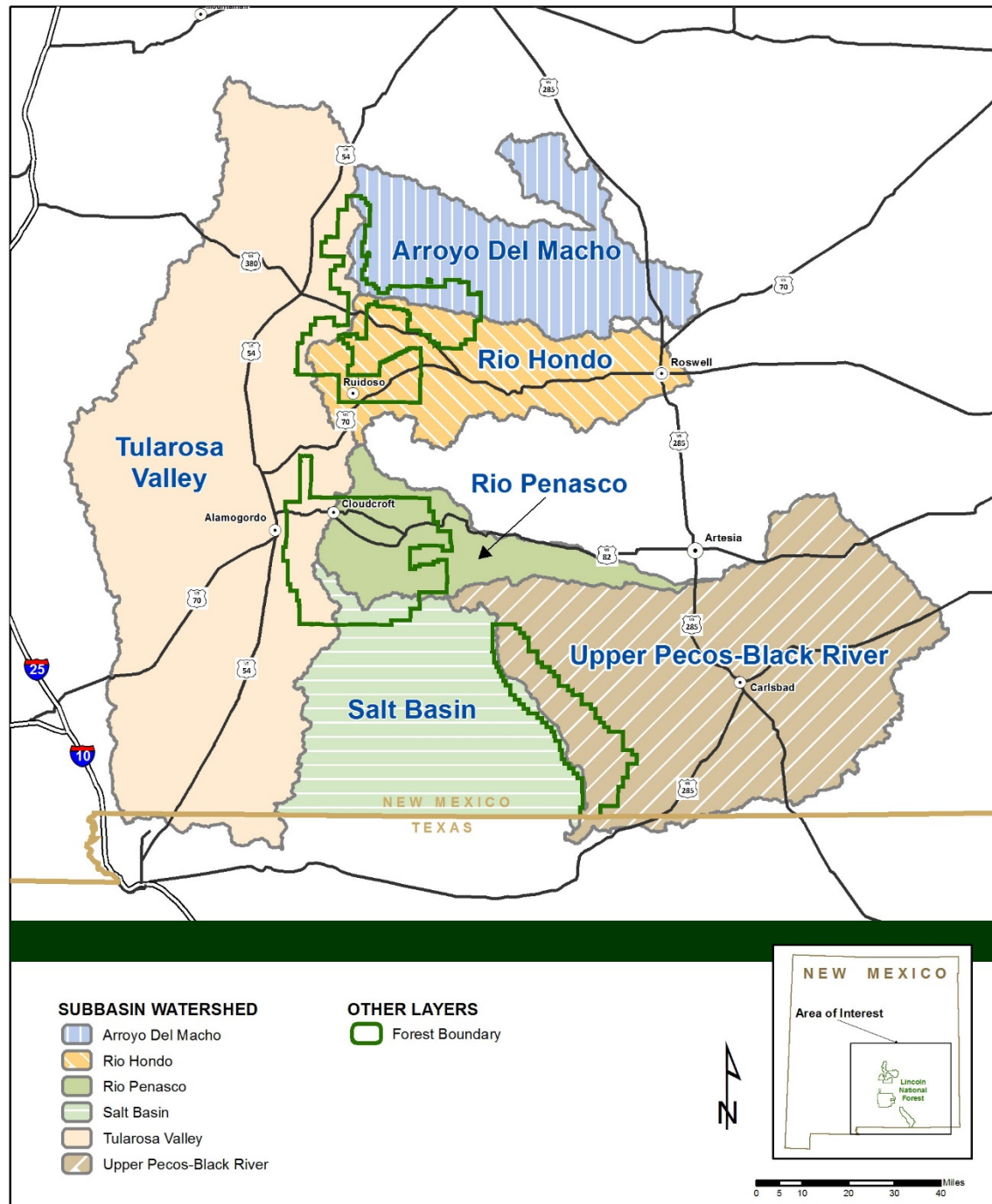


Figure 27. The Lincoln National Forest lies partially within six sub-basins (HUC 4) as shown above.

Water Resources and Uses

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 Lincoln NF must be understood. Water resources on the Lincoln NF include streams, springs, wetlands, riparian corridors, and the underlying groundwater that support these features. Most of these water resources are used for consumptive purposes such as drinking water, livestock watering, and agricultural

irrigation, as well as oil and gas exploration and development; however, these water resources also provide many non-consumptive uses and ecosystem services from which society derives enjoyment or benefit. Water sustains all life by supporting ecosystem services such as primary production for native plants and crops, and contributes to soil formation and nutrient cycling. Water resource features contribute to provisioning and regulating services such as erosion control; flood regulation; water purification; domestic and agricultural uses; the production of forage, livestock, and game animals taken for meat; and other products. Water resources also provide many cultural ecosystem services to society as they provide opportunities for recreation, personal enrichment, education, and research.

The social concern regarding adequacy of water was one of the elements for which the Forest Service was created and while this is still a concern, the vast majority of visitors come to the Lincoln NF to engage in recreational activities. In arid southern New Mexico, water is a primary recreational attractant, bringing friends and families together to enhance social ties and share a respite from urban living. For that reason, Bluff Springs and Sitting Bull Falls are popular recreation destinations on the Forest. Visitors come to these areas to picnic, hike, and bath at the base of the falls. In areas immediately adjacent to the Forest, fishing and boating are popular activities at Mescalero Lake, Alto Lake, and Grindstone Reservoir. Fishing, camping, and hiking occurred at Bonita Lake, along the Rio Bonito, prior to the Little Bear Fire and are expected to resume as soon as campground and lake restoration activities are completed. Hiking, dispersed camping, and recreational day use are popular activities along the Rio Bonito and Rio Peñasco. Both the sights and sounds of clear water, along with the associated riparian vegetation and wildlife, are often cited as valued amenities that draw people to live in communities surrounding the Forest.

Hunting is also a very popular recreational activity on the Lincoln National Forest. Big game species such as elk, deer and wild turkey are the most popular; however, these and other game species are hunted over large portions of the Forest, especially at higher elevations. The distribution of water, whether it be naturally occurring on the landscape or constructed features (i.e. trickle tanks and troughs), is critical for wildlife management and hunting opportunities. Furthermore, hunting activities on the Lincoln NF contribute to the economies of the cities and towns adjacent to the Forest bringing added business to restaurants, motels, and other local establishments.

Water Rights and Adjudication

All natural water flowing in streams and found underground in New Mexico is declared to be public and subject to appropriation for beneficial use. In New Mexico, beneficial use can include: domestic use, livestock and wildlife watering, irrigation, prospecting and mining, and construction of public works, highways, and roads; however, water for instream flows and fish culture is not considered a beneficial use.

In New Mexico, the State Engineer is charged with administration of surface and ground water use within the state. This applies to new appropriations, transfers of location, changes in beneficial use, changes in points of diversion, or enlargements. Spring developments and stock tanks are classified as surface waters which are regulated by stream systems, while wells are categorized as groundwater, which is regulated by declared underground water basins.

There are four basic rules that govern New Mexico's water laws and administration, including:

1. **"First come, first served."** Water in New Mexico is governed by the "doctrine of prior appropriation."

2. **Water must be applied to a beneficial use.** Under New Mexico water law, beneficial use is the basis, measure, and the limit of the right to use water.
3. **Water rights are transferrable.** In New Mexico, water rights may be bought, sold, and moved around within a basin, subject to approval by the State Engineer. Users may change the point of diversion, purpose of use, and place of use.
4. **“Use it or lose it.”** Unlike other property rights, failure to utilize a water right for a period of time may result in a permanent forfeiture of the right to use water in the future.

The State Engineer has declared stream systems and underground water basins throughout the state and administers water rights subject to rules and regulations that are specific to each basin. The core components of water rights administration consist of the place and purpose of use, priority date, point of diversion, allocation, and timing of diversion.

Water Rights on the Lincoln National Forest

According to the New Mexico Office of the State Engineer’s database, over 38,700 water right points of diversion were identified in the four counties encompassing the Lincoln NF. Figure 28 shows most of the water rights based on existing or abandoned wells. Within the Lincoln NF boundary, nearly 3,850 water rights exist, and many others are adjacent to the Lincoln NF boundary. These rights are primarily used for livestock and domestic purposes (i.e., private inholdings, campgrounds and other administrative sites). Of these, approximately 32 percent are held in ownership by the United States of America, and roughly 68 percent are privately-held.

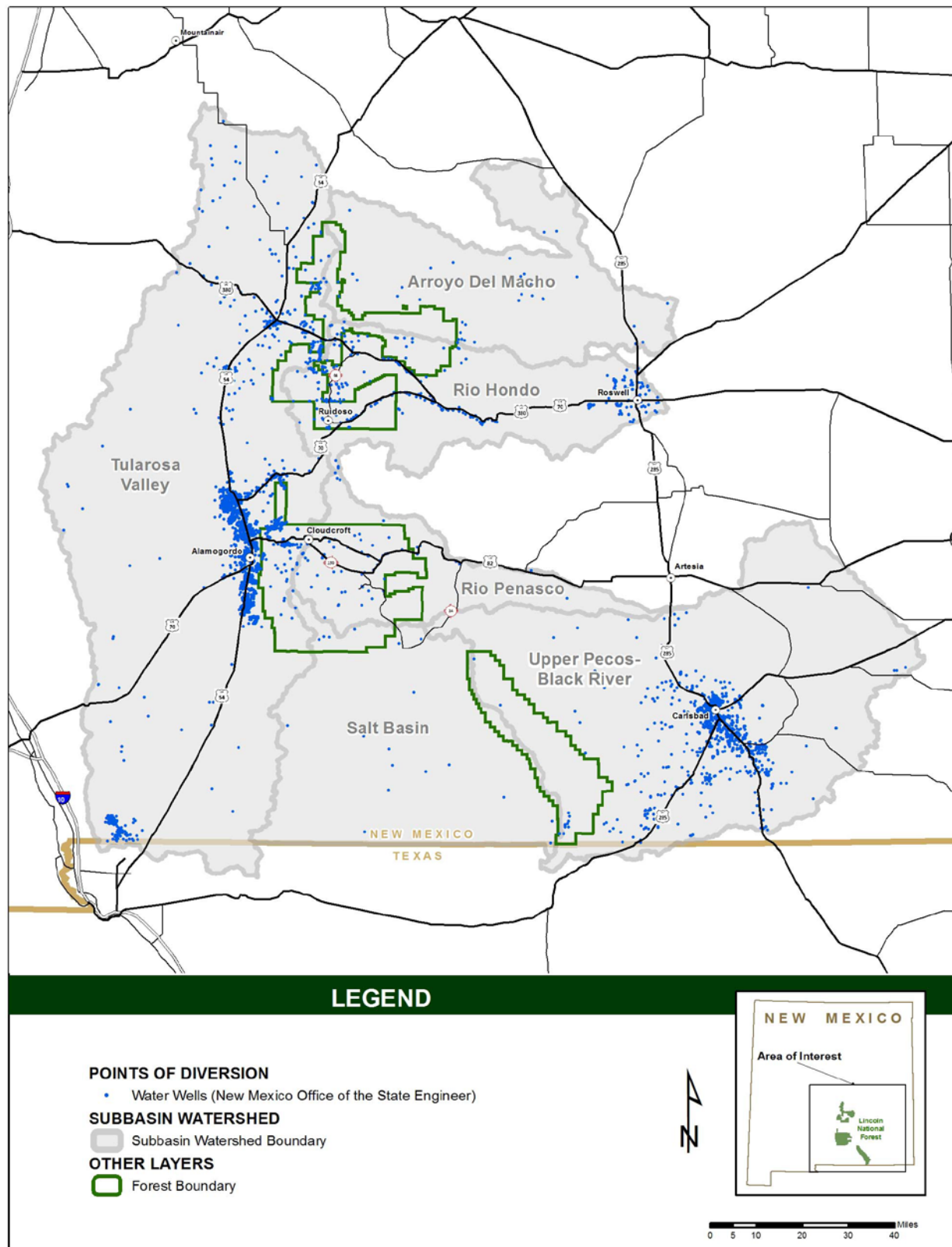


Figure 28. Water wells on and around Lincoln NF

Water Supply and Demand

At the State-level, the six sub-basins that encompass the Lincoln NF have been incorporated into two larger Water Planning Regions, those being the Tularosa-Sacramento-Salt Basins and Lower Pecos Valley Basin. The Lower Pecos Valley Water Planning Region includes the Arroyo Del Macho, Rio Hondo, Rio Peñasco and Upper Pecos-Black River sub-basins and roughly coincides with the Lower Pecos River Basin boundary though the northern and eastern boundaries vary slightly from the river basin boundaries (NMISC 2016a). The Tularosa-Sacramento-Salt Basins Water Planning Region includes the Tularosa Valley and Salt Basin sub-basins. These Water Planning Regions are just two of the sixteen designated throughout the State of New Mexico. A Water Plan has been developed for each of these regions for the explicit purpose of protecting New Mexico's water resources and ensuring that each region is prepared to meet future water demands.

The Lower Pecos Valley Water Planning Region

In the Lower Pecos Valley Water Planning Region, potential water demands have always exceeded the supply, as a result, the region relies on water supplies from both groundwater and surface water sources. Surface water supplies approximately 30 percent of the water currently diverted in the Lower Pecos Valley Region, while groundwater accounts for approximately 70 percent of all water diversions (Longworth et. al 2013). The Lower Pecos Valley region has six administratively declared underground water basins, including: Fort Sumner, Roswell, Hondo, Peñasco, Capitan, and Carlsbad. The primary water use in this region is irrigated agriculture (Figure 29), and the principal constraint to use of water is the 1948 Pecos River Compact.

The 1948 Pecos River Compact is a settlement agreement in which a water conservation plan was designed to augment the surface flows of the lower Pecos River in order to (1) secure the delivery of water within the Carlsbad Irrigation District (CID), (2) meet the State's obligations to Texas under the 1948 Pecos River Compact (Compact) and the 1988 United States Supreme Court Decree, and (3) limit the circumstances under which the United States and CID would be entitled to make a call for the administration of water right priorities (NMISC 2016a).

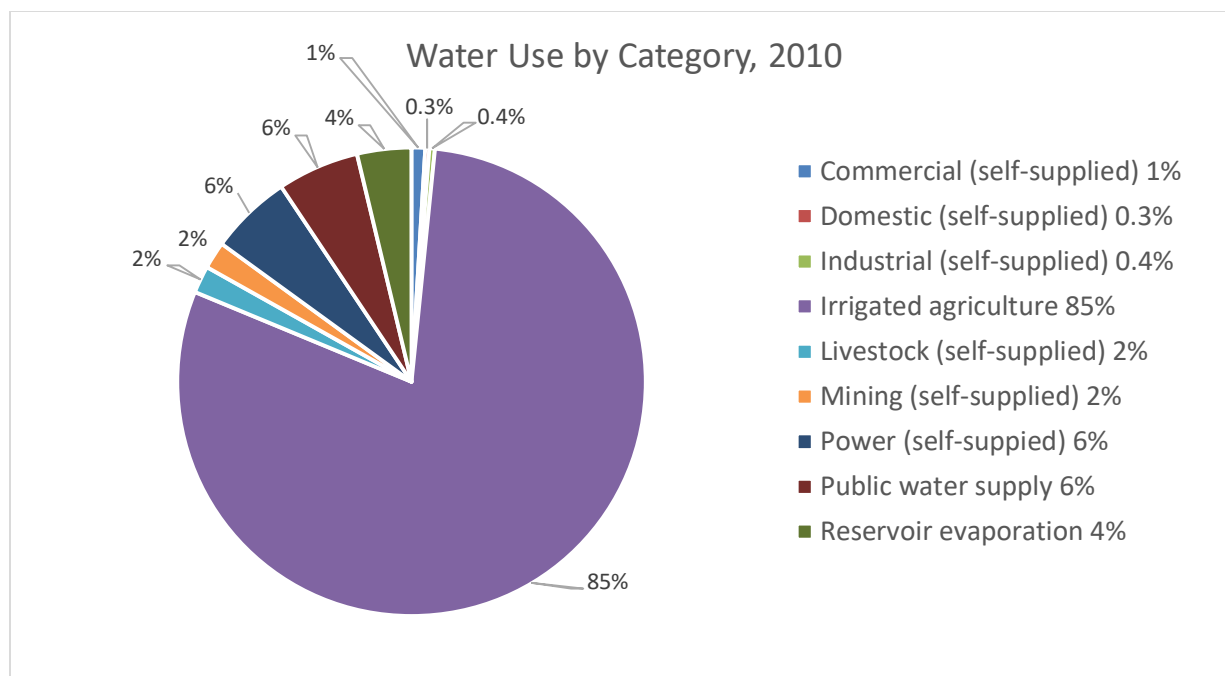


Figure 29. Total 2010 water use (597,279 acre-feet) by category in the Lower Pecos Valley Water Planning Region (NMISC 2016a). Note: Tribes and Pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

The Pecos River streamflow is composed of snowmelt from the headwaters in the Sangre de Cristo Mountains, baseflow gain largely originating from the Sacramento Mountains, and flood runoff (NMISC 2016a). Surface water is diverted directly from the Pecos River and its major tributaries, such as the Rio Bonito, Rio Ruidoso, Rio Peñasco, Rio Hondo, and the Black River; however, the Pecos streamflow is extremely variable from year to year and over long periods of time (NMISC 2016a). Eddy, Lincoln, and the small portion of Otero County that falls within the Lower Pecos Valley Region, rely heavily on surface water (Table 38). Because of this reliance on surface water, these areas have a high degree of vulnerability to prolonged drought and other natural disasters. For example, the Village of Ruidoso, a destination tourist town and the largest mountain community in the northern part of the Lincoln NF, was extensively impacted by the Little Bear Fire in 2012. The Village of Ruidoso relied heavily on surface water supplies from Alto and Grindstone reservoirs on Eagle Creek and the Rio Ruidoso, respectively, until the Little Bear Fire and subsequent floods and debris flows damaged the watershed. Contamination from ash and increased erosion has reduced the ability to effectively treat surface water. As a result, the Village of Ruidoso has had to increase groundwater pumping and implement Stage 5 water restrictions in order to satisfy the water demand (NMISC 2016a).

Table 38. Total regional water demand expressed in percent of use by county for 2010 in the Lower Pecos Valley Water Planning Region (Lower Pecos Valley Water Plan 2016).

County	Surface Water	Ground Water	Total
De Baca	30%	3%	11%
Eddy	51%	33%	39%
Otero*	1%	0.1%	0.4%
Chaves	9%	61%	45%
Lincoln	9%	2%	4%

County	Surface Water	Ground Water	Total
Total Usage	181,157 acre-feet	416,123 acre-feet	597,279 acre-feet

**Note: Only 5 percent of Otero County's population resides within the Lower Pecos Valley region.*

In order to effectively plan for meeting the future water resource needs, it is important to understand current use trends as well as future changes that may be anticipated. Water demand projections were developed utilizing data from New Mexico's water use by categories. To capture uncertainty of these projections, low and high water demand estimates were developed for each category in which growth is anticipated, based on demographic and economic trends (NMISC 2013, NMISC 2016a).

Over the next 40 years, demand in the *public water supply* category – community water systems that rely on surface and ground water diversions other than wells and that consist of common collection, treatment, storage, and distribution facilities operated for the delivery of water to multiple service connections – is projected to increase in Lincoln, Chaves, Otero, and Eddy counties under the high demand scenario, proportional to the increasing population projections. In addition, the projected water demand in the *domestic* category – self-supplied residences that may be single family or multi-family dwellings with well permits issued by the New Mexico Office of the State Engineer – is assumed to be proportional to population growth rates, which are expected to increase in Lincoln, Chaves, Otero, and Eddy counties (NMISC 2016a).

The agriculture sector within all five counties of the Lower Pecos Valley region (De Baca, Eddy, Lincoln, Otero, and Chaves) may decline in the future due to the aging population of farmers. Furthermore, although groundwater is the primary water source for irrigated agriculture, surface water, which is highly susceptible to drought, supplies 30 percent of irrigated agriculture in the Lower Pecos Valley region. Therefore, the recent drought, along with the recession, is thought to be contributing to the decline. However, even though the agriculture sector may decline, the projected high demand scenario for *agricultural* water use in all five counties assumes that overall water use will remain consistent. This is owing to the fact that a reduction in demand does not mean that additional water would be available for appropriation because water that has been applied to beneficial use represents a valid water right that may be licensed or adjudicated. As a result, transfers between water use sectors may occur through sales and leases. The low demand scenario projects some decrease in *agricultural* water use in four of the five counties, including De Baca, Eddy, Chaves, and Lincoln counties. Otero County relies solely on groundwater for irrigated agriculture, therefore water use was assumed to be stable throughout the forecast period (NMISC 2016a).

Livestock water use is projected to decline in all five counties of the Lower Pecos Valley region. In 2020, water usage for livestock is projected to be 50-60 percent of the 2010 level for De Baca County, 55-60 percent for Lincoln County, 60-65 percent for Otero County, 60-70 percent for Eddy County, and 75-85 percent for Chaves County. By 2060, these projections are expected to increase to 80-90 percent of the 2010 level for De Baca County, 80-85 percent for Lincoln County, 85-90 percent for Otero County, 75-85 percent for Eddy County, and 85-95 percent for Chaves County. The estimates were highest for Chaves County because in this county livestock primarily consists of milk cows, and the dairy industry is expected to remain the backbone of agriculture in that county (NMISC 2016a).

The *commercial* category now includes oil exploration using the water-intensive hydraulic fracturing technique and since 2010, water demand for this type of drilling has grown substantially in Eddy County. The projections for this category include a high and low scenario to accommodate the volatile nature of the oil drilling industry; however by 2030, drilling will level off, as most wells are expected to be drilled

by 2025, even if the price of oil dips. The projected water demand will decline through the remainder of the forecast period (NMISC 2016a).

Mining activity, including some oil and gas drilling, takes place throughout the region. Historically, mining of gold and silver occurred in Lincoln County. De Baca, Chaves, Lincoln, and Otero counties have a small amount of mining (sand and gravel) that is projected to remain steady throughout the forecast period. The bulk of the mining in the region, however, takes place in Eddy County, which is home to two large potash-mining companies. These companies are big water users; however, one of the companies, Mosaic, is closing down one of its mines. Therefore, a decline in mining water use over the forecast period is projected due to the closure of that mine and the fact that some oil drilling water use (i.e., for hydraulic fracturing) is being transferred to the commercial category (NMISC 2016a).

No water is used for *power* generation in the Lower Pecos Valley region and none is expected in the future, and only Chaves and Eddy counties have much *industrial* activity. In Chaves County industrial water use is projected to increase modestly, as Roswell is attracting businesses to the area, a trend that will continue (NMISC 2016a).

The Lower Pecos Valley region projections include significant water use in the *reservoir evaporation* category due to the presence of Lake Sumner Reservoir (De Baca County), Brantley Lake (Eddy County), and Lake Avalon (Eddy County). Though these reservoirs are almost entirely for the benefit of the Carlsbad Irrigation District (a required obligation under the 1948 Pecos River Compact), the use is recorded in the counties in which the reservoirs are located. The projected demand is based on 2010 reservoir surface areas so that it can be compared accurately to the 2010 administrative water supply. Increases in reservoir evaporation could impact the water supply available to the whole region.

Figure 30 provides an overall perspective of the balance of water supply and demand in the Lower Pecos Valley Region. This figure illustrates the total projected water demand under the high and low scenarios and also depicts the administrative water supply, which is nearly 600,000 acre-feet; and the severe drought-adjusted water supply, which is 443,296 acre-feet or about 74 percent of a normal-year administrative water supply (NMISC 2016a).

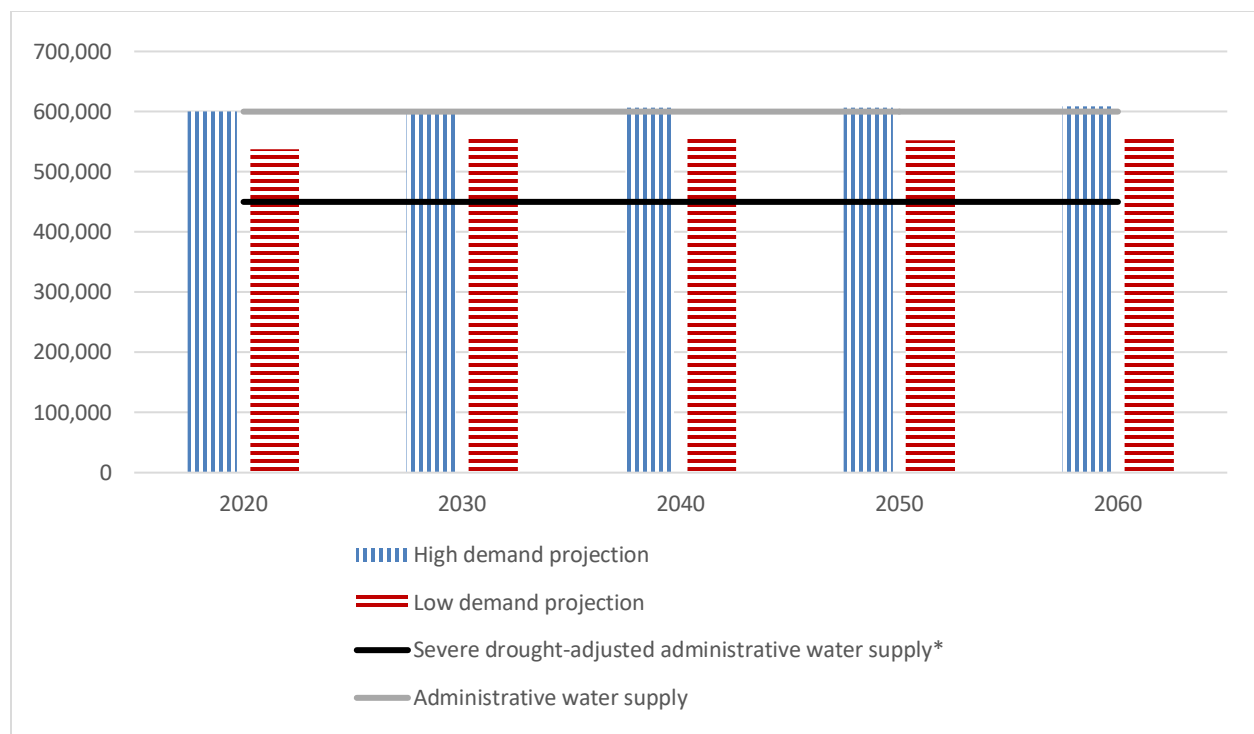


Figure 30. Illustration of the total projected regional water demand for the Lower Pecos Valley region, under high and low demand scenarios, with normal administrative water supply and the drought-adjusted water supply estimates (NMISC 2016a).

The Tularosa-Sacramento-Salt Basins Water Planning Region

The Tularosa-Sacramento-Salt Basins region includes portions of Lincoln, Otero, Chaves, and Eddy counties, and provides water to the communities of Tularosa, Alamogordo, Carrizozo, Timberon, Holloman Air Force Base (AFB), and La Luz. The Village of Cloudcroft while located in the Tularosa-Sacramento-Salt Basins region, straddles the divide between the Tularosa Basin and the Peñasco Basin, but obtains its water from springs in the Peñasco Basin, which is part of the Lower Pecos Valley region (NMISC 2016b).

A third of the water supply for the Tularosa-Sacramento-Salt Basins region is derived from surface water tributaries that flow from the Sacramento Mountains into the Tularosa Basin. Its primary uses are for public water supply and irrigated agriculture; however, small amounts of surface water are also used for commercial and livestock purposes (Figure 31). These tributaries, including: Three Rivers Creek, Tularosa Creek, La Luz-Fresnal Creek, and Alamo Stream, flow from the western flanks of the Sacramento Mountains into the Tularosa basin, carrying fill sediments (NMISC 2016b). As the water transports the fills sediments to the basin, the sediments precipitate and are ultimately deposited in playas. Likewise, the Sacramento River captures runoff from the southern end of the Sacramento Mountains and discharges sediment into the Salt Basin (NMISC 2016b).

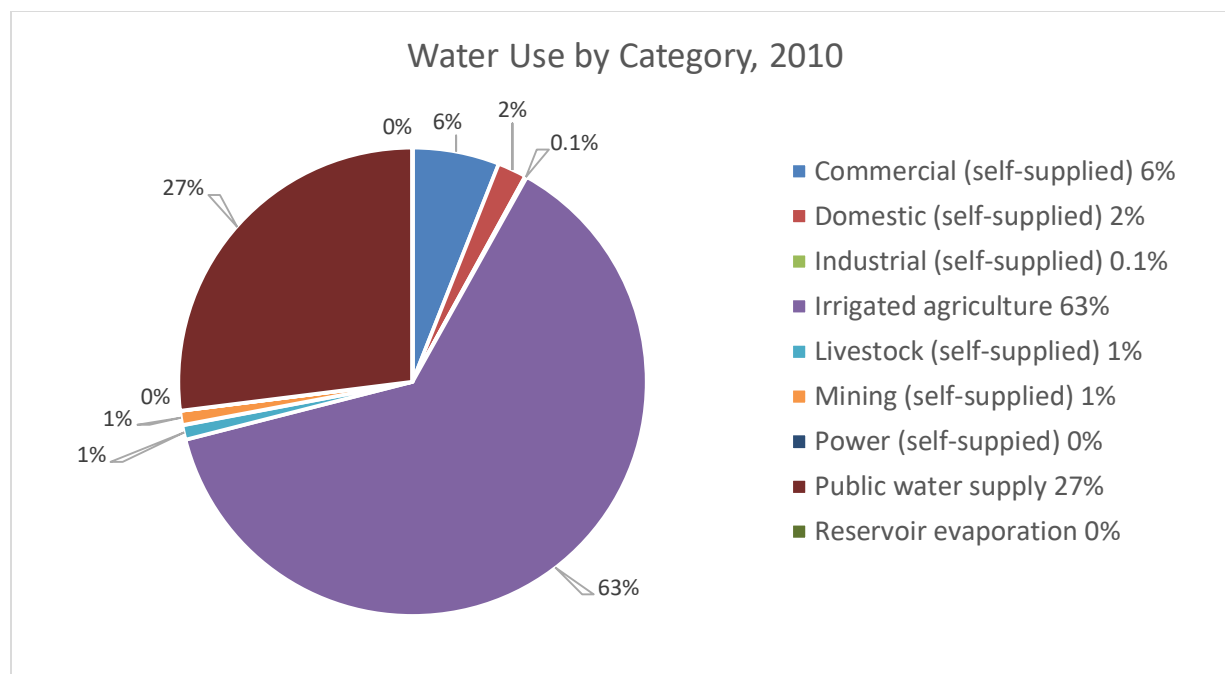


Figure 31. Total water use (32,814 acre-feet) by category in the Tularosa-Sacramento-Salt Basins Water Planning Region in 2010 (NMISC 2016b). Note: Tribes and Pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

Ground water is the primary source of water for the Tularosa-Sacramento-Salt Basins region, which accounts for about 70 percent of all water diversions. This region includes two declared underground water basins (UWBs), the Tularosa and the Salt, and very minor portions of the Roswell and Hueco UWBs. Groundwater in the region is sourced from the basin-fill aquifer and the bedrock aquifer (NMISC 2016b). The Tularosa and Salt UWBs are non-stream-connected aquifers, so the water entering the basin collects in playas and evaporates, resulting in increasing salinity near the center of the basins. Although little groundwater development of the Salt Basin has occurred in New Mexico, pressure to develop this resource is growing. The Salt Basin is being considered by some entities as a water source to augment supplies in southwest Texas. In addition, the water resources of the Salt Basin are needed to meet future demand for the benefit of the State of New Mexico (NMISC 2016b). However, water levels are declining in some areas of the Tularosa Underground Water Basin (UWB), and if no measures are taken to limit those declines, saline water encroachment may degrade the remaining fresh groundwater (NMISC 2016b). For example, modeling studies predict that the aquifer in the vicinity of Alamogordo and Tularosa will experience an average annual water level decline of more than 2 feet per year over a 10-year period due to the full exercise of existing permits and declarations (Embid and Finch, 2011). The aquifers in the Tularosa-Sacramento-Salt Basins region generally are not recharged through direct rainfall because evaporation far exceeds precipitation in the valleys. However, precipitation in the mountain, particularly the Sacramento Mountains, result in significant mountain-front recharge as well as surface water runoff in stream channels (NMISC 2016b).

For the Lower Pecos Valley region, the 2010 administrative water supply data was used to estimate water demand projects for approximately the next 40 years. Similarly, the 2010 administrative water supply totals for surface water (10,005 acres-feet) and groundwater (22,810 acre-feet) withdrawals were used to estimate water demand projects for the next 40 years within the Tularosa-Sacramento-Salt Basins region (Longworth et al. 2013). However, unlike the Lower Pecos Valley region, the Tularosa-Sacramento-Salt Basins region is a non-stream connected groundwater basin, where the aquifers are

being depleted. As such, the administrative water supply may not be sustainable in the future; therefore the 2060 administrative supply is estimated to be 33 percent less than the 2010 supply (18,742 acre-feet/year reduced to 12,464 acre-feet/year) in a normal year (i.e., no drought) (NMISC 2016b). Furthermore, the estimated 2060 administrative supply in the closed basin, with considerations for continued pumping and a 20-year drought with no recharge over the 40-year planning period, is approximately 56 percent less than the 2010 groundwater supply (Figure 32) (NMISC 2016b).

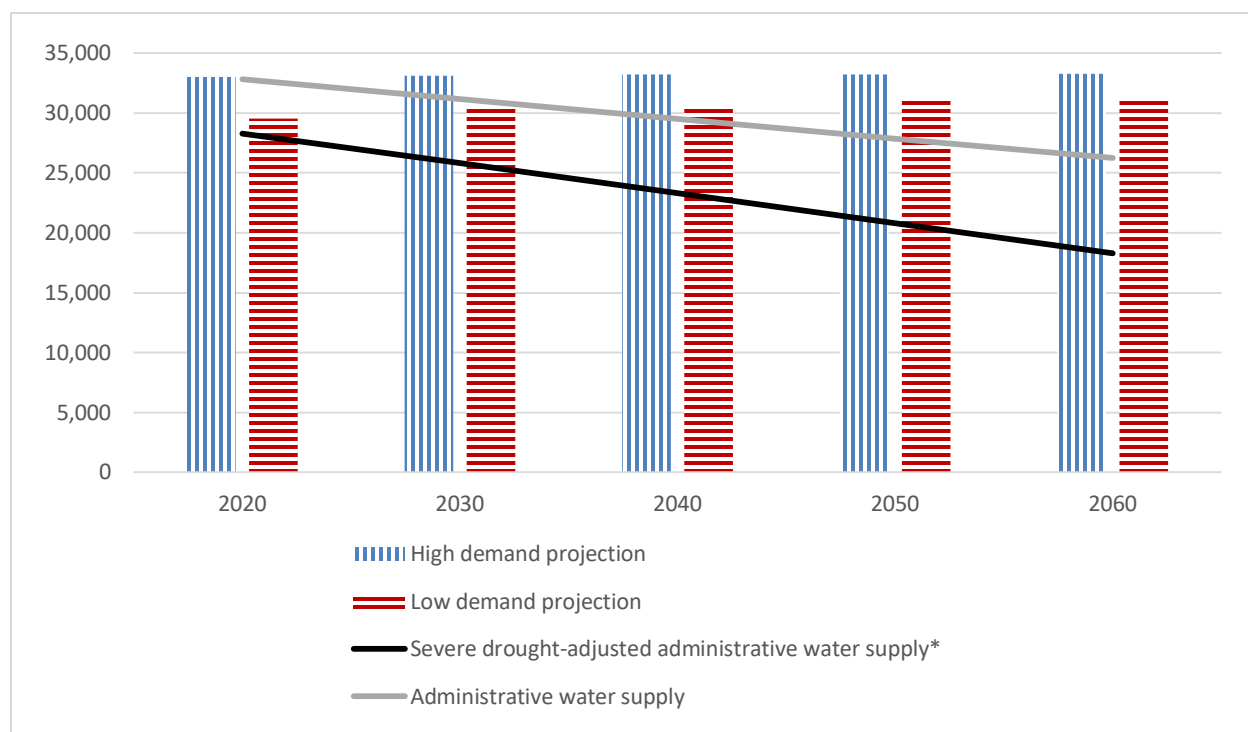


Figure 32. Depiction of the total projected regional water demand for the Tularosa-Sacramento-Salt Basins region, under high and low demand scenarios, with normal administrative water supply and the drought-adjusted water supply estimates (NMISC 2016b)

Projected demands in the *public water supply, domestic, and commercial* categories is expected to increase in Otero and Lincoln counties proportional to increasing population projections, under the high demand scenario. Under a low demand scenario, water use levels are assumed to remain consistent with 2010 use levels (NMISC 2016b).

Throughout much of the state, it is thought that recent periods of recession and drought are contributing to a decline in agricultural production. As a result, the current declining trend observed in *agricultural* water use is expected to continue until 2020, under the low demand scenario. This scenario also anticipates an 80 percent decrease, from 2010 levels, in the amount of ground water used. However, these decreasing trends are expected to level off in the 2030s and rebound. By 2050, groundwater usage is projected to be at 90 percent of 2010 levels and remain there through 2060. No decline is expected in surface water use. Under the high demand scenario, water use levels are assumed to remain consistent with 2010 use levels (NMISC 2016b).

Livestock water use is projected to decrease in Otero and Lincoln counties, reflecting current trends in livestock production. By 2020 water use levels in Otero County are expected to be at 60 percent of 2010 levels in 2020 and to gradually recover to 80-90 percent of 2010 levels by 2060, assuming that the

drought continues and ranchers continue to abandon this occupation. Meanwhile, Lincoln County water usage for livestock is expected to drop to 55-65 percent of the 2010 use level and then increase to 85-90 percent of 2010 water usage by 2060 (NMISC 2016b).

Mining water use in Lincoln County is very minimal; however, several aggregate mining operations and one gold and silver mine currently are operating in Otero County. Projections of water usage through 2060, in this category, are assumed to remain steady under both the high and low demand scenarios (NMISC 2016b).

Power and *industrial* activity in the region is very low. No *power* water usage occurs in the region, and only a minimal amount of water is used for *industrial* purposes. This usage, in Otero County, is expected to remain stable through 2060 under both the high and low scenarios (NMISC 2016b).

No significant water use in the *reservoir evaporation* category occurs in the Tularosa-Sacramento-Salt Basins region; therefore, no water usage was projected for this category. However, in an effort to conserve water, the City of Alamogordo has recently covered some of its raw-water storage reservoirs to inhibit evaporation. It is estimated that the cover has reduced evaporation by 90 percent or more and that water saved using the cover would probably equal the water produced from a new well (NMISC 2016b).

Drought and Climate Change

New Mexico's climate has historically exhibited a high range of variability. Periods of extended drought, interspersed with relatively short term, wetter periods, are quite common (NMISC 2016b). Regional climate assessments conducted by the U.S. Global Change Research Program (USGCRP) have found that temperatures in the southwestern United States have increased and are predicted to continue to increase (USGCRP 2009). Serious water supply challenges are expected as snowpack and streamflow amounts are projected to decline in parts of the Southwest, resulting in decreasing surface water supply reliability for cities, agriculture, and ecosystems (USGCRP 2009).

The most severe droughts in the last century occurred in the early 1900s, 1950s, early 2000s, and most recently from 2011 to 2013 (NMISC 2016a). Drought has significantly affected the Lower Pecos Valley region, with 2011, 2012, and 2013 being extraordinarily dry (until September 2013), resulting in record low flows (NMISC 2016a). The estimated water shortage in drought years throughout the Lower Pecos Valley Region is expected to range from 94,000 to 166,000 acre-feet per year (NMISC 2016a). In the Tularosa-Sacramento-Salt Basins, the potential water shortage in 2060, during a prolonged drought, and due to declining water levels is estimated to range from 13,000 to 15,000 acre-feet (NMISC 2016b).

Water Quality

Assurance of the ability to meet current and future water demands not only requires sufficient quantity but also sufficient quality. Water quality sources of contamination are considered either point source or nonpoint source. Point source contamination originates from a single location such as municipal and industrial sources, leaking underground storage tanks, and landfills; while nonpoint source contamination originate over a more widespread or unspecified location, such as fertilizers and pesticides from farms, and septic systems. Most water quality impairments on the Lincoln NF are due to nonpoint source contaminations.

Surface water quality in the Lower Pecos Valley and Tularosa-Sacramento-Salt Basins Water Planning Regions is evaluated through periodic monitoring and comparison of sample results to pertinent water quality standards. In the Lower Pecos Valley region, water quality varies with the rate of flow, exhibiting

higher salinities during drought periods. In general, water quality is best in the upstream reaches and increases in salinity downstream (NMISC 2016a). Within the six sub-basins that constitute the Lincoln National Forest Context Area, fifteen water bodies are impaired, seven of which are located in the Lower Pecos Valley region (Table 39). However, it is important to note that impairments are tied to designated uses. For instance, an impaired tributary may not meet water quality standard for use as drinking water but may be acceptable for irrigation. Groundwater quality is generally good on the west side of the Lower Pecos Valley Water region, in the Sacramento Mountains however salinity increases further east towards the Pecos River, reaching salinity levels as high as 35,000 parts per million (ppm). Also, a major concern within this region is groundwater contamination due to septic tanks (NMISC 2016a).

Table 39. Impaired water bodies in Context Area of the Lincoln National Forest Plan Assessment Report

Surface Water Sub-Basin (HUC 4)	Number of Water Bodies Impaired	Uses	Comments
Tularosa	8	Most impairments are for Cold Water Aquatic Life and a few for Personal Contact.	Common impairments are due to irrigation diversions, sediment, temperature, and <i>E.coli</i> .
Rio Hondo	3	Most impairments are for Cold Water Aquatic Life and a few for Personal Contact.	Common impairments are due to turbidity, nutrient/eutrophication, low flows due to groundwater pumping, and <i>E.coli</i> .
Rio Peñasco	4	Most impairments are for Cold Water Aquatic Life and Warm Water Aquatic Life.	Common impairments are due to turbidity and sedimentation.
Upper Pecos-Black*	4	Most impairments are for Warm Water Aquatic Life and Irrigation.	Three of these water bodies are lakes where fish consumption advisories are in place due to <i>Polychlorinated biphenyl</i> (PBC) and <i>Dichlorodiphenyltrichloroethane</i> (DDT).

**Note: Water bodies identified in the Upper Pecos-Black Sub-Basin are not actually located on the Lincoln National Forest but were included in the Context Boundary of the Lincoln NF Forest Plan Assessment Report.*

In the Tularosa-Sacramento-Salt Basins region, water quality ranges from good to poor. In this region, water quality is generally best near headwater springs. Accordingly, surface waters, such as Tularosa and La Luz Creeks, degrade downstream as total dissolved solid (TDS) concentrations increase (NMISC 2016b). As previously noted in this section, fifteen water bodies within the Lincoln NF Context Area are impaired, eight of which are located within the Tularosa sub-basin (Table 39). On a related note, Bonito Lake, while not located in the Tularosa-Sacramento-Salt Basins region but rather the Lower Pecos Valley region, is operated by the City of Alamogordo and supplies municipal water for Alamogordo, Holloman AFB, Carrizozo, Nogal, and Fort Stanton. Water quality in the lake had been very good until June 2012, when the Little Bear Fire burned approximately 35,000 acres in the Lincoln National Forest. Due to the resulting ash, silt, and debris, Bonito Lake is not currently a viable source of municipal water supply.

(NMISC 2016b). Besides wildfire, other nonpoint sources of pollutants for surface water quality include grazing, agriculture, recreation, hydromodification, streambank destabilization/modification, removal of riparian vegetation, road and highway maintenance, land disposal, resource extraction, road runoff, and septic tanks (NMISC 2016b).

Groundwater quality is an issue because much of the groundwater in the Tularosa-Sacramento-Salt Basins region is brackish, with TDS concentrations greater than 1,000 milligrams per liter (mg/L). Some of the highest TDS concentrations in the region are found at the White Sands Missile Range and Holloman AFB-Alamogordo area. Most of the recoverable, fresh groundwater is in the eastern portion of the Tularosa-Sacramento-Salt Basins region; however, these resources are limited (NMISC 2016b). Although naturally occurring salinity is the primary water quality concern, poorly maintained septic tanks are another source of water quality concern, particularly in the Alamogordo area. In areas with shallow water tables or karst terrain, septic systems discharges can percolate rapidly to the underlying aquifer, increasing concentrations of TDS; iron, manganese, and sulfides (anoxic contamination); nitrate; potentially toxic organic chemicals; and bacteria, viruses, and parasites (microbiological contamination) (NMISC 2016b). Collectively, septic tanks and other on-site domestic wastewater disposal systems constitute the single largest known source of groundwater contamination in New Mexico (NMWQCC 2002).

In an attempt to protect surface water quality, the New Mexico Environment Department's Water Quality Control Commission approved the statewide designation of Outstanding National Resource Waters (ONRW), on December 15, 2010. These waters include perennial rivers and streams, lakes, and wetlands that are part of a national or state parks, wildlife refuges, wilderness areas, special trout waters, waters with exceptional recreational or ecological significance, and high quality waters that have not been significantly modified by human activities. These designated areas receive the highest level of protection under the New Mexico's Water Quality Standards (NMED 2010). The ONRW designation seeks to prevent surface water quality degradation while allowing grandfathered uses, such as grazing, acequia maintenance and irrigation, to continue. Of the 174 miles of perennial streams on the Lincoln NF, 21 miles have been designated as ONRW; and of 8,651 acres of wetlands, 102 acres have also been labelled as "Outstanding". On the Lincoln NF, the White Mountain Wilderness contains seven streams that have been designated as "Outstanding". These streams include Argentina Creek, Aspen Creek, Bonito Creek, Little Bonito Creek, Mills Canyon/Creek, Rodamaker Creek, South Fork Rio Bonito, and Turkey Canyon/Creek. ONRW respects and protects traditional and sustainable land use activities while protecting these waters from additional pollution or degradation.

Conditions and Trends

Volume I, Chapter 7-Water Resources of this Assessment Report describes the conditions and trends for the Watershed Condition Classification (WCC), perennial streams, springs, groundwater, water quality, and water rights and uses. This section summarizes the conditions and trends for WCC, water quality, and water supply and demand, with regard to the socioeconomic implications for the communities in and around the Lincoln NF. Although management of water resources by the Lincoln NF has some impact on these communities, there are still many facets of watershed management that will need the involvement of other public and private entities in order to sustainably manage this valued commodity.

Watershed Condition Classification

The Watershed Condition Classification describes the status of the physical and biological characteristics and processes within a sub-watershed that affect hydrologic and soil functions supporting aquatic ecosystems. As part of the WCC, there are twelve indicators of sub-watershed condition,

grouped according to four major process categories. These categories represent terrestrial, riparian, and aquatic ecosystem processes or mechanisms by which management actions can affect the condition of watersheds and associated resources (Potyondy and Geier 2011). On the Lincoln NF, the WCC process determined that 76 percent of these sub-watersheds are functioning-at-risk, 17 percent are impaired, and nearly 7 percent are functioning properly (Figure 33). Of the 12 indicators used in the WCC, 8 contributed substantially to impairment of the sub-watersheds that are rated as “impaired function”. These indicators are water quality, water quantity, aquatic biota, riparian wetland vegetation, road and trail network, fire regime or wildfire, forest cover, and terrestrial invasive species. For an explanation of the WCC process and its results, please refer to Volume I, Chapter 7-Water Resources, of this Assessment Report.

The Forest uses Watershed Condition Classification information for planning restoration projects; assisting in prioritizing work; and identifying sub-watersheds where there are risks to domestic water use and consumption, agricultural use, and recreational use. All of the indicators that are used to measure the health of the sub-watersheds are affected either directly or indirectly by climate change. Consequently, improving conditions of degraded watersheds will become more challenging in the future as these conditions will be significantly affected by climate change.

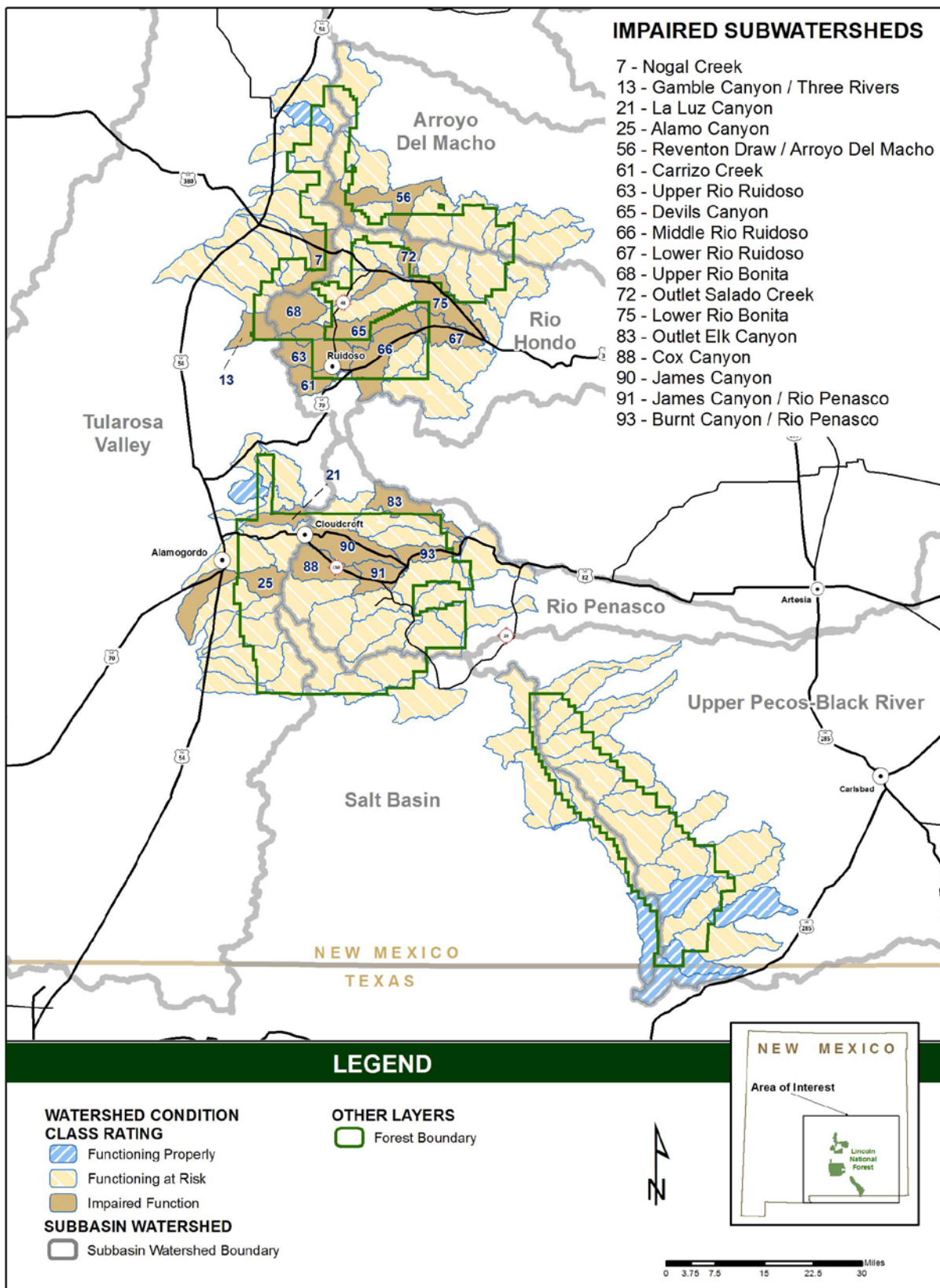


Figure 33. Watershed Condition Class ratings for the Lincoln NF

Water Quality

The New Mexico Environment Department has listed 108 miles of streams within the Lincoln NF as impaired in 2014. In both Water Planning Regions, water quality concerns increase downstream and downgradient from the Lincoln NF. Primary threats to water quality include high salinity levels due to natural processes such as drought and sediment precipitation and anthropogenic sources such as fertilizers and pesticides, and contamination from other nonpoint sources such as septic tanks. These threats are likely to continue because the Lincoln NF is slightly limited in its ability to improve these conditions due in part to the many multi-jurisdictional inholdings within each watershed. It is clear that to be truly successful, collaborative efforts will need to be employed across jurisdictional boundaries.

Water Supply and Demand

From 1980 to 2000, the population within the four counties surrounding the Lincoln NF increased by about 40,000 individuals. The greatest amount of growth occurred in more sparsely populated areas of Lincoln and Otero counties, where the largest swaths of National Forest System land are located. The rapid population expansion of Otero and Lincoln counties is at least partially explained by relocation of retirees or partial retirees attracted by the mountains and recreational amenities (UNM BBER 2007) and over the next few decades, the population of these four counties is projected to continue increasing (UNM BBER 2014). Meanwhile, climate change is increasing hydrologic uncertainty as snowpack and streamflow amounts are projected to decline throughout the entire Southwest. This is a concern given that New Mexico has been experiencing drought conditions for the last several years. Consequently, it is important to understand the effects that climate change, increase in population and the amount of water usage have on water resource. The effects of increased population, coupled with climate change and drought, can result in significant lowering of water tables and subsequent depletion of surface water supplies.

Future projects indicate public, domestic, and commercial water use in the Tularosa-Sacramento-Salt Basins region (28 percent of the Lincoln NF Context Area) will experience an increased demand due to projected population increases. In addition, an overall decrease in water supply is projected due to drought and ground water use that exceeds aquifer recharge. Likewise, public and domestic water use in the Lower Pecos Valley region (72 percent of the Lincoln NF Context Area), is also projected to increase proportional to population growth.

In both Water Planning Regions, agricultural water use may decline due to drought, economic recession, and aging population of farmers. In addition, livestock water use in the Tularosa-Sacramento-Salt Basins region is projected to decrease, which reflects current trends in livestock production. The decreasing trend in livestock water use is similar in the Lower Pecos Valley region with the exception of Chaves County, which has a very strong dairy industry. Finally, mining water use is projected to remain stable in the Tularosa-Sacramento-Salt Basins region and may decline in the Lower Pecos Valley region due to mine closure; however, total water use is minimal in this category for both regions.

Contributions of Water to Social, Cultural and Economic Sustainability

Water is considered an ecological resource and an important life sustaining requirement. As previously mentioned, the social concern regarding adequacy of water was one of the elements for which the Forest Service was created. The integrity of these upper watersheds is important in supporting the delivery of quality water to users and uses downstream. The Lincoln NF has a role in supporting this need through management, protection, and restoration activities. The management of the Forest to ensure a sustainable supply of clean water will continue to be a major consideration into the future.

One could easily determine the dollar cost by multiplying cost per acre-feet by how many acre-feet come off the Lincoln National Forest. However, this is only a determination of economic cost and does not determine economic value. In the assessment area, water provides value based on the social context it serves. Values such as cultural attachment to historic uses of water, recreation, domestic use, agricultural uses, and the value of water rights are examples of water value considerations. Unfortunately, this type of study has not been conducted for water supplied by the Lincoln National Forest, so these values are unknown.

The economic and general welfare of people and communities in and around the Forest are dependent on maintenance of adequate supplies of good quality water. The assurance of water for residential, commercial, industrial, and local government uses are in the interest of sustaining current and future economics and interests.

Water Summary

Water is one of the important resources of the Lincoln NF, ecologically and socially. Water is a key ecosystem resource as described in Volume I, Chapter 7-Water Resources. It is a key component in the cultural development and settlement of the assessment area. Water is important economically for the development and maintenance of agriculture, livestock production, and mining including their associated benefits to the communities, counties, and state revenues and employment. Also, there is additional social and economic benefits of water associated with recreational opportunities as previously described in this section. However, ongoing and future concerns for water quality and quantity will continue to be an issue considering ecological pressures and increasing demands.

Wildlife, Fish, and Plants

New Mexico is one of the most biologically diverse states in the nation, with over 6,000 species of animals that occupy habitats ranging from desert to alpine tundra (NMDGF 2017). It is also fourth in the nation for plant diversity with a total of 4,204 documented plant taxa (NM Biodiversity Consortium 2016), of which 109 species are endemic to the state (Allred 2012; NHNM 2017). When it comes to biodiversity, the Lincoln National Forest is no exception. The presence and variety of vegetation, wildlife, and aquatic species on the Forest provide the public with many opportunities for passive and spiritual recreation, such as nature watching; as well as active and direct recreation through fishing, hunting, and plant gathering. This section will discuss the current condition of hunting, trapping, and fishing; plant material gathering; and wildlife, bird and plant viewing within the plan area. It will also discuss the Lincoln National Forest's contribution to these activities and its ability to sustain this level of contribution.

Wildlife, fish, and plants on the Lincoln National Forest contribute to social wellbeing and quality of life by promoting recreational and educational opportunities. The opportunity to hunt, fish, or just commune with nature is an important tradition for families and communities living around the forest. Many families have been here for generations and these activities have become part of the social fabric upon which family and community relationships are built. Local tribes also rely on resources within the plan area for cultural and traditional uses (refer to [Chapter 4-Areas of Tribal Importance and Tribal Uses](#)).

Commonly Hunted Species

Hunting is a long-held tradition for American families, providing an enriching outdoor experience to the millions of people who participate. The 2011 National Survey of Fishing, Hunting, Wildlife-Associated Recreation found that 913,000 New Mexico residents and nonresidents hunted, fished, or nature

watched in New Mexico that year (U.S. Fish and Wildlife Service 2013). By the same token, the ability for Lincoln National Forest visitors to hunt, fish, trap, and participate in wildlife viewing is very popular in and around the plan area and a vital asset to the local economy.

Big Game

The Lincoln National Forest supports several of New Mexico’s big game species. The Forest Service maintains a stewardship responsibility for the habitat of these valued animals, while New Mexico Game and Fish Department (NMDGF) is the agency responsible for managing all game species within the state. The agency also issues hunting permits and enforces hunting regulations. In accordance with state law, the NMDGF has developed a quota system, with a draw that attempts to distribute a minimum of 84 percent of the licenses for each hunt to New Mexico residents, 10 percent to residents or nonresidents who’ve contracted with an outfitter and 6 percent to nonresidents who have not contracted with an outfitter (NMDGF, 2017). For the most current information on hunting, interested hunters are encourage to contact the NMDGF.

Typically, there are more interested hunters than there are available animals to hunt. As can be seen in the table below (Table 40), the number of hunters that applied for an elk tag (38,384) in 2016 was nearly 20 times the available tags (2,823). For another example, in 2016 the number of applicants for 675 Barbary sheep tags for game management units 32, 34, 36 and 37 was 3,112 (NMDGF 2016). Even so, big game species continue to be a popular interest for Lincoln visitors, with a variety of take methods available, such as archery, muzzleloader and gun (general) hunts.

Table 40 Big game species permits, applications, and take in 2015-2016.

Species	Take method counted	Game Management Unit	Permit Tag Applications (number)	Permit Tag Authorizations (number)
Deer	General, Muzzleloader, Archery, Youth, Mobility Impaired	30, 34, 36, 37	24,735	7,160
Bear	General and Archery	34, 36, 37	n/a	n/a
Barbary sheep	General	30, 34, 36, 37	6,518	1,275
Pronghorn	General, Archery, Mobility Impaired	30, 36, 37	5,264	165
Elk	General, Muzzleloader, Archery, Youth, Mobility Impaired	30, 34, 36, 37	38,384	2,823
Oryx	Off-Range General and Youth	30, 34, 36, 37	13,489	780

Species	Take method counted	Game Management Unit	Permit Tag Applications (number)	Permit Tag Authorizations (number)
Turkey	General and Youth (Spring and Fall)	30, 34, 36, 37	n/a	n/a
Javelina	General, Archery, Youth	30, 34, 36, 37	1,300	1,400
Cougar	General and Youth	30, 34, 36, 37	n/a	n/a
Total			89,690	13,603

Often one of the first questions prospective hunters ask is about the game management units (GMUs). There are 4 GMUs that cover the Lincoln National Forest, Units 30, 34, 36 and 37 (NMDGF 2017). The NMDGF uses a GMU system to better regulate game populations in response to hunting pressure, and to ensure opportunities are based on availability of big game. There are a lot of game manage units, which can be chosen based on different aspects such as land use, human density, habitat, recognizable physical features and access (Shooting Mystery, 2017). Moreover, by dividing the state into many units, the NMDGF can make hunting regulations simpler and more specific based on each area, as well as allowing drawing for tags based on the specific big game population. The map below shows the location of GMUs 30, 34, 36 and 37 in reference to the Lincoln National Forest.

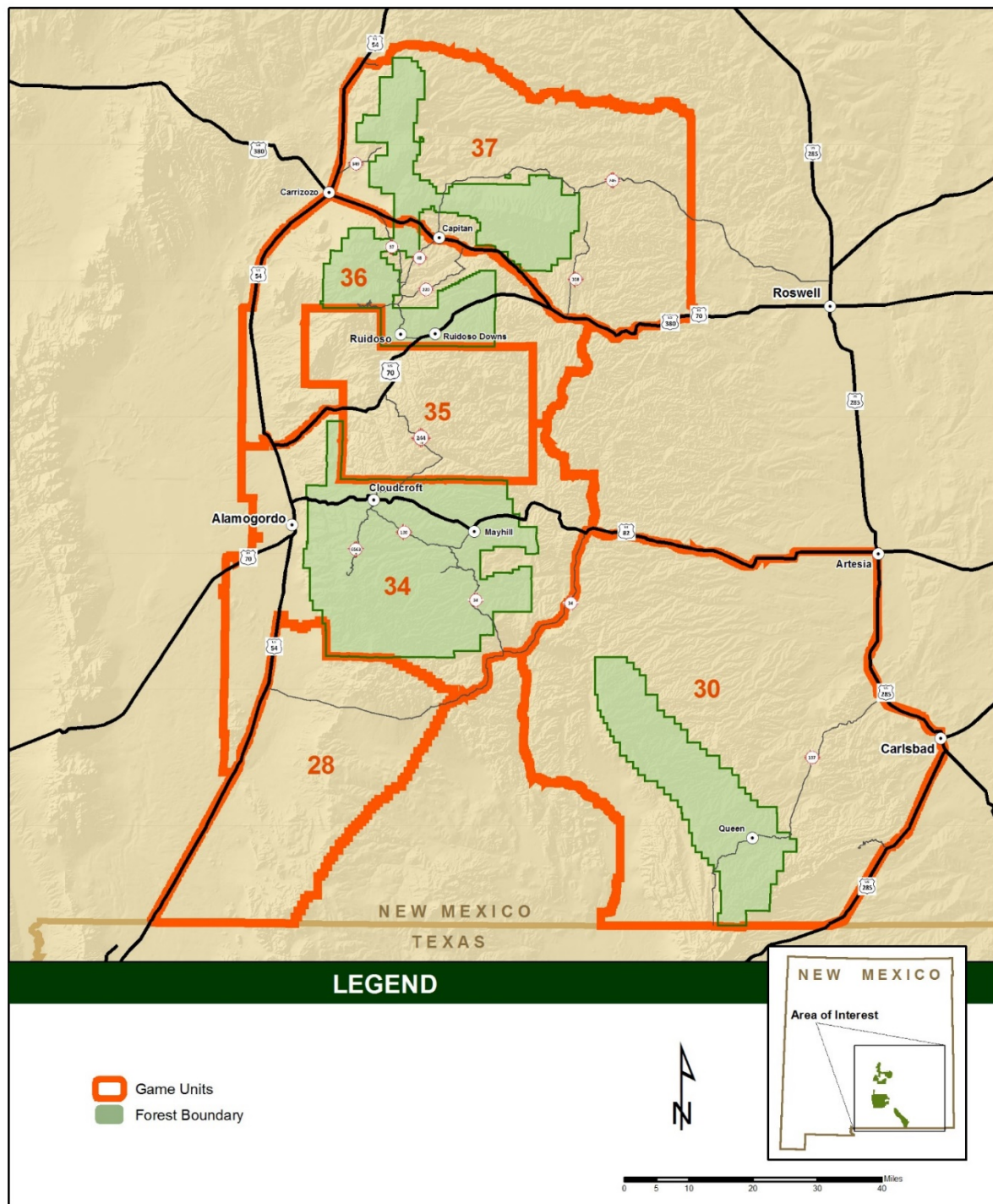


Figure 34. Game Management Units of the Lincoln NF.

Black Bear

Black bears in New Mexico can be found in a variety of habitats on the Lincoln National Forest including forests, woodlands and meadows. Riparian areas are important to black bears, providing valuable cover for travel and foraging as well as water for drinking, fishing and play. Being omnivorous and opportunistic, black bears have a diet that varies according to seasonal availability of foods. In spring, the diet is mostly fresh grasses and forbs, young succulent shoots, roots, insects and carrion. In summer,

young grasses, forbs, insects, berries and fruit are primary sources of nourishment. Bears typically overturn rocks and stumps in search of larval insects, termites or ants, and may invade yellow-jacket nests. In late August, bears begin to forage on a great deal of acorns, pinon nuts and juniper berries in the fall to store fat for the approaching winter (NMDGF 2017). Black bears are not true hibernators but enter a state of ‘torpor’, which is a modified form of hibernation. They select a surprisingly small den, frequently located under outcroppings of large rocks or tree roots. Bears are habitat generalists, and found throughout various forest and woodland vegetation types in all their seral states (see Chapter 1, Terrestrial Vegetation).

Most of the vegetation types have become departed from desired conditions, mostly due to encroaching woody vegetation in the absence of low severity wildfire, but also due to large stand replacing wildfire. Both conditions can affect bear habitat negatively in the short term, but management activities designed to maintain forests and woodlands on a trajectory toward desired conditions by reducing woody plant density and reducing probability of severe wildfires can maintain relatively stable habitat in the longer term. Black bears contribute to the biodiversity of ecosystems by assisting in keeping prey species populations in check. Interactions with humans in the wildland/urban interface (WUI) and resulting habitat fragmentation have a high impact on bears. With education to local people as well as visitors, the number of nuisance bears having to be relocated from the Ruidoso and Cloudcroft areas are down. Based on the harvest reports, and on sightings, the black bear populations appear to be healthy, and relatively stable on the Lincoln National Forest.

Deer

Deer is a wildlife species enjoyed by many visitors that spend time in our state’s wild country and rural areas. They are distributed throughout the state, in areas ranging from low elevation deserts and piñon-juniper covered hills and canyons, to river bottoms and ponderosa forested high mountain country. Deer can be hunted in every game management unit overlapping the Forest. New Mexico’s climate and weather patterns are extremely important to deer survival. Periods of good rainfall can improve fawn survival by producing better forage and vegetative cover, but moisture at the wrong time (hard, snowy winters) or prolonged periods of drought, like the drought periods of recent years, can have devastating effects on fawn survival and overall deer numbers.

Two other potential factors that may contribute to decreases in deer populations are predation by mountain lions, coyotes and bears; and the encroachment of human development into mule deer habitat. However, the New Mexico Department of Game and Fish has developed a Deer Management Plan to implement actions that are intended to result in increased deer survival, higher population numbers and increased public satisfaction with management of the state’s deer herds. Based on steadily increasing harvest numbers from 2013-2016, the deer population on the Lincoln appears to be on the increase.

Pronghorn antelope

On the Lincoln National Forest, pronghorn antelope primarily occur in large open basins and rolling, grassy plains with scattered brushy draws within only two game management units. Population numbers have rebounded from historical lows seen in the 1910s when New Mexico’s Department of Game and Fish began trapping and transplanting antelope to new ranges. Pronghorn antelope are not normally hunted on the Lincoln National Forest, as their preferred habitat consists of open grasslands, with few encroaching junipers. Pronghorn antelope eat mostly forbs though grasses constitute a minor component of their diet. Nonetheless, encroachment of woody species into grassland areas has been

shown to reduce suitable habitat for this species (Merriman 2014). Antelope may range widely for food when snows are heavy or ranges are dry.

Net-wire fences may interfere with antelope movements, but barbed wire fences - especially if a little room is left at the bottom - can be compatible with their need to roam. Coyotes and golden eagles may prey on young antelope, and prolonged drought or heavy winters may cause herd die-offs. Antelope are comparatively free of serious diseases and parasites. The antelope populations appear to be low but stable, based on the New Mexico Department of Game and Fish harvest numbers. However they are not a commonly managed species on the Lincoln National Forest, and there is limited suitable habitat on NFS lands.

Elk

Rocky Mountain elk exist in New Mexico because the state and private individuals made persistent efforts to re-establish elk populations between 1910 and 1966. These efforts were necessary because relentless hunting pressure in the late-19th century resulted in extirpation from New Mexico. Elk have expanded greatly since the last releases of the 1960s. Now they are found in many areas once considered marginal habitat. Grass is a preferred food of elk, however they can thrive on forbs and woody browse as well. Cover is the animals' lifeline. Large and mobile, elk can move to water at night, but cover provides daytime shade and protection from insects and humans. Among the mountains of New Mexico, dark cool forests with interspersed large and small meadows provide cover, food, and water.

Elk populations appear to be increasing on the Lincoln NF based on New Mexico Department of Game and Fish elk counts and harvest numbers. Increasing elk population numbers can negatively impact aspen regeneration by reducing aspen populations in mixed conifer forests; thereby contributing to a departure in desired conditions for the mixed conifer/aspen ecosystem.

Turkey

New Mexico has three sub-species of wild turkey: Merriam's, Rio Grande, and Gould's. The New Mexico Department of Game and Fish considers these big game species, as the turkey is the largest game bird in the United States. The specific habitat types vary by wild turkey subspecies. The Lincoln National Forest is primarily home to one of the three wild turkey subspecies found in the state, the Merriam's turkey, although the Rio Grande turkey incidental occurrences have been reported in the lower elevations of a couple of southeastern drainages on the Guadalupe Ranger District. This subspecies occurs primarily in ponderosa pine forest, but can also be found in areas of riparian deciduous forest and other vegetation types that occur between 3,500 and 10,000 feet in elevation.

Turkeys have excellent eyesight and hearing, and are extremely wary. They spend most of the daylight hours on the ground, but roost in trees at night. Turkeys use mature trees for roosting and will scratch a shallow depression in the ground to use as a nest site. Nests are often located in dense vegetation consisting of grass, fallen leaves, shrubs, or at the base of a tree. Ponderosa pine forests and woodlands historically were more open than they are now, which may indicate a reduction of suitable habitat for this species.

Management activities designed to maintain forests and woodlands on a trajectory toward desired conditions by reducing woody plant density and reducing probability of severe wildfires can maintain relatively stable habitat in the long-term. Forest management regimes which support the turkey also provide a richer mosaic of habitat, thus supporting a richer biodiversity. Turkey poults depend on small

insects and available seed crops in order to reach juvenile status. It has been found that extremes in weather of both drought and excessive rainfall can negatively impact poult survival to juvenile age, thereby having short-term impacts on turkey populations. In general, turkey populations appear to be stable to increasing on the Sacramento and Smokey Bear Ranger Districts, based on the 2013-2016 harvest numbers. Additional efforts by the New Mexico Department of Game and Fish to reintroduce a sustainable Merriam's wild turkey population into the Guadalupe Mountains are ongoing.

Barbary sheep

Barbary sheep are a non-native sheep species introduced into the area by the New Mexico Department of Game and Fish in 1950. It was intended that this drought-resistant exotic might be a desirable substitute for New Mexico's beleaguered native bighorn sheep in areas that the desert bighorn did not inhabit or from which they had been extirpated (Ogren 1965). Native to the dry mountainous areas of northern Africa, this sheep is adapted to a dry, rough, barren, and waterless habitat — same as the native bighorn sheep of our southwestern deserts. Consequently, it is quite likely that these two could not survive together in the same area because of competition between them (Davis & Schmidly, 1997).

In studies conducted in New Mexico, Herman Ogren found that 79 species of plants were included in the diet of these sheep; of these, 13 were grasses, 20 were shrubs and the remainder forbs. Mountain mahogany (*Cercocarpus breviflorus*) was the most preferred plant. On a year-long basis mountain mahogany comprised nearly 22 percent of the forage found in rumens of the sheep (Ogren, 1962). There is no historical information on population numbers of Barbary sheep, since this is a non-native species, nor is there historical data on impacts to habitat condition. Based on harvest numbers from the New Mexico Department of Game and Fish, this species population appears to be on the increase.

Javelina

Javelina are fairly widespread across the lower elevations of the Lincoln National Forest, occurring within many habitat types such as desert scrub, pinyon-juniper and oak woodlands. Much of those vegetation types have become encroached by woody vegetation, in the absence of wildfire, resulting in departure from historic conditions but it does not appear to limit javelin populations. They are particularly adept at existing in human-impacted areas, such as agricultural lands and the fringes of urban centers. This species is a recent arrival in the Southwest U.S., with only limited reports from early settlers and no archeological evidence. Their range is continuing to expand northward. Javelina have a year round breeding season and can have up to two litters per year. This gives them the greatest reproductive potential of all North American big game. Javelina populations don't appear to be affecting native vegetation in desert scrub or oak woodland, nor do management activities appear to be affecting javelina populations. Recent sightings of javelina have been documented as high as 7,600 feet in elevation, which is generally ponderosa pine habitat, and indicating expanding populations. This expansion may have a negative effect on plant species diversity, as they begin to impact a new habitat type. The increasing population estimates are supported by New Mexico Department of Game and Fish, which show increases in harvest numbers annually since 2013.

Cougar

Cougars are known by many names, including puma, mountain lion, and panther. Cougars are found in most parts of New Mexico—wherever there is an abundance of prey, rough terrain, and adequate vegetation to provide hunting cover. Current conditions in the forests, woodlands, and shrublands on the Lincoln NF are generally departed from historical conditions, but probably are not limiting cougar populations, as deer and other prey species are relatively abundant. They are active year round. While cougars tend to avoid people, they can and do live in close proximity to humans. They tend to be more

active when there is less human presence. The cougar's staple diet is deer. Cougars also prey upon rabbits and hares, bighorn sheep, elk, raccoons, turkey—even porcupines. They may also prey upon domestic animals such as livestock and pets. Cougars and other meso-predators contribute to biodiversity, especially plant species, by helping to keep populations of herbivores in check. Cougars are most active during the night, with peak activity at dawn and at dusk. Cougar populations in the game units that include the Lincoln National Forest appear to be on a stable trend, based on harvest numbers from 2012-2017.

Small Game

The state of New Mexico features a large variety of small game species (Table 41), offering a diversity of hunts. The 3 year average number of small game hunters was 103,238. Most small game species can be hunted using multiple methods, such as shotgun, rifle, dogs, archery and falconry. Small game includes migratory game bird species, upland game birds, fur bearing mammals and predators. Some species have bag limits and specific hunting seasons, while others do not. Bird species have daily and total bag limits, while some mammals, such as squirrels, have daily limits. Predatory species such as coyotes and bobcats do not have limits. Turkeys are another popular game bird species, but are regulated as big game by the New Mexico Department of Game and Fish.

Table 41 Other commonly-harvested small game on the Lincoln National Forest.

Upland and Small Game Species	General Habitat Use	General Hunt Seasons and Limits
Gambel's quail	A warm-desert resident of brushy and thorny vegetation in desert mountain foothills, brushy drainages, as well as adjoining cultivated lands. Common vegetation includes mesquite, acacia, skunkbush, littleleaf sumac, and various cactus species.	Statewide - Nov. 15 – Feb. 15, 2016. 15 per day (no more than 5 Montezuma quail) / 30 in possession (no more than 10 Montezuma quail).
Scaled quail	Are found in semi-arid rangelands with mixed scrub. This species is generally associated with open habitats and tend to avoid rugged slopes and dense stream courses. Common vegetation includes mesquite, prickly pear cactus, and scattered shrubs and grasses.	Statewide - Nov. 15 – Feb. 15, 2016. 15 per day (no more than 5 Montezuma quail) / 30 in possession (no more than 10 Montezuma quail).
Montezuma quail	Are found in pine-oak and oak scrub habitats, especially in open woodlands with a grass understory. They are often found on steep slopes, and do not occur in areas without an adequate grassland component.	Statewide - Nov. 15 – Feb. 15, 2016. 15 per day (no more than 5 Montezuma quail) / 30 in possession (no more than 10 Montezuma quail).
Eurasian collared-dove	Eurasian collared-doves mainly live in urban, suburban, and agricultural areas. They tend to perch on telephone poles and wires, and in large trees. The Eurasian collared-dove is considered	Statewide - April 1 – March 31. Unlimited

Upland and Small Game Species	General Habitat Use	General Hunt Seasons and Limits
	upland game due to its non-migratory nature and invasive status.	
Gray squirrel	Are found in the mountains and plateaus of New Mexico. Gray squirrel habitat is fairly dense, mixed broadleaf communities of deciduous forests near montane or evergreen woodlands. They prefer mature forests of tall and decadent trees.	Statewide - Sept. 1 – Nov. 30 8 per day / 16 in possession
Red squirrel	Are found in the montane areas of New Mexico. They use subalpine spruce-fir forests, mixed-conifer forest, and on occasion ponderosa pine forests. They prefer large, older trees, in habitats enhanced with snags, downed timber, and thickets of saplings.	Statewide - Sept. 1 – Nov. 30 8 per day / 16 in possession
Abert's squirrel	Are found in ponderosa pine forests in the mountains and plateaus of New Mexico. They rely on ponderosa pine trees for both food and shelter. The preferred habitat is uneven-aged pine stands, composed of small even-aged groups within the stand containing tree densities between 200 and 250 trees per acre.	Statewide - Sept. 1 – Nov. 30 8 per day / 16 in possession
Raccoon, Badger, Weasel, Fox, Ringtail, and Bobcat	Common, occur across the state in both urban and wild areas.	Statewide - Badger, Weasel, Fox, Ringtail and Bobcat: Nov. 1, 2016–March 15, 2017. Raccoon: April 1–May 15, 2016 and Sept. 1, 2016–March 31, 2017.
Coyote and Skunk	Common, occur across the state in both urban and wild areas.	Statewide – No closed season or bag limit.
Migratory Game Bird	Migratory game birds include doves, band-tailed pigeons (see also this dove and band-tailed pigeon USFWS identification guide), sandhill cranes, ducks, geese, coots, common moorhens, snipes, soras and Virginia rails. Common, occur across the state in various habitat areas, including wetlands.	Various depending on species.

Overall, small game habitat conditions on the Lincoln National Forest are stable and are expected to remain this way. Threats to the quality of habitat for small game foraging or nesting include uncharacteristic wildfires, climate change, and an increase in invasive species (see Volume I, Terrestrial Vegetation chapter of this assessment for more information). Small game populations in the counties around the plan area appear healthy and are considered stable overall, by the New Mexico Department of Game and Fish. Population levels, particularly of small game birds and small mammals, can fluctuate from year to year, each species responding differently to levels of moisture availability, timing of winter and summer rains, and levels of snow pack. Areas of conservation concern include use of wetland areas by wetland game species and concentrated human recreation, conversion of wetlands, and loss of riparian floodplain from a variety of human-related actions.

Trapping in New Mexico

Small game animals that can be trapped legally in New Mexico include coyotes, skunks, raccoon, badger, weasel, fox, ringtail, bobcat, muskrat, beaver, and nutria; seasons vary by animal. Resident and nonresident trappers and furbearer hunters must purchase a Trapper License or Nonresident Trapper License. A Habitat Stamp is required on Forest Service and Bureau of Land Management lands. There are several types and sizes of traps that are not allowed in New Mexico. All legal traps require some distance from dwellings or other areas people frequent before making a set. The 2015-2016 annual trapper harvest in New Mexico included 4,474 protected furbearer animals, with a total of 1,671 trappers (NMDGF 2016).

Angling

The Lincoln National Forest provides habitat for a limited number of fish species that are popular for sport fishing. The NMDGF manages sportfish species as either cold water or warm water species. Coldwater species that occur on the Lincoln National Forest include Rio Grande cutthroat trout, and the introduced non-native brook trout. The Rio Grande cutthroat trout was reintroduced in a limited stream section on a single stream, and was not a sustainable population, therefore was not open for fishing opportunities. All of the fishing for cold water species on the Lincoln National Forest occurs in streams on the Smokey Bear and Sacramento Ranger Districts. Coldwater species on the Lincoln National Forest are managed by the NMDGF under three management strategies: Put and Take (stocked throughout season for immediate harvest); Put, Grow and Take (stocked with fingerling or fry trout into waters with the expectation that the fish will grow to larger sizes; and Wild waters (no stocking). In the past, the NMDGF stocked non-native rainbow and non-native brown trout but streams no longer support this activity. At this time, no additional stocking by the state game and fish department has occurred. The Lincoln National Forest does not have any warm water sportfish species.

Lincoln Coldwater Species Current Conditions

Rio Grande Cutthroat Trout

The Rio Grande cutthroat trout is a valued sportfish and species of conservation concern in New Mexico. The only native sportfish species found on the Lincoln National Forest, the Rio Grande cutthroat trout, is only found in Pine Lodge Creek on the Smokey Bear Ranger District, as part of a reintroduction project. The trout in the Pine Lodge Creek is a Core Conservation Population of Rio Grande cutthroat trout, and is not open to fishing. However, the current population status is unknown due to extended drought conditions. Federal listing of Rio Grande cutthroat trout was determined to be not warranted in 2014 and it was removed from the candidate species list under the Endangered Species Act. However, it is still considered a species of conservation concern.

The U.S. Forest Service Southwestern Region has been a signatory to the *Range-wide Conservation Agreement for Rio Grande Cutthroat Trout* since 2002 and recently signed a complimentary Conservation Strategy. The purpose of these documents is to memorialize formal commitments by the U.S. Forest Service, New Mexico Department of Game and Fish and other federal, state, and tribal cooperators to Rio Grande cutthroat trout conservation efforts including desired population numbers within certain watersheds. The U.S. Forest Service, in conjunction with the New Mexico Department of Game and Fish will continue ongoing restoration efforts that benefit Rio Grande cutthroat trout. Conservation Populations of Rio Grande cutthroat trout that are open to angling, which does not include Pine Lodge Creek, are also considered Wild trout waters. Specific criteria for Conservation Populations of Rio Grande cutthroat trout which are open to angling are discussed in the relevant conservation and recovery planning documents for the species.

Rainbow Trout

New Mexico Department of Game and Fish stocks non-native rainbow trout in a number of waters to provide angling opportunities. Within the Lincoln National Forest, rainbow trout used to be stocked in Rio Bonito (downstream of Bonito Lake), Rio Peñasco, Sacramento River, Agua Chiquita, Rio Ruidoso, and other sizeable streams. However, no streams on the Lincoln National Forest have been stocked with the non-native rainbow trout in the past two decades. Below the National Forest boundary, Rio Bonito and Rio Ruidoso trout species are managed as Put and Take waters. Put and Take trout waters involve stocking catchable (> 9 inches in length) rainbow trout to be immediately harvested by anglers especially where angler demand significantly exceeds natural production. Generally, Put and Take trout waters are stocked consistently throughout a stocking season with catchable rainbow trout. Rio Peñasco is managed as Put, Grow and Take trout water. Put, Grow and Take trout waters involve stocking sub-catchable (6 to 8 inches in length), fingerling or fry trout into waters with the expectation that the fish will grow to larger sizes within the receiving water. These waters may have limited habitat to support natural reproduction or angler harvest exceeds the number of fish produced via natural reproduction. The daily bag limit is five fish per day for rainbow trout.

Brown Trout

Several introduced populations of brown trout occur throughout New Mexico. Streams on the Lincoln National Forest include the Rio Bonito downstream of Bonito Lake, the Rio Ruidoso, the Sacramento River and the Rio Peñasco. Most of the Rio Peñasco and the Rio Ruidoso and its tributaries are on private land or the Mescalero Apache Indian Reservation. For the Rio Ruidoso, there is a Special Trout Water regulation (three trout only, any legal tackle or bait) from Mescalero Reservation boundary downstream to Friedenbloom Drive. All other areas are subject to the statewide daily bag limit of five fish per day.

Brook Trout

Brook trout, an eastern U.S. species, are not native to New Mexico, but can be found in most small tributaries throughout New Mexico. Brook trout are not stocked on the Lincoln National Forest, although the New Mexico Department of Game and Fish did stock non-native brook trout in major streams such as the Rio Bonito, Rio Peñasco, Sacramento River, Agua Chiquita, Rio Ruidoso and other sizeable streams up until the 1990s. Brook trout have since spread upstream into small tributaries. Several populations of brook trout on the forest are self-sustaining non-native populations and can be found throughout the Lincoln National Forest. These areas containing brook trout are also subject to the statewide daily bag limit of five fish per day.

Sportfish Population Trends

Coldwater Species

The New Mexico Department of Game and Fish has noted considerable declines in the historic distribution of native trout populations, specifically the Rio Grande cutthroat trout, on the Lincoln National Forest. Declines of about 75 percent have been noted in Pine Lodge Creek, most likely due to the 2004 Peppin Fire and subsequent flooding. Reintroduction of this species showed positive results, but a 10-year drought severely impacted the sustainability of that population, and there are few remaining Rio Grande cutthroat trout at that site. There are no other known Rio Grande cutthroat trout populations on the Lincoln National Forest. Conservation populations, such as Pine Lodge Creek, are concentrated in streams with elevations from 9,000–10,000 feet. These isolated high-elevation streams are subject to extreme and fluctuating environmental conditions including forest fires, freezing, and dewatering. In addition, headwater mountain streams often lack critical resources, such as deep pools, therefore they cannot provide sufficient refuge from catastrophic disturbance. The resulting limited habitat resources cause the remaining populations to be lower in overall number of individuals and more at risk of extirpation from extreme events. The New Mexico Department of Game and Fish restocked Rio Grande cutthroat trout in Pine Lodge Creek in 2008. Post-fire monitoring in Pine Lodge Creek was conducted in 2011 and 2016, showing persistence of the reintroduced population. As part of the Rio Grande Cutthroat Trout Conservation Strategy, both the U.S. Forest Service and the New Mexico Department of Game and Fish will continue to implement habitat enhancement projects on the Lincoln National Forest to help these impacted populations.

For the 2011 license year, there were a total of 278,000 angling licenses sold in New Mexico (U.S. Fish and Wildlife Service 2014). Seventy-seven percent were sold to residents of New Mexico, and the remaining 23 percent were sold to nonresidents (U.S. Fish and Wildlife Service 2014). **Table 42** shows total angler participation by county. Although, fishing opportunities on the Lincoln National Forest are limited because of the relative lack of perennial water or streams; it is recognized as an important economic factor for local communities and the Lincoln National Forest will continue to provide habitat for fish.

Table 42. Angler participation in 2013.

County	Total Participants
Chaves	3,729
Eddy	5,801
Lincoln	11,340
Otero	3,947
Total	24,817

Source: Southwick Associates 2014

Impacts of Hunting and Fishing on Ecological Integrity and Species Diversity

Hunting, trapping, and fishing of designated game species have beneficial and adverse impacts on ecological integrity and species diversity. Managed hunting serves as a method to control species population numbers, which can have a beneficial impact on habitat and species diversity. Overpopulation of species can lead to terrestrial and riparian vegetation degradation, overutilization of forage, and potentially make animals more susceptible to disease causing massive die-offs. Additionally,

revenues from hunting and fishing licenses, permits and tags are used to manage and conserve game and nongame wildlife species, as well as their habitats.

Adverse impacts associated with hunting and trapping include user-created roads, impacts from dispersed camping, introduction of lead into the environment, and unsafe recreational target shooting. Increased forage removal associated with these activities has a potential to lead to habitat degradation and greater habitat fragmentation. These adverse impacts are often localized and can look dramatic, but the overall impacts are small at a forest-wide scale or nonexistent, when hunting and trapping are conducted according to sporting rules and regulations. Impacts to camping associated with hunting activities is minimal. Overall, hunters are respectful of their environment and pack out what they pack in.

While thriving sportfish populations provide angling opportunities for the public, many of these species are introduced, non-natives and significantly alter the aquatic systems they inhabit. They may especially pose a threat to native species that did not adapt to predation or competition from sportfish. Thus, in some areas introduced species may inhibit the restoration and maintenance of native, aquatic species (refer to the Aquatic Biota Section of Chapter 7: Water Resources, in the Ecological Resource Volume of the Assessment Report for more information).

Habitat Stamp Program Wildlife Enhancement Projects

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 Forest Service personnel and a great many volunteers. Implementation is also accomplished by awarding contracts. A number of projects are located on the Lincoln National Forest and include but are not limited to: rainwater catchment tanks and drinkers, habitat improvement such as manual thinning or prescribed burning, fence installation to protect spring water quality and sensitive wildlife areas from livestock, fisheries improvement projects and installation of informational wildlife signs on projects, and restoration of wetlands. Since 2012, approximately \$1,785,000, including additional partnership funding, has been spent on wildlife habitat improvement projects on the Lincoln National Forest. Because the Lincoln NF has been very active in the development of constructed habitat improvements such as trick tanks, for example, the recent trend has been to improve existing facilities rather than construct new ones.

Nature Viewing on the Lincoln National Forest

Watchable Wildlife

In 2011, nation-wide, 72 million people over the age of 16 (roughly 30 percent of the population) participated in wildlife watching with the majority choosing to enjoy wildlife around their homes. Within New Mexico during that same year, approximately 566,000 people enjoyed watching wildlife, contributing over \$327 million to the economy by spending on related specialized equipment, travel, food and lodging (U.S. Fish and Wildlife Service 2014).

There are a variety of opportunities on the Lincoln National Forest to view and photograph wildlife and plants, with experiences that provide a range of comfort levels for individuals. Organized group wildlife watching activities occur annually such as the Christmas Bird Count and Bat Bio Blitz. Standing snags, fallen logs and woody debris under conifer forests create cover, food sources, nesting and den sites for small mammals and birds; these structures become focal areas where visitors can enjoy observing chipmunks, squirrels, woodpeckers, song birds, frogs, lizards at close range. Other opportunities include roads and hiking trails that might allow a glimpse of wildlife in their natural habitats, either from the comfort of a vehicle or on foot.

Bird Watching

Nationally, over 46 million birdwatchers (nearly 20 percent of the total population 16 years of age and older) spent close to \$41 billion on total expenditures for a total of just under \$107 billion in economic output in 2011. This activity supports 666,000 jobs nationally, generating \$6 billion in state tax revenue and \$7 in federal tax revenue (U.S. Fish and Wildlife Service 2014). New Mexico is home to over 415,000 birdwatchers, spending more than 48 million days actively watching birds, either around their homes or greater than one mile from home.

With its varied habitat and elevations, the Lincoln National Forest is a unique opportunity for bird watchers. The forest provides essential foraging, roosting, and nesting habitat that supports the propagation of wildlife species. The Audubon Society recognizes areas with unique habitat or importance as “important bird areas.” These sites provide essential riparian corridors for one or more species of birds for breeding, wintering, or migrating. Important bird areas range from a few acres to thousands of acres, and may include public and private lands. There are two identified important bird areas in the four-county assessment area, with one on the Lincoln National Forest: Hondo Valley, and Peñasco Canyon important bird areas.

Peñasco Canyon Important Bird Area

The Peñasco Canyon important bird area (IBA) is approximately 4,137 acres in size and is located in a high mountain canyon in the Lincoln National Forest with some private in-holdings. Mixed conifer or spruce-fir is found at the upper end grading into Ponderosa Pine at the lower end and the lower end of this canyon contains a marsh. Mexican spotted owls and other high priority species can be found in this canyon in great abundance. Throughout this IBA, there are many Protected Activity Centers (PACs) identified for nesting and roosting Mexican spotted owls. This IBA is also the southern-most known breeding location in the state for the Lincoln's Sparrow. Other species with high populations in this important bird area include the yellow-rumped warbler, the broad-tailed hummingbird, the warbling vireo, the violet-green swallow, the golden-crowned kinglet, and the orange-crowned warbler. The riparian area with perennial waters provides an important stop-over for migrating birds. Riparian grazing and a decreasing water table are exacerbating headcuts in the canyon and the marsh at the eastern end of the canyon is in danger of being completely drained.

Hondo Valley Important Bird Area

The Hondo Valley important bird area (IBA) is 27,613 acres of river valley downstream of the Lincoln National Forest with some mature cottonwood riparian areas. This area contains small sections of intact riparian vegetation and tree cover, with a perennial stream. During various seasons, this area would serve as nesting and foraging for several bird species, especially those that depend on intact riparian habitats. This area is also an important migration stop-over area, especially for waterfowl. The location in southern New Mexico, paired with the perennial water source, makes this area a viable wintering site

for birds. It has been documented that the Hondo Valley IBA contains as many as six Black Hawk pairs (Audubon Society, 2016).

Although this IBA does not fall within the Lincoln National Forest boundary, there are other watchable birding opportunities on the Forest, as numerous locations across the Forest are important for maintaining species diversity. The Lincoln National Forest still provides essential foraging, roosting, and nesting habitat across all vegetative communities that support the propagation of wildlife species, whether that be important habitat for local breeding birds or stopover habitat for migratory species.

Plant Species Commonly Viewed on the Lincoln National Forest

The Lincoln National Forest provides the only suitable areas, in terms of altitude, aspect, slope, and soils, for some narrow endemic or rare plant species. Development and habitat conversion on private lands adjacent and within the plan area emphasize the importance of the Lincoln National Forest's role in maintaining habitat for special plant species that may not occur elsewhere. As previously mentioned, New Mexico is one of the most biologically diverse states and has the fourth highest plant diversity in the country. A total of 4,204 plant taxa have been documented, including 487 exotic species and 109 plant species endemic to the state. Over 12 percent of the vascular flora in the state is considered at risk (ENMRD 2017). The majority of New Mexico's rare plants occur in mountainous ecoregions (approximately 70 percent), which support the largest concentrations of highly endemic plants species and include many of New Mexico's Important Plant Areas. Important Plant Areas (IPAs) are specific places across New Mexico that support either a high diversity of sensitive plant species or are the last remaining locations of our most endangered plants. Many of these species are restricted to the high elevations of sky islands, which are isolated mountain ranges surrounded by radically different lowland environments. These include the Mogollon Mountains, Black Range, White Mountains, and Sacramento Mountains of southern New Mexico, which contain the largest number of endemic plant species in the state. A little more than 30 percent of rare species occur in the Chihuahuan Deserts Ecoregion. Deserts are highly vulnerable to habitat alterations caused by climate change and associated impacts, livestock grazing, and water and energy development projects. The Chihuahuan Deserts Ecoregion is the most human impacted ecoregion in New Mexico, which includes urban expansion and development, livestock grazing, water development, agriculture, landscape wide herbicide treatments, and oil & gas development.

Rare and endangered plants receive limited or no protection on non-federal lands, including federally listed species. Therefore, management responsibility lies largely with federal land managers. The Lincoln NF has five Important Plant Areas (IPAs), which occur in the Capitan Mountains and on Sierra Blanca on the Smokey Bear Ranger District, the Sacramento Mountains on the Sacramento Ranger District, and the Guadalupe Mountains and Guadalupe Ridge on the Guadalupe Ranger Districts. These IPAs contain a variety of plant communities from desert to subalpine and include many rare species that are not known to occur anywhere else in the world. These plant communities provide opportunities for professional botanists and amateur naturalists alike to view, study, and appreciate the diversity of plants on the forest.

Furthermore, forest ecosystems and the life they support have intrinsic values that underpin their social, cultural and economic importance. Flora provides ambiance to surroundings where they grow. Ambiance is a special quality, mood, climate, feeling, aura, atmosphere or tone that a particular thing's existence gives to an area. When people enjoy various Lincoln National Forest habitats, they receive mental and physical stimuli which produce states of relaxation, enjoyment, pleasure, satisfaction,

comfort, contentment, educational fulfillment and for some, spiritual renewal. Some examples of how forest plants calm, revive, and refresh a person's mind-set, thought processes, emotional tensions and mental health are described as follows:

- Mixed conifer and aspen replace urban traffic noise and desert heat with natural running water sounds and cool crisp breezes. The Sacramento Mountains populated with Douglas-fir and other evergreens are remote land areas in the Lincoln National Forest's highest elevations where many hours of solitude or family gatherings can be experienced in a relatively natural plant community.
- Visitors who view yucca, agave, ocotillo, mesquite and creosote bush develop an appreciation for plant diversity and survivability in harsh Chihuahuan Desert environments.
- Maples, aspen and oak leaves add a variety of brilliant colors to contrast to green stream bank vegetation when fall temperatures cover ponderosa pine and mixed conifer forests. As a result, special photography opportunities are available for forest visitors. New Mexico penstemon, cutleaf coneflower and columbine cover hundreds of acres with vistas of bright yellow, red, and blue flowers across high elevation wet meadow plant communities during spring and summer months. Those patches of flowers provide a unique beauty which can be enjoyed from car windows.

Socioeconomic Contributions of Wildlife, Fish, and Plants

The ability for visitors to hunt, fish, trap, and participate in wildlife and plant viewing is very popular in and around the plan area and a vital asset to the local economy. Activities involving wildlife, fish, and plants in the plan area contribute to economic sustainability through employment opportunities, support of small businesses, and federal receipts shared with local governments. The 2011 National Survey of Fishing, Hunting, Wildlife-Associated Recreation found that 913,000 New Mexico residents and nonresidents hunted, fished, or nature watched in New Mexico that year (U.S. Fish and Wildlife Service 2013). Around 566,000 residents and nonresidents participated in wildlife-watching activities, which included observing, and photographing wildlife; and wildflower viewing (U.S. Fish and Wildlife Service 2013). These participants contributed to economic sustainability in the plan area by spending approximately \$327 million in 2011 (U.S. Fish and Wildlife Service 2013). The same survey found that 278,000 New Mexico residents and nonresidents fished and 69,000 hunted in New Mexico in 2011, for a total of 347,000. According to a 2013 study, 53,524 participants fished or hunted in the four counties encompassing the Lincoln National Forest (Table 43).

Table 43 Sportsmen participation and expenditures in 2013

County of residence	Fishing (#)	Hunting (#)	Fishing	Hunting	Total
Chaves	3,729	5,395	\$ 4,863,862	\$ 8,727,242	\$ 13,591,104
Eddy	5,801	5,678	\$ 7,263,621	\$ 10,930,720	\$ 18,194,341
Lincoln	11,340	8,126	\$ 6,845,135	\$ 10,915,671	\$ 17,760,806
Otero	3,947	9,508	\$ 4,042,778	\$ 12,694,516	\$ 16,737,294

These participants spent approximately \$66,283,545 on these activities in the four counties (NMDGF 2014). In 2013, the effects of direct expenditures made by sportsmen who fish and hunt, along with the effects associated with these activities in the four county area supported more than 770 full and part-time jobs, providing more than \$21 million in labor income and adding \$5 million in state and local tax revenue (Table 44) (NMDGF 2014).

Table 44 Total number of jobs, income, and taxes generated from hunting and fishing in 2013

County	Jobs	Wages	State and Local Tax Revenues
Chaves	154	\$ 4,426,538	\$ 1,035,598
Eddy	181	\$ 5,503,196	\$ 1,094,505
Lincoln	225	\$ 6,582,499	\$ 1,522,534
Otero	210	\$ 4,853,489	\$ 1,438,123

Summary

New Mexico is one of the most biologically diverse states in the nation and the Lincoln National Forest is no exception. The Lincoln National Forest, as a sky island, acts as a reserve for many increasingly rare plant and animal species. As such, this unique set of natural resources and their associated habitat has important economic, biological, and cultural value to communities surrounding the Lincoln National Forest as well as visitors to the area. Wildlife, fish and plant associated recreational activities, such as hunting, fishing, wildlife and bird watching, plant collection, and plant viewing generate income for the local economy through spending on related specialized equipment, travel, food, and lodging.

The Forest Service maintains stewardship responsibility for the habitat of these valued plant and animal resources, 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. Factors affecting habitat for these plants and animals include increasing concerns with the spread of invasive plant species, feral hog impacts, uncharacteristic wildfires, and drought. These issues have the potential to strongly affect wildlife, fish and plant management in the future.

Stakeholder Input

This section summarizes input, perspectives, and feedback relevant to this assessment topic and received from the public between March 2015 and January 2016. Input was gathered from multiple public and group meetings, from online submissions, and from emails. Key expressed issues and concerns included health and intact wilderness areas and their ecosystems, access and multiple uses, effective communication, collaboration and involved decision-making. See the following sections for a more detailed list of these concerns, management suggestions.

Concerns/Issues:

Timber and Forest Products

- Substantial decline in timber harvest and fuels management due to environmental and other pressures
- Less use of timber marking to ensure retention of good trees and removal of diseased trees
- Limited roads and access for forest thinning
- Increase in illegal (non-permitted) use and harvest of forest resources (wood, minerals, etc.)
- Limited cleanup and completion of timber/logging projects
- Hire fire risk to residential areas/WUI due to unburned and residual slash/piles, incomplete timber projects
- Impacts from timber harvest operations such as roads and unburned and residual slash/piles

- Burning of slash/piles during drought periods
- Closing of sawmills, schools, and local business due to shutting down of commercial logging by the Forest Service in the 1980s
- Trend away from multiple use management and trend toward single species management (e.g., Mexican spotted owl)

Livestock Grazing and Water

- Overregulation of livestock grazing and not recognizing grazing rights
- Irrigation and spring development/use by agricultural interests are negatively impacting watersheds and fisheries
- Overregulation of springs and infringing on water rights
- Reduction of livestock use instead of increasing elk harvest
- Overgrazing and concentrated use by livestock
- Degraded range and grasslands associated with livestock use and poor management
- Livestock trespass and permit violations

Fish and Wildlife

- Reduced/limited fisheries and suitable waters and stream-based recreation opportunities
- The LNF provides important summer, winter, and calving habitat for elk
- Healthy elk populations and habitat
- Reduction of livestock use instead of increasing elk harvest
- Impacts to habitat, range conditions, ranching operations, and public safety due to overpopulation of elk
- Lack of facilities for fishing opportunities
- Less focus on fisheries and stream-based recreation management
- Excellent public access for hunters
- Impacts to vegetation and hydrology due to 300' travel allowance for motor vehicles use off of forest routes

Regulation, Education, Enforcement

- Increase in amount and extent of trash, illegal dumping; lack of enforcement
- Limited outreach to/education of public regarding forest uses and policies
- Too much regulation of non-impacting collection of forest products and materials

Management Suggestions:

Timber and Forest Products

- Thin and/or clear cut forests more to reduce risk of catastrophic fire
- Build more roads to improve access and forest management
- Employ forest management and sustained timber production/harvest to control regeneration of trees
- Restore watersheds and implement erosion control following fire and timber harvest
- Discontinue burning of piles/slash on site, have contractors remove the material from the site or use it for erosion control
- Promote and support growth of sawmill industry and alternative forest products such as pulp production

- Emphasize wildlife, habitat, water, and recreation values over others

Livestock Grazing and Water

- Address the environmental impacts of livestock grazing
- Decrease livestock grazing levels
- Reduce grazing AUMs and/or stocking rates
- Deny some livestock grazing permit renewal requests
- Close some livestock grazing allotments
- Give allotment management control to grazing permittees
- Recognize people's water rights
- Military training/activities must consider potentially adverse effects on livestock and wildlife (disturbance, safety, reproduction)
- Emphasize wildlife, habitat, water, and recreation values over others
- Reactivate a Grazing Advisory Board for the forest

Fish and Wildlife

- Emphasize wildlife, habitat, water, and recreation values over others
- Maintain large tracts of habitat for wildlife populations and hunting
- Military training/activities must consider potentially adverse effects on livestock and wildlife (disturbance, safety, reproduction)
- Improve watershed and fisheries with new reservoirs (e.g., Sacramento RD), ponds, water developments, and similar and stock w/ fish
- Maintain and enhance elk populations and habitat; make elk a focal species
- Work with New Mexico Game and Fish to improve elk population management (herd size and harvest) and hunter use, including trespass problems
- Include key game species in your vulnerability assessment
- Give livestock AUMs precedence over elk

Regulation, Education, Enforcement

- Implement more restrictions to protect forest resources
- Install more signage/direction regarding use of forest resources and camping
- Provide more trash cans and facilities to minimize littering
- Utilize social media and similar means to educate the public
- Military training/activities must be subject to ongoing review and modification as necessary

Conditions/Trends

Beginning in November of 2015 and concluding in January 2016 the Lincoln NF provided survey forms to assess the stakeholder's opinions on the 15 Areas of Interest. This data was compiled and assigned both an Area of Interest (AOI) as well as an Issue grouping.

The issue of "permits" received the highest number of comments with 13 followed by "thinning/treatments", "general recreation" and "wildlife" each with four. Nearly all of the issues the public felt were getting worse with the exception of general and general recreation which show a slight improvement. The "general" issue is a grouping of miscellaneous items such as back country aviation and military use which are discussed in detail within the [Infrastructure](#) and [Recreation chapters](#).

Summary of Findings for Multiple Uses

Conditions and trends are key to move into the next phase of our plan revision process because it tells us what may need to change and what may be working fine under current management direction. Conditions and trends have been discussed in detail within this chapter along with any trends that follow. In the overall trends section following are bulleted quick references to these trends. For further detail, please refer to the chapter sections for these subjects.

Overall Trends

Rangeland

- Competition to access to land near water sources is increasing
- Range condition is intrinsically linked to precipitation events
- Forage condition could be improved through increases in vegetative management
- Vegetative management is mostly done in association with multiple resources benefits
- Authorized and actual uses have remained relatively flat.

Forestry and Timber

- Selling timber has become a greater challenge since this closures of the local timber mills due to increased transportation costs.
- New development markets including pellets and biochar
- Change from past to present from product based to urban interface protection and general forest health improvement

Water

- Conservation of water is increasing
- Competition for water, especially in time of drought will continue to rise as populations increase

Fish, Wildlife, and Plants

- Elk permits have risen in costs for private hunts
- Habitat Stamp Program improvements have focused on repairing existing developments rather than building new
- Introduction of non-native aquatic species is on the rise, especially on privately owned lands.
- Invasive plant species, feral hog impacts, uncharacteristic wildfires, and drought threaten habitat

CHAPTER 6 - Recreation and Scenic Character

Introduction

In addition to sustaining multiple uses of the National Forest System land's renewable resources for current and future generations, one objective of the 2012 Planning Rule is to "broaden and deepen engagement of the American people in national forest planning" (36 CFR 1921.02). Participation in outdoor recreation activities 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 national forests, and that of public lands as a whole (USDA Forest Service 2010a). National forests and grasslands provide a wide variety of outdoor recreation opportunities that contribute to social and economic sustainability and provide opportunities to connect people with nature. Recreation provides a host of benefits to individuals, communities and society as a whole. The goal is to provide social, economic, and environmental benefits to users while preserving a protecting the character for which the recreation resources are established.

This chapter of the Assessment first describes the existing recreation settings, opportunities and access on the Lincoln NF and then discusses recreation in the context of economic, social and environmental sustainability. Finally, this chapter will identify key trends affecting recreation on the Lincoln, and within the broader landscape and will inform the next steps in the land use planning process by identifying information gaps, opportunities, and current and future trends.

Recreation Settings, Opportunities, and Access

Overview

The Lincoln NF provides a diverse range of recreation settings, across nearly 1.2 million acres ranging from the Chihuahuan Desert to subalpine forested mountains. Outstanding recreational opportunities from the most primitive and wild to the highly developed and are available throughout the year. During hot summer months, visitors enjoy the cooler temperatures in higher elevation forested areas; during winter, they seek both the lower elevation desert activities in the multi-hued canyons and Chihuahuan Desert environments and higher elevation snow activities in the peaks and valleys of the Sacramento Mountains (USDA Forest Service 2014a). The Lincoln NF consists of "sky islands," isolated mountain ranges surrounded by desert. One of the smaller forests in the west, the Lincoln NF has three distinct districts, each with its own personality and constituents.

Around the tourist town of Ruidoso, the Smokey Bear District consists of the White, Capitan, Jicarilla, and Carrizo Mountains, and the hills above Highway 70 east of Ruidoso Downs. Both of the Lincoln NF's Wilderness areas, comprising about 82,924 acres, are located within this district and a large amount of equestrian use and outfitter/guiding for hunting occurs here. Mountain biking is popular and walking and biking trails close to town have been developed in partnership with local agencies and organizations. The southern-most major ski area in the United States sits on both the District and the Mescalero Apache Reservation offering snow-based activities in the winter, zip lining in the summer.

The Sacramento District has the majority of developed campgrounds on the forest and is a destination for motorized trail riders. Encompassing about one-half of the forest, this district is the largest contiguous area of forest and is also provides special use permits to outfitter/guides for hunting in this area. Locals are proud of their railroad logging history, which they highlight with their rail trails. The

clear skies of the Sacramento Mountains make this area popular for astronomers, both professional and amateur. The western boundary of the Sacramento District abuts the eastern edge of Alamogordo.

Adjacent to Carlsbad Caverns, the Guadalupe District draws cavers from all over the world to explore undeveloped caves. Fall brings hunters to the steep ridges and canyons of this district and its oasis in the desert, Sitting Bull Falls can be busy year-round.

The Lincoln NF offers interpretive information at the District offices and at sites throughout the forest including popular recreation sites such as Sitting Bull Falls and the Mexican Canyon Trestle Vista, at overlooks such as Five Points Vista, Haynes Canyon Vista, and the West Capitan Vista, and at more remote sites like Nelson Canyon and sites along various rail trails. Visitors appreciate having information available; therefore, the Lincoln NF has the opportunity to improve visitor satisfaction by making more information available whether on signs at the site, through guided hikes or through electronic means. Signs have high upfront costs, lower ongoing costs, and may be damaged inadvertently or by vandals. Guided hikes and electronic means have ongoing costs as they require employees, partners or volunteers for implementation.

In 2008, the Lincoln NF developed a recreation niche statement and setting map through the recreation facility analysis process. The niche statement describes the unique characteristics, opportunities, settings, and activities of the Lincoln's recreation program. The recreation niche settings (represented in Figure 35) are spatial representations of the potential opportunities and activities available across the Lincoln. It should be noted that an effort to redefine the 'niche' areas would be advantageous to overall management. In 2008, data that is now readily available such as ERUs, was not available and mapping methodologies were done based upon standards of the day. This data, with the same guidelines, could much more precisely map a more accurate geospatial distribution.

The four principle settings, special places, and values from the 2008 Recreation Facility Analysis are detailed in Figure 35, which include climatic relief zones, dispersed use, scenic corridors and recreational site nodes. Visitors experience a diversity of life zones, from desert canyons and mesas to pinion-juniper woodlands and subalpine forests. Sitting Bull Falls presents a unique opportunity for water play during the spring and summer months and the Permian Reef entices visitors nationally and from abroad to explore the geology and biology of this Karst topography. Steep and narrow canyons and other lower elevation areas offer warmth during colder months. Heritage attractions such as CCC sites, the Trestle and lookout towers showcase the history of the forest. Partnerships like the Sunspot observatory and the rails-to-trails program have enhanced the forest's recreation offerings. Families and retirees appreciate the diversity of day use recreation opportunities.

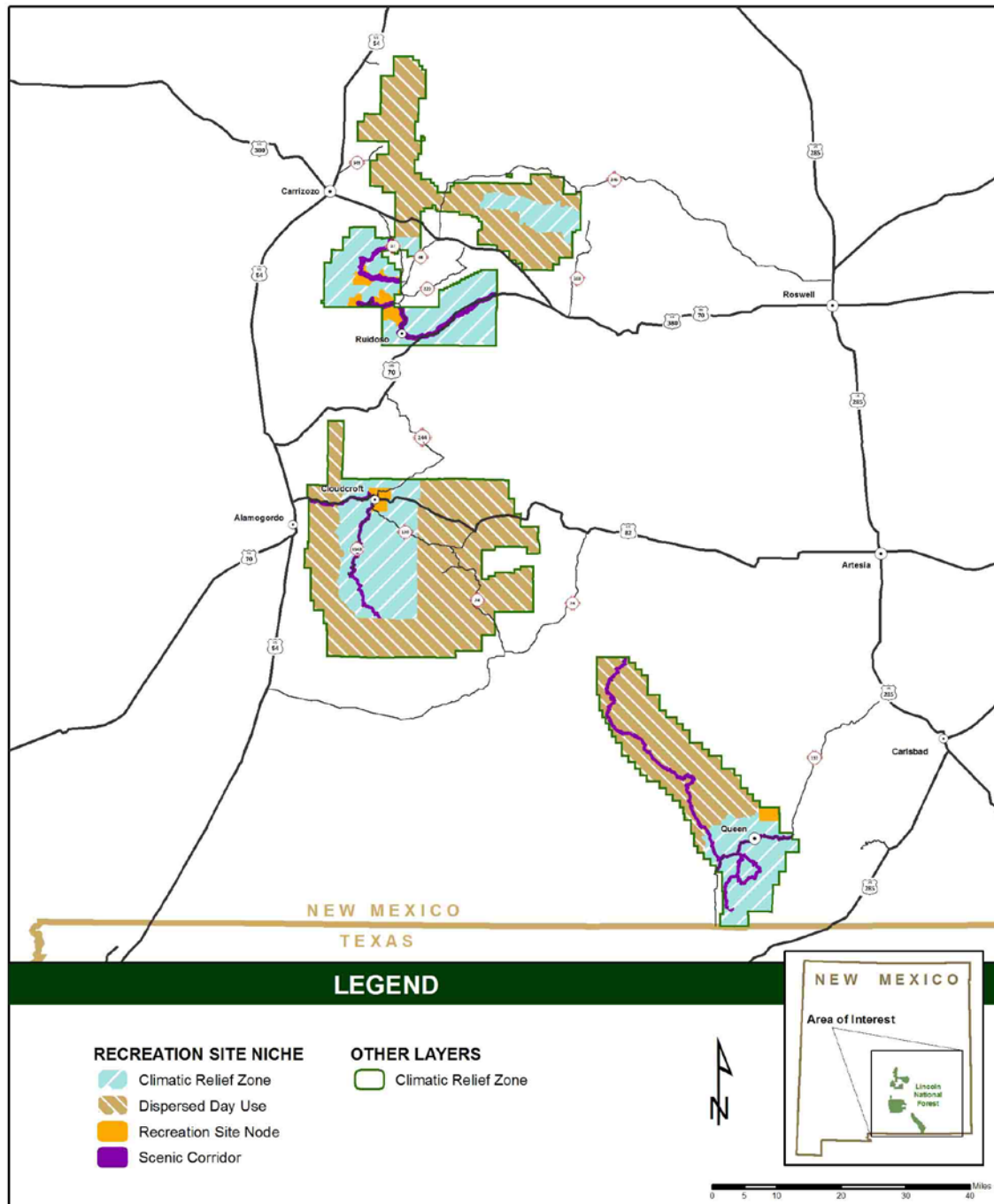


Figure 35. Recreation Site Niches for the Lincoln NF

Conditions and trends of these niches are affected by multiple factors including vegetative health, natural fire scars, increased local and visitor populations to name but a few.

- Climatic relief zones, although defined mostly by elevation, have been impacted by natural wild fires and insect and diseases in different locations. These areas have seen a slight decrease in quality within the affected areas.

- Dispersed day use has remained relatively stable. Many of the areas available for such use are limited due to geomorphology of the landscape with other, more remote areas visited mostly by hunters.
- Scenic Corridors has been affected in some areas by both fire scars and insect and disease (generally a more temporary affect). A future trend affecting the Sunspot Scenic Byway could be the transitioning of the aspen seen along its edges into mixed conifer. Many of these stands of aspen are reaching old growth stage. The aspen is the principle draw along this route during the autumn.
- Recreation site nodes are currently in good condition but with the current and future trend of greater local and visiting populations, these sites could receive damage. This will more than likely increase costs to maintain them to expected standards, visually and safety wise.

A future data need recommended would be to reevaluate the Niche data for the Lincoln NF utilizing more accurate GIS data such as our Ecological Response Unit vegetation types not available at the time of the initial study. The results of this would not necessarily change the concepts, merely the spatial representation of the areas to a more updated version.

Recreation Opportunity Spectrum

The Forest Service uses a concept called the Recreation Opportunity Spectrum (ROS) to provide a variety of recreation opportunities that can be enjoyed in diverse settings. A recreation opportunity is defined as “the opportunity to participate in a specific recreation activity in a particular recreation setting to enjoy the desired recreation experiences and other benefits that accrue.” Recreation opportunities include non-motorized, motorized, developed, and dispersed recreation on land, water, and in the air. The social, managerial, and physical attributes of a place, when combined, provide a distinct set of recreation opportunities.

The Recreation Opportunity Spectrum 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. The Recreation Opportunity Spectrum class characterizations are described in the following section, and those on the Lincoln NF are displayed in Figure 36.

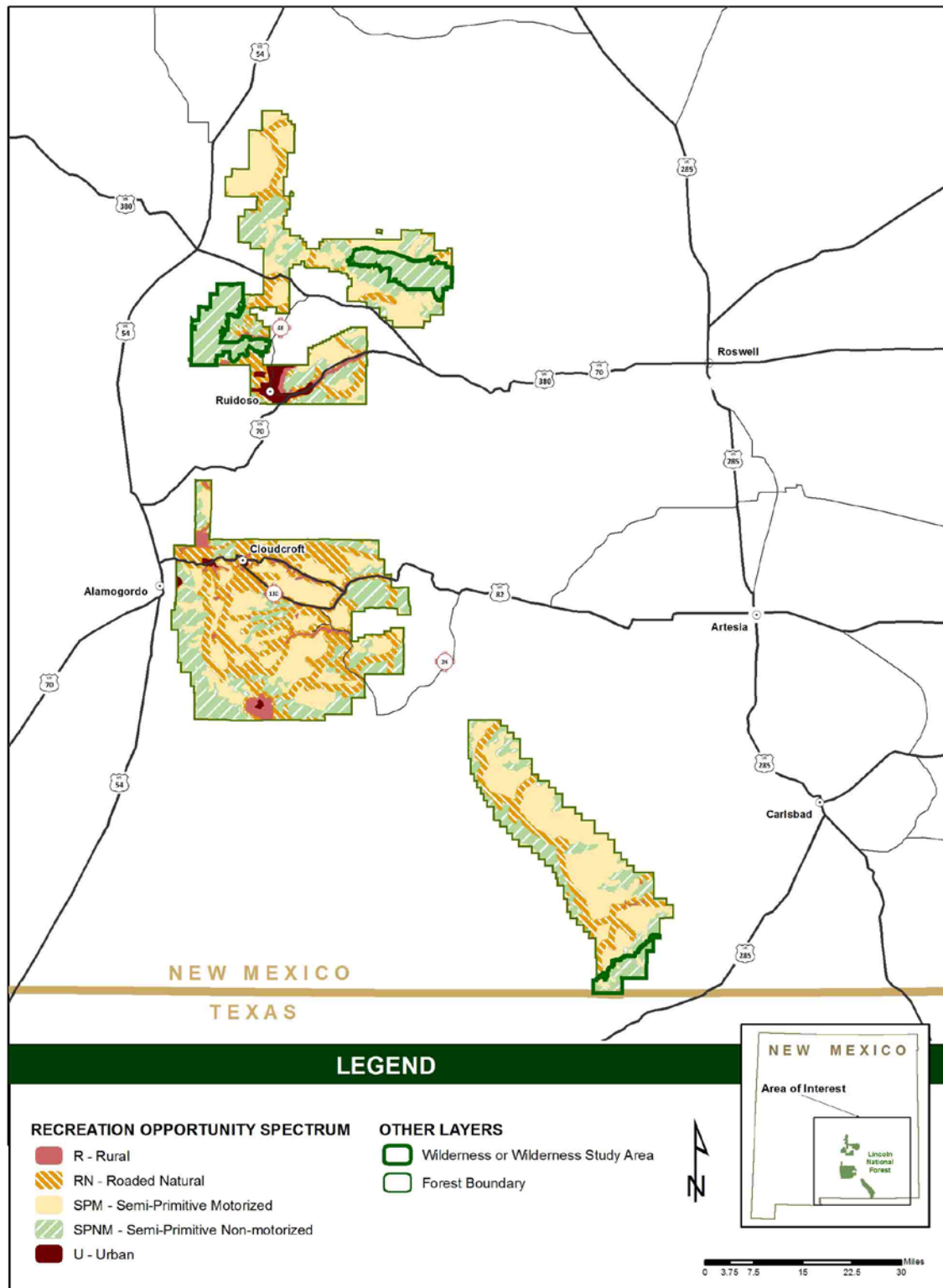


Figure 36. Recreation Opportunity Spectrum on the Lincoln NF

ROS Class Characterizations are listed as follows:

- **Primitive (P):** 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 control. Motorized use within the area is not permitted.
- **Semi-Primitive Non-motorized (SP):** 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. The area is managed in such a way that minimum on-site controls and restriction may be present, but are subtle. Motorized use is not permitted.
- **Semi-Primitive Motorized (SPM):** 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. The area is managed in such a way that minimum on-site controls and restriction may be present, but are subtle. Motorized use is permitted.
- **Roaded Natural (RN):** Characterized by predominantly natural-appearing environments with moderate evidences of sight and sounds of man. 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. Conventional motorized use is provided for in construction standards and design of facilities.
- **Rural:** Characterized by substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sight and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate densities are provided for, away from developed sites. Facilities for intensified motorized use and parking are available.
- **Urban (U):** Characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resources modification and utilization practices are to enhance specific recreational activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans, onsite, are predominant. Large numbers of users can be expected, both on-site and in nearby areas. Facilities for highly intensified motorized use and parking are available, with forms of mass transit often available to carry people throughout the site.

Recreation opportunity settings represent a range from a very high probability of solitude, self-reliance, challenge and risk to a very social experience where self-reliance, challenge, and risk are less important. 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.

Table 45 shows the Recreation Opportunity Spectrum class distribution redone and completed in 2016. The revised inventory much more accurately represents the existing conditions on the Lincoln NF and will be used to help define desired conditions for the plan revision process.

Since the initial 1986 inventory, communities within and adjacent to the Lincoln NF have grown in population size and development. This change has led to an increase of rural class acres and the addition of urban class acres on the Forest. New uses and demands have encroached on areas within the less developed end of the spectrum, shifting more acres into the roaded natural class. This is likely due to the increased pressure from off-highway vehicle use and proliferation of motorized vehicle routes in many areas, and due to the general increase in visitation and associated changes in the social settings. Conversely, new protection measures on acres where threatened and endangered species occur have shifted acres from the semi-primitive motorized to the semi-primitive non-motorized. Due to the proximity of urban development and the abundance of system roads that run adjacent to the Lincoln's Wilderness Areas, the Forest does not contain any primitive class acreage.

Table 45. Recreation Opportunity Spectrum Classes for the Lincoln NF

Recreation Opportunity Spectrum Class	Acres	Percent of Forest
Primitive	0	0 %
Semi-primitive Non-motorized	370,548	30 %
Semi-primitive Motorized	491,234	39 %
Roaded Natural	341,674	27 %
Rural	38,949	3 %
Urban	18,417	1 %

Types of Recreational Opportunities Currently Available

A wide range of recreation activities and settings are available on the Lincoln NF, resulting in recreation opportunities that range from semi-primitive non-motorized to highly-developed on the Recreation Opportunity Spectrum. As described in the recreation niche statement, primary recreation opportunities on the Lincoln include climatic relief from the summer heat, easily accessible day use activities in dispersed settings, scenic touring, and opportunities for family gatherings in developed sites.

According to the 2014 National Visitor Use Monitoring results, visitors participate in a variety of activities, with the most popular being viewing natural features, hiking and walking, relaxing, and driving for pleasure. Over 73 percent of the visiting population participates in viewing natural features while on the Lincoln; nearly 40 percent of that report that it is their primary activity. On average, those visits that participate in viewing natural features spend just under 4 hours participating in the activity. Another 34 percent of visits participate in hiking and walking while on the Lincoln with nearly 17 percent stating that it is their primary activity. Almost 40 percent of the visiting population participates in wildlife viewing, although for most that is not the primary activity. Popular specialized activities include scenic byway touring, visitor center and museum stops, and interpretative displays. More traditional activities such as camping and skiing are also popular (USDA Forest Service 2009a).

Recreation Access

Recreational access to the Lincoln NF is generally good. A network of State highways and county roads provide access to national forest roads and trailheads from the various metropolitan areas and smaller surrounding communities. A well-developed network of road and trails provides a variety of non-motorized and motorized recreational experiences. The Lincoln NF manages 128 non-motorized and 57

motorized trails covering nearly 550 miles and 927 miles of motorized routes on roads open for use by high clearance vehicles (Maintenance Level 2). Other infrastructure that provides recreational access includes trailheads, parking lots, vistas, and other developed recreation facilities. The [Infrastructure chapter](#) provides additional detail about the road and trail system.

A “Values, Attitudes, and Beliefs” study was conducted for the Lincoln NF in 2006 to assist forest managers in identifying local perspectives of key management issues and concerns. Participants in the study’s discussion and focus groups indicated that with the perceived increase in recreational use of Lincoln NF lands and resources, education and enforcement are among the most valued activities. Management closures of roads and trails as a means to curtail misconduct and an approach to trail resource improvements are among the specific concerns of participants (Russell and Adams-Russell 2006).

Roads, Trails, and Other Infrastructure

Whether by full size four-wheel drive, utility-terrain vehicles, four-wheelers, or motorcycles, off-highway vehicles are one of the primary means of access to recreation activities on many national forests, including the Lincoln NF. Off-highway vehicle use on public lands has continued to increase nationwide, and the increase in New Mexico is amplified by the ever-increasing population and opportunities for year-round use.

Roads

The Lincoln NF has a travel management plan that designates a system of roads and trails open for motorized vehicle travel. Open roads and trails are designated as such on the Lincoln NF’s Motorized Vehicle Use Map (MVUM). The Lincoln NF has worked to physically close roads that are not part of the open transportation system by installing gates, berms, or otherwise blocking vehicular passage. Some roads that are not part of the open transportation system are not physically closed, causing confusion for some visitors.

There are many locations on the Lincoln NF where the public has historically been allowed informal access to the forest through private land. As times and owners have changed, some people have chosen to gate or otherwise close public access through their private land to roads and trails on the national forest, frustrating visitors. The forest aims to acquire legal access to popular forest sites where possible, but right-of-way acquisitions are rare for a variety of reasons. This trend of reduced access through private land is expected to continue in the coming years.

Trail Use

In the National Visitor Use Monitoring data, activities with the highest participation on the Lincoln NF include hiking, walking, viewing natural features and viewing wildlife. Approximately, 40 percent of visitors to the forest participate in non-motorized trail activities while only 3 percent participate in motorized trail activities.

Motorized Use on Roads and Trails

Motorized trails are recreationally and economically important to New Mexico. OHV riders share some facilities with campers, equestrians, hikers, and mountain bikers and desire similar experiences such as solitude and scenery, yet often have different impacts than most other recreating populations.

Motorized activities are attractive to out-of-state visitors and New Mexico is well-positioned compared with nearby states. However, planning and design for motorized recreation must be cognizant of user

conflicts, reducing environmental impacts, and increasing visitor experience. New Mexico does offer many OHV trail opportunities, however additional advertising would expand these opportunities where appropriate and draw in the motorized tourism dollars that would help many rural communities. OHV organizations can assist with design, construction and maintenance of motorized trails, and assist management agencies with educational outreach to ensure appropriate OHV use.

The Lincoln NF is very popular for motorized off-highway vehicle recreation, including four-wheel drive vehicles, utility terrain vehicles, four-wheelers and motorcycles. Motorized cross-country travel is restricted on the entire forest per the current forest plan and the Lincoln NF's Travel Management Plan. The Travel Management Plan designated a system of roads and trails for motorized vehicle travel. Additional detail about the forest road and trail system is located in the [Infrastructure chapter](#).

Off-highway vehicle use is predominately higher on the Sacramento Ranger District where two-thirds of the trail system (55 out of 86 trails) is designated for motorized use and the road system is larger. The Sacramento Ranger District is known for its motorized trail system and is preferred by many of those that visit the forest. Due to this popularity, a lot of user-created motorized trails exist on the district. This creates a spaghetti of trails for all users and degrades the landscape on the forest. In addition, illegal motorized use of closed roads has significantly grown with the popularity of this activity. Demand for motorized opportunities are expected to increase, and off-highway vehicle recreation will continue to be one of the main recreation opportunities provided by the Lincoln NF.

Non-Motorized Trail Use

The Lincoln NF trail system includes 128 non-motorized trails, totaling over 330 miles (USDA Forest Service 2014a), in settings from the Chihuahuan Desert to the Sacramento Mountains. The trails provide opportunities for short duration day hikes and rides with easy access as well as long distance travel in more remote settings. The popularity of trail-based recreation on the Lincoln NF is likely based on ease of access, proximity to urban areas, and low-cost of equipment or investment for activities such as hiking and biking. Popular non-motorized trail based activities include hiking, backpacking, horseback riding, and mountain biking. Additional detail about the trail system is located in [the Infrastructure chapter](#).

Mountain Biking

Mountain biking is hugely popular in Ruidoso and there are many opportunities provided by the Lincoln NF, the Bureau of Land Management, the Mescalero Apache Indian Reservation and the Village of Ruidoso. The Smokey Bear Ranger District has been vigorously expanding its trail system and connections to other locally managed mountain bike trails to provide longer distance routes and loops with scenic views. The district has active partnerships with the Village of Ruidoso, Bicycle Ruidoso, and EcoServants that participate in trail activities on the forest and around the Village of Ruidoso. The Village of Cloudcroft is another popular mountain bike community located in the Sacramento Ranger District.

Equestrian Use

Equestrian use occurs across the Lincoln NF with more than 250 miles open to equestrian use. Two equestrian outfitters are currently permitted on the Lincoln. The most popular areas are the Smokey Bear and Sacramento Ranger Districts. Most of the equestrian use on the forest is on the Smokey Bear Ranger District, concentrated primarily in the two Wildernesses. Fire scars have caused use on the Sacramento Ranger District to increase as users seek new areas to recreate in. Some trailheads on the Smokey Bear Ranger District are designed specifically to accommodate equestrians.

Trail Maintenance Issues

In 2013, the Government Accountability Office² was asked to review the Forest Service trails program and examine funding and staffing resources, the extent to which the agency is meeting trail maintenance needs, and factors that might complicate agency trail maintenance efforts. The Southwestern Region of the Forest Service (Arizona and New Mexico) was included in that review.

In general, the 2013 report on Forest Service trails recommended that the Forest Service analyze trails program needs and available resources and develop options for narrowing the gap between them. The results of the review accurately reflect the condition of the Lincoln's trails program.

The findings of the Government Accountability Office review indicate that 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.

For example, many trails were created for purposes other than recreation, such as access for timber harvesting or firefighting, and some were built on steep slopes, leaving unsustainable, erosion-prone trails that require continual maintenance. 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. The Lincoln typically maintains approximately 20-25 percent of the forest trails annually. 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. It is likely that the Lincoln NF will look to close trails that are deemed unused, underutilized, or no longer existent due to large fires impacting trail condition and location. In addition, trails will likely be redesigned to meet trail sustainability standards as funding allows.

Overnight Use of the Lincoln in both Developed and Undeveloped Settings

With 16 developed campgrounds, 6 group campgrounds, and 3 dispersed developed areas, a variety of camping opportunities are available throughout the Lincoln NF. Varying levels of facilities are available from highly developed campgrounds to minimally developed campgrounds. Some campsites are first-come first-serve while others require reservations through www.recreation.gov.

Many years ago when Forest Service campgrounds were first built, families camped in tents and small trailers towed behind their vehicle. Today more national forest campers come in larger trailers and RVs, requiring campgrounds with larger sites and more space for backing and turning. We expect this trend to continue for many more years. Over the last 20 years, the well-used campgrounds on the Lincoln NF have been rebuilt to better reflect those current uses. Campgrounds farther off the beaten path and more appropriate for tent or small campers have been getting less visitation, such as Monjeau Campground, making them harder to manage efficiently due to distance and cost. Therefore, we have closed campgrounds or reduced the number of campsites where they were not being well-used and have rebuilt and improved popular campgrounds to better serve current visitors. With appropriate maintenance, campgrounds should remain in good condition for many years.

Family campgrounds range from minimally developed sites like Skyline Campground adjacent to the White Mountain Wilderness and most appropriate for tent camping to sites like South Fork or Silver

² The Government Accountability Office is a Federal agency that works for Congress to audit Federal agencies and programs that receive Federal funding.

Campgrounds where some visitors camp in tents while others use their RVs, to Silver Overflow Campground, a large paved area utilized by large RVs and people with mobility issues. Except for a few remote campgrounds, our family campgrounds are filled to near capacity many summer weekends and an open site can't be found on holiday weekends. During the week all but the most popular campgrounds have available sites.

The Lincoln NF's highly popular group campgrounds have large grills, fire-rings, picnic tables, shelters, restrooms and water. Group campgrounds are generally reserved as soon as they can be for all summer weekends. Like the family campgrounds, group campgrounds are often available during the week.

Although some of the developed sites on the Lincoln receive heavy visitor use, the developed facilities are thought to be adequate to meet demand. Most of these facilities are in good condition and trending at a flat rate due to minimal recreational infrastructure and sufficient funding to maintain the sites, keep trash cleaned up, maintain signs, provide law enforcement, provide stable parking surfaces, and maintain water quality. Although allocated funding has been declining, funds generated on the Forest in recreation sites and the management of concessionaire-run facilities makes up for the decline. Some sites have been temporarily closed due wildfire and/or flood damage. Those sites are repaired, altered if needed, and reopened as funding allows.

Dispersed camping is allowed within most areas of the Lincoln NF. Generally, dispersed camping is more popular at higher elevations on Smokey Bear and Sacramento Ranger Districts from May through September. Heavy concentrations of dispersed use are found along main access points to the national forest, near water sources, along scenic and well maintained roads, and along major access points to the trail system. The Guadalupe Ranger District and the low elevations areas of the Smokey Bear and Sacramento Ranger Districts are generally more popular during cooler seasons. During hunting season, many hunters set up dispersed campsites in their favorite hunting areas. Due to funds mostly being used for developed recreation, some of the dispersed recreation areas have little attention throughout the year. At times, garbage is left in the sites for animals or the next campers. Many times campers will move on to another location due to the debris left by someone else. Some campers will act as stewards and will clean up what has been left by others. With the number of dispersed campers increasing and allocated funding decreasing this is going to be a growing concern. Volunteers have begun to help to fill this gap.

Picnicking

A popular day use activity on the Lincoln NF is picnicking. There are 6 picnic sites within the national forest. Demand for picnicking and large group day-use facilities is expected to continue with the potential to grow as most visitors to the Lincoln NF come for the day only.

Wildlife Viewing

Wildlife watching was one of the top three activities noted in the resident and visitor surveys conducted for the 2015 Viva New Mexico: A Statewide Plan for Outdoor Adventure. The National Survey of Fishing, Hunting and Wildlife-Associated Recreation conducted in 2011 found that 913,000 New Mexico residents and nonresidents participated in wildlife-related recreation (hunting, fishing and wildlife watching). Of the total number of participants, 566,000 participated in wildlife watching (U.S. Fish and Wildlife Service 2011). Comparison of the survey results from 2001 and 2006 show that participation in wildlife watching changed significantly. From 2001 to 2006 participation in wildlife watching increased by 68 percent and from 2006 to 2011 it decreased by 40 percent. National trends point to a 9 percent increase in non-consumptive wildlife recreation from 2001 to 2011.

Several events focus on watchable wildlife opportunities on the Lincoln NF such as Christmas Bird Surveys and Bat Bio Blitz. Most visitors to the Lincoln NF actively pursue watching wildlife from forest roads, trails, recreation areas, and from private property throughout the mountain communities within the Forest.

There are several Important Bird and Biodiversity Areas that are recognized as being globally important habitat for the conservation of bird populations, described in detail in the “Wildlife, Fish, and Plants” section of this Assessment (see Volume I). This program is administered by the National Audubon Society and includes the following important bird areas on the Lincoln NF: Hondo Valley Important Bird Area on the Smokey Bear Ranger District and Peñasco Canyon Important Bird Area on the Sacramento Ranger District.

Hunting and Fishing

Hunting is regulated by the New Mexico Game and Fish Department and allowed on the Lincoln National Forest during open seasons with the appropriate permits. The Lincoln NF is located within New Mexico Game and Fish Department’s Game Management Units 30, 34, 36, and 37 with opportunities for hunting deer, elk, bear, cougar, pronghorn antelope, Barbary sheep, javelina, oryx, raccoon, badger, weasel, fox, ringtail, bobcat, quail, dusky grouse, pheasant, Eurasian collared-doves, squirrel, turkey, and several migratory game birds. (New Mexico Game and Fish Department 2016). Elk hunting is popular in the Sacramento and Smokey Bear Ranger Districts but the highest amount of turkey hunts in the New Mexico are in the Sacramento Ranger District. Although the districts receive complaints about too many competing outfitter/guide permits, a Capacity Analysis completed in 2015 indicated that the capacity for these types of permits on the Lincoln has not been met at this time.

Fishing opportunities on lakes, ponds, rivers and streams throughout the Lincoln NF is extremely limited. Because of the relative lack of permanent water or streams on the Forest, there are few streams that potentially harbor fish. Of those that do contain fish, the majority are non-native, introduced species. Popular fishing areas on the Lincoln NF include Three Rivers, Sacramento, Rio Peñasco, Fresno, and Bonito.

Outdoor sportsmen and women can have a very positive effect on the natural landscape when they follow the rules and regulations. However, if they do not and leave garbage, travel where they are not supposed to, or camp in areas they are not allowed to camp, etc., damage will be done.

Interpretive Sites

There are eight interpretive sites within the Lincoln NF that provide visitors information about the national forest and surrounding areas. These sites are typically monitored infrequently. Sites are rarely used to well-loved, some are highly visited especially from May to September by visitors to New Mexico even though they generally have low level development. Benign neglect to vandalism and outdated information is seen in most of the sites due to infrequent Forest Service presence and higher priorities. Without volunteers or funding for minimal costs to keep sites hosts at sites, neglect and vandalism will continue costing the forest and our visitors’ the loss of our history.

Heritage and Cultural Site Education and Exploration

The Lincoln NF has a rich heritage program with thousands of prehistoric and historic cultural sites. Many of these sites are sensitive and not advertised to recreation visitors. Several sites have been

developed to provide public interpretation and education through publications, brochures, and exhibits at developed recreation sites (USDA Forest Service 2014a).

Interpreted heritage resource sites on the Lincoln include Sitting Bull Falls Recreation Area, Mexican Canyon Trestle, Sunspot Observatory and Monjeau Lookout. Sitting Bull Falls Recreation Area is a very popular Civilian Conservation Corps site on the Guadalupe Ranger District with an interpretive trail, paved parking, picnic ramadas, toilets, swimming areas and waterfalls. The Mexican Canyon Trestle is a 19th and 20th century railroad and logging site on the Sacramento Ranger District with a parking area, interpretative signage and an overlook platform. Sunspot Observatory, on the Sacramento Ranger District, contains an interpretative trail, a visitor center, a picnic area, and restrooms. Monjeau Lookout is another very popular Civilian Conservation Corps site on the Smokey Bear Ranger District with interpretive signage, a stone cabin and lookout tower with scenic views and a toilet. Additional information is included in the [Cultural and Historic Resources chapter](#) of this Assessment.

More of these sites could be developed, saving heritage and cultural locations from vandalism, time and the natural elements if funding were available.

Recreational Shooting

Recreational target shooting is a popular activity across the entire Lincoln NF, with the Smokey Bear Ranger District having the only shooting range on the forest. While recreational shooting is an activity that is allowed when conducted in compliance with State and Federal laws, there are several potential problems that may arise. This is a growing activity in both popularity and demographics across the nation and has been popular in the West for decades. Another more recent development has been in the change in use of the types of guns being shot. With the current national and global climate of growing need for personal safety, recreational target shooting will grow.

Several areas in the Lincoln NF are currently closed to shooting to protect public safety and resources.

There is one permitted shooting range outside Ruidoso Downs on the Smokey Bear Ranger District which is located directly adjacent to private lands. Most of the public accepts and appreciates it as a safe place to shoot, however, nearby residents find it noisy and disruptive. In the past, the area immediately adjacent was less dense and recent housing developments have pushed the residential use on private lands very near the gun range. Another more recent development has been in the change in use of the types of guns being shot. Residents now hear automatic and semi-automatic shooting which is louder but they also feel that the users are less respectful of the nearby residents than in the past. Work needs to be done in the future to ensure that permitted uses such as gun ranges be located in places where this type of conflict cannot occur.

Dry Canyon on the Sacramento Ranger District has been used for recreational shooting for many years. Historically, visitors drove up, down and across the canyon to access favorite shooting areas and to separate themselves from other shooters. This caused resource damage and accumulated refuse from shooting. Although mitigations have been implemented, the area continues to receive high use most weekends and intermittent use during the week. Because the Lincoln NF is located in a rural area with a tradition of gun ownership and hunting, the demand for recreational shooting areas is expected to maintain or increase during the coming planning period.

Caving

Caves on the Lincoln NF provide unique and varied recreational opportunities ranging from first-time novice caving experiences to very experienced expedition-class cavers. The typical user groups include the organized caving community with grottos (chapters) affiliated with the National Speleological Society and other local groups and organizations such as scouting groups. There are known caving areas on the all three ranger districts, with the most being on the Guadalupe Ranger District. All caves on the Lincoln NF are designated as “significant” and require a permit to enter per forest orders. The location of significant cave resources is protected under the Federal Cave Resources Protection Act. Cavers typically learn the location of caves from others in the caving community, and this information is not widely shared to protect these often fragile resources.

Conclusions on Current Offerings on the Lincoln NF:

As discussed previously, the dispersed user group is identified as the primary user group of the forest and recreate in a variety of forms from hunting and fishing to hiking and scenic driving. Although access is currently thought to be adequate, as populations increase it is likely that visitors would like more access points to the Lincoln NF. Although new rights-of-way would be difficult to acquire, the Lincoln NF could revisit the Travel Management Plan to reevaluate use patterns and offering. It is unlikely though that changes in Travel Management would be at the pace of future desired uses from the public.

The variety of dispersed uses can create conflicts between types of use. This is predominately occurring between the non-motorized and the motorized uses throughout the Lincoln NF. There is a large concentration of this within the highly motorized use areas of the Sacramento Ranger District. Motorized users recreating trespass into non-motorized areas creating disruptions to non-motorized recreationists and creating unauthorized routes. User conflict between motorized and non-motorized uses is expected to continue and possibly increase.

In addition, conflicts also exist between various types of motorized recreational vehicles (off-highway vehicle types). Conflicts between off-highway vehicle types occur between full-sized four-wheel drive vehicles, utility task vehicles, all-terrain vehicles, and off-road motorcycles because of preferences for width of routes, distance travelled, and speed. Full-sized four-wheel-drive vehicles and utility task vehicles prefer wide routes and traveling long distances since they drive in comfort with their supplies and soft seat. All-terrain vehicles and off-road motorcycles look for narrow, short routes since they cannot carry supplies and exert more energy riding. In addition, full-sized four-wheel-drive vehicles and utility task vehicles tend to drive slowly around corners due to them being larger and heavier so they are more difficult to maneuver than the lighter weight all-terrain vehicle and off-road motorcycles that travel fast around corners. It is especially dangerous conditions when the different types of motorized recreational vehicles meet at blind corners or narrow passages where there is poor visibility.

The existing transportation system on the Lincoln NF includes motorized trails specifically dedicated to all-terrain vehicles or off-road motorcycles. There are no trails dedicated to vehicles over 50 inches wide, so other motorized trail users, specifically utility task vehicles, illegally use these designated trails. This results in conflicts between larger off-highway vehicle types and smaller off-highway vehicle types. Lack of a designated trail system on the Lincoln NF for full-sized four-wheel drive vehicles and utility task vehicles does not provide for a diverse range of safe motorized recreation opportunities and does not meet the expectations or desires of off-highway vehicle users.

Conflicts occur between mountain bike users and equestrians especially when they meet at blind corners or narrow passages where there is poor visibility and one is going faster than the other. The

same conflict occurs between mountain bike users and equestrians when they meet hikers at blind corners and the mountain bike users and equestrians are going faster.

In order to provide a quality recreation experience, conflicts between dispersed user groups need to be addressed.

Recreation Opportunities on Other Lands

Other public land outdoor recreation providers within 60 miles of the Lincoln NF include the National Park Service; Bureau of Land Management; New Mexico State Parks; tribal lands; Otero, Lincoln, Chaves and Eddy Counties; and numerous cities and towns. There are a number of private outdoor recreation providers; however, they do not offer the same land base or variety of recreation opportunities as public providers and are not included in detail in this Assessment. Some of these other land-based agencies do provide opportunities similar to those on the Lincoln; however, they do not have the same unique land base or topography that the Lincoln has to provide these opportunities and therefore offer a different experience and are not in competition with the opportunities provided on the Lincoln NF. Other areas do not have similar goals or desires to provide similar opportunities for the visiting public. This places the Lincoln in a unique position to provide the public with many varieties of opportunities for recreation.

Generally, coordination and management across jurisdictional boundaries is good. One challenge is coordination of management adjacent to State lands that can be sold for other purposes as these lands are managed for the economic wellbeing of the State (including the public school system) and not as public land for general public use per their legislation. Coordination with the Mescalero Apache Indian Reservation adjacent to the Lincoln NF, particularly with the Ski Apache area, has been positive and has complemented recreation opportunities available on the Lincoln. Coordination with the Carlsbad Caverns and Guadalupe Mountains National Parks has also been positive. Both parks have been working with the Lincoln to connect individual agency trail systems for expanded public recreational opportunities. Oliver Lee State Park and the Lincoln NF has been cooperating for multiple decades by co-managing one of the most popular trails in the Alamogordo area. The Lincoln NF and the BLM are working together to explore the Snowy River Cave which is underneath both jurisdictions.

One concept that has been introduced recently across all recreation opportunity providers, ranging from federal, state, and private servicers is the concept of sustainable recreation. The next section will explore this concept as it relates to the Lincoln NF and will identify some trends in economic, social and environmental sustainability.

Sustainable Recreation

In 2010, the Forest Service developed an approach to recreation called “Framework for Sustainable Recreation” ([USDA Forest Service 2010a](#)). This document provides strategic direction for the Forest Service:

“to unite diverse interests, create and strengthen partnerships, focus scarce resources on mission driven priorities, connect recreation benefits to communities, provide for changing urban populations, and most importantly, sustain and expand the benefits to America that quality recreation opportunities provide.”

The goal of the Framework for Sustainable Recreation is to:

- Provide a diverse range of high-quality natural and cultural resource based recreation opportunities,
- 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, sound investments, and accountability; collaborative approaches to integrated solutions across the landscape; and enhance professionalism of our workforce.

Building upon the strategic guidance for sustainable recreation, the 2012 Planning Rule recognizes the role the recreation program plays in supporting the overall Forest Service mission of sustainability and requires that national forests identify sustainable recreation opportunities during plan revision (36 CFR 219.19 and 219.8) as sustainability is only possible when recreation is integrated with all other agency programs. Similarly, national forests are vital to the sustainability of many rural and urban communities. Thus, national forest recreation plays a key role in the economic vitality, social stability and environmental integrity of these communities.

The sustainability of recreation opportunities on the Lincoln NF depends on the balance among economic, social and environmental conditions, commonly known as the three spheres of sustainability. In recent years, the Lincoln National Forest has assessed the sustainability of the recreation program through the recreation facility analysis and by creating a sustainable recreation strategy. This strategy has combined the National Forest's guidance on recreation management, assessed the developed recreation sites through a recreation analysis, and has reviewed visitor use data. These are described in more detail below.

Recreation Facility Analysis

In 2006 the Lincoln NF began a comprehensive analysis of the existing recreation facilities to evaluate how these facilities might operate more efficiently while receiving the required maintenance. This was an inward evaluation of what the Lincoln NF offers to the public, the financial costs of facilities and visitor use to better meet the changing preferences of our public. This evaluation was called the Recreation Facility Analysis process and it identified to the Lincoln NF as a dispersed day-use forest. This means that the campgrounds that are offered are likely adequate for current and projected use and that most visitors to the Lincoln NF choose to stay off-Forest. For the locations of the developed recreational areas please refer to Figure 37 which displays the known dispersed, or road-side camping sites.

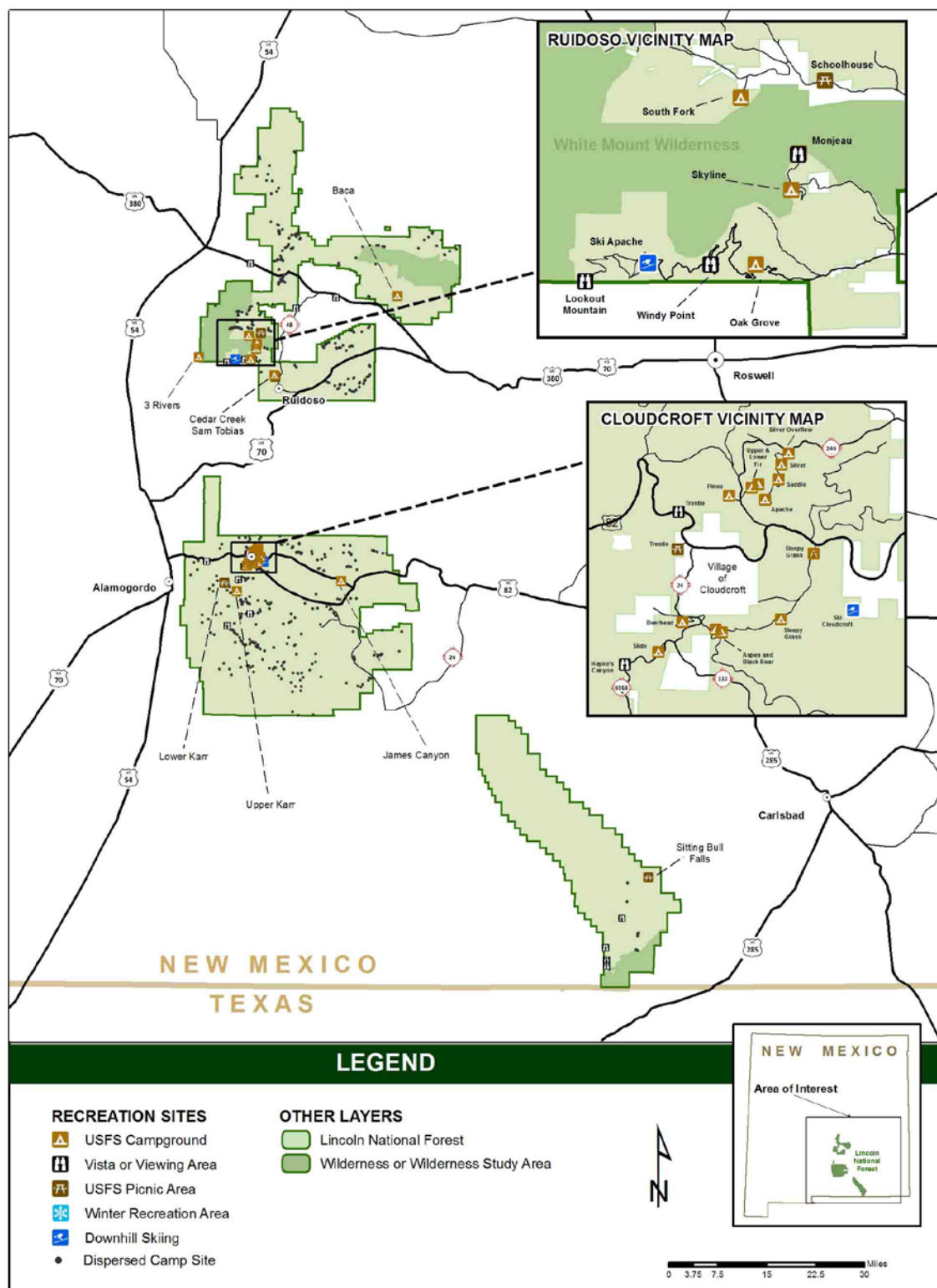


Figure 37. Recreation sites on the Lincoln NF

The Lincoln NF completed the Recreation Facility Analysis (RFA) in 2008 and from that developed a 5-year program of work to guide the sustainable financial management of recreation facilities such as

campgrounds, trailheads, and day-use areas that best met visitor needs. The program of work served as a framework to prioritize investments and pursue changes in operation and maintenance of recreation sites. This information was reviewed and incorporated into the 2012 Sustainable Recreation Action Plan for the Lincoln NF.

National Visitor Use Monitoring (NVUM)

In addition to the RFA, the Lincoln NF reviewed data from The National Visitor Use Monitoring surveys, which are conducted every 5 years on every national forest and are a key metric for many of the sections within the recreation chapter. The Lincoln NF conducted surveys in 2004, 2009, and 2014. Unless stated otherwise, data in this report is from the 2014 NVUM and will be referenced as needed throughout the chapter. Results from the 2004 NVUM will not be used in this discussion because different survey methodology was used, therefore results cannot be compared to 2009 and 2014.

These surveys are part of a nationwide process to understand visitor use on national forests. The monitoring provides reliable information about recreation visitors to National Forest System lands at the national, regional, and forest level. For this survey, visitation is estimated through a combination of traffic counts and surveys of exiting visitors. Both are obtained on a random sample of locations and days distributed over an entire national forest for a year. All of the surveyed recreation visitors are asked about their visit duration, activities, demographics, travel distance, and annual usage.

It is important to understand the limitations associated with the 2014 National Visitor Use Monitoring survey results. The descriptive information about national forest visitors is based upon only those visitors that were interviewed. In 2014, there were 916 individuals who agreed to be surveyed. To extrapolate the number of total visitors, traffic counters were also set up throughout the Lincoln NF during certain times. From the 2014 data, the Lincoln NF had approximately 767,000 visitors annually. NVUM results will be discussed in further detail in the Social Sustainability section of this chapter.

Lincoln National Forest Sustainable Recreation Strategy Development

In 2014, the Forest Service Southwestern Region developed a Sustainable Recreation Strategy (USDA Forest Service 2014e) to:

“ . . . guide the region toward a recreation program that is vital to the well-being of our visitors and communities and is essential to the future of the Forest Service and the national forests and grasslands. “

To implement the regional strategy, the staff of the Lincoln NF developed an initial action plan by revisiting the 2008 RFA and utilizing feedback from National Visitor Use Monitoring results. This 5 year action plan presently guides the short-term program of work for the recreation program on the Lincoln NF and future iterations will provide information for the development of desired conditions and required plan components to address sustainable recreation for the forest plan revision efforts. The Lincoln NF recognizes the need to expand sustainable recreation beyond facilities management to include actions that address the sustainability of the full suite of recreation opportunities and settings. The following sections describe the current conditions, trends and risks associated with moving the Lincoln’s recreation program toward economic, social and environmental sustainability.

Economic Sustainability

Historically the Lincoln NF, like most national forests, relied primarily on appropriated funds to support its recreation program. Over time, the costs of doing business have increased and budgets have been stretched more thinly. The Lincoln NF now depends on a wider variety of funding sources including volunteers and partners, fee revenue, and grants to meet recreation needs. Overcoming budget

challenges requires that the Forest Service think creatively to forge new strategic partnerships, work efficiently and inspire citizen stewards, all of which can help increase economic sustainability. Working with private recreation providers to promote unique recreational opportunities on national forests and grasslands can increase sustainability while contributing to local economies by creating new jobs.

Volunteer and Partner Contributions

The volunteer and partnership program on the Lincoln NF significantly contributes to the recreation program, with both on-the-ground accomplishments and by building community knowledge and goodwill.

The Lincoln NF partners with various organizations that share mutually beneficial goals and works with these organizations to meet resource management objectives. Partnerships are key to sustainable recreation management and are important opportunities to engage interested community stakeholders, allowing both the Lincoln NF and the organizations to leverage available resources to meet mutual goals. Key areas where partnerships and volunteers are helping to meet resource management objectives include:

- Wilderness monitoring,
- Visitor information and education,
- Trail maintenance,
- OHV education and route maintenance,
- Monitoring and management of developed and dispersed recreation sites, and,
- Cave and karst resource management.

Table 46. Summary of Volunteer Hours and Costs, 2011-2016

Fiscal Year	Volunteer Hours	Value of Volunteer Time	Partner Hours	Value of Partner Time	Person-years Contributed by Volunteers & Partners
2016	17,823	\$419,898	36,330	\$855,935	30.1
2015	9,076	\$209,390	5,724	\$132,053	8.2
2014	7,381	\$166,437	8,225	\$185,471	8.7
2013	5,403	\$119,620	6,116	\$135,408	6.4
2012	33,919	\$739,088	n/a	n/a	n/a
2011	6,894	\$147,256	5,015	\$107,110	6.6
Average	13,416	\$300,282	12,282	\$283,195	12.0

The value of volunteer time is calculated annually by [Independent Sector](#) and is based on the average wage of non-management, non-agricultural workers. The value of volunteer time has increased over time from about \$21.79 in 2011 to \$24.14 in 2016.

Over the past decade, the Lincoln NF has significantly increased the number of active partnerships on the forest (Table 46). Examples include working with colleges such as Eastern New Mexico University in Ruidoso and New Mexico State University in both Alamogordo and Carlsbad, juvenile justice programs in Lincoln and Otero Counties, Tribal youth from Mescalero and military veteran programs. Individuals involved in these programs learn about the Lincoln NF and natural resource management and will hopefully become more involved in national forest management as forest users, supporters, and possibly employees. As with volunteers, employee capacity to initiate and support additional partnership activities is limited and likely near capacity for the existing workforce.

Volunteer and partner contributions will continue to be an important part of the Lincoln NF's sustainable recreation program. The level of volunteer and partnership accomplishments will depend upon the Lincoln NF's ability to support those individuals and groups. It is anticipated that interest in volunteerism and in partnerships will continue to increase in the future on the Lincoln NF.

Recreation Fees

The Lincoln NF recreation program is a mix of developed and dispersed recreation opportunities. Developed recreation sites include ski areas and campgrounds with picnic tables, fire-rings, restrooms and refuse collection. Dispersed recreation includes hiking, biking, or ATV riding on trails, hunting, or self-contained camping along a forest road.

Historically, appropriated funds were used to operate and maintain both developed and dispersed recreation opportunities. In the mid-1960s, the Lincoln NF began collecting user fees at developed recreation sites (campgrounds) under the authority of the Land and Water Conservation Fund, which requires recreation sites to provide a certain level of facilities and services for fees to be charged. Forest Service employees managed all of these sites—daily operations, maintenance & repairs, and fee collections, financed by funds appropriated to the Forest Service.

In the late 1980s, the Lincoln NF solicited proposals from private companies to take over management of campgrounds on the Cloudcroft (now Sacramento) Ranger District under a Concessionaire Special Use Permit. A percentage of camping fees collected by the Concessionaire is deposited in the federal treasury, another portion retained by the concessionaire to support their business, and the remainder reinvested by the concessionaire in campground maintenance projects. Most annual operations and maintenance costs are covered by the concessionaire.

In 1997, Recreation Fee Demonstration Authority (referred to as “Fee Demo”) allowed the Forest Service and other land management agencies to pilot fee collection at a wider variety of recreation sites. In 2004, the Federal Lands Recreation Enhancement Act made Fee Demo permanent and provided the legal authority for the Secretary of Agriculture to establish, modify, charge, and collect recreation fees at Federal recreational lands and waters. The Lincoln NF continues to collect recreation fees at 17 recreation sites, six managed on the Smokey Bear and Guadalupe Ranger Districts and eleven concessionaire-managed on the Sacramento Ranger District. (<http://www.fs.fed.us/passespermits/fee-legislation-text.shtml>). Ninety-five percent of fees collected at Forest Service-managed recreation sites are kept by the local unit and reinvested in those recreation sites. According to law, these fees may be used for:

- Repair, maintenance, and facility enhancement related directly to visitor enjoyment, visitor access, and health and safety;
- Interpretation, visitor information, visitor service, visitor needs assessments, and signs;
- Habitat restoration directly related to wildlife-dependent recreation that is limited to hunting, fishing, wildlife observation, or photography;
- Law enforcement related to public use and recreation;
- Direct operating or capital costs associated with the recreation fee program; and
- Fee management agreement established under section 6805(a) of this title or a visitor reservation service.

Over the last ten years, an annual average of \$51,869 (Table 47) was collected from the six fee recreation sites managed by Lincoln NF. There is no clear trend of increasing or decreasing recreation fee income

for the Lincoln NF. Fee collections have varied significantly (from a low of \$28,287 in 2012 to a high of \$85,406 in 2010) and are highest when:

- Fire danger is low and the entire Lincoln NF is open to visitation,
- All recreation fee sites are open (both Sitting Bull Falls and South Fork Campground, two of the Lincoln NF's most popular sites have been closed various years due to fire and flood damage), and,
- Price of gasoline is low and people are more likely to travel.

Table 47. Recreation fees collected on Lincoln NF

Year	Fees Retained	Appropriated Funds	Total Available Recreation Funds
2016	\$60,308	\$897,456	\$957,764
2015	\$45,936	\$935,479	\$981,415
2014	\$30,163	\$857,310	\$887,473
2013	\$30,370	\$914,400	\$944,770
2012	\$28,287	\$949,100	\$977,387
2011	\$36,700	\$880,918	\$917,618
2010	\$85,406	\$721,016	\$806,422
2009	\$82,377	\$683,000	\$765,377
2008	\$41,015	\$702,000	\$743,015
2007	\$78,129	\$568,000	\$646,129
Average	\$51,869	\$810,868	\$862,737

Fee sites on the Lincoln NF are a critical component of the Forest's sustainable recreation program both because of recreation opportunities they provide and income they generate.

Visitors and Tourism

In addition to the Lincoln NF's economic ability to maintain recreational opportunities to the visiting public, the Lincoln NF is also a major contributor to the local economies surrounding the forest. The Lincoln NF contributes to the tourism industry by providing recreational opportunities, especially climate-relief activities, which draw people to the area, or encourage them to extend their visit in the surrounding communities. These opportunities vary distinctively by district but include skiing, mountain biking, motorized trail use, hunting and caving. The Lincoln NF also provides much of the scenic backdrop that attracts visitors to the southeast area of the state, which is a major tourism draw to the area. There are opportunities for the Lincoln NF and New Mexico tourism providers and promoters to cooperate to effectively manage these mutually beneficial resources.

Economic Sustainability Conclusions

The Lincoln NF has been successful in the past decade at leveraging volunteers and partners to provide services that were lacking. The volunteer and partnership program is an important component in moving the Lincoln NF recreation program toward economic sustainability by accomplishing work at minimal cost and was born out of a need to provide basic services that could not be met with current staffing levels. Volunteers and partnerships provide trail inventory and reconnaissance, campground hosts, developed site maintenance and upkeep, dispersed recreation site cleanups, facility maintenance, conservation education, sign maintenance, road maintenance, cave inventory and maintenance and

various other work. Use of volunteers and partnerships will continue at current levels for the foreseeable future and are anticipated to provide increased work capacity based on regional direction.

Fee recreation sites currently generate sufficient funds to cover much of the annual operations and maintenance costs at these sites. Because fee revenue is reinvested directly into the fee sites and cannot be spent on non-fee recreation sites or dispersed recreation, maintenance and clean-up of non-fee and dispersed sites often suffers. Appropriated funding is not expected to increase much in the near future while the cost of living is expected to continue increasing. At some point the Lincoln NF will not be able to maintain existing recreation opportunities unless we increase contributions from volunteers and partners, work more creatively with private industry, increase fees at developed sites and expand funding sources.

The Lincoln NF will continue to be a staple for economic contributions to the local communities. Tourism in these areas will continue to increase and recreation opportunities will continue to be sought after on the National Forest.

Condition and Trends:

As the Lincoln NF has had more volunteer and partnership contributions, there has been an increase in public contact and litter pick-up. Forest protection officers on the Lincoln NF are lacking but that is attributable more to a decrease in LEO presence and an increase in crimes against law enforcement or those perceived to be law enforcement. Backcountry presence is minimal as use in those locations is very low. It is anticipated that backcountry use will continue to remain low relative to other locations near communities.

With current levels of appropriated funds, retained fees, partnerships and volunteer labor, the Lincoln NF is able to operate and maintain the existing recreation program, however, some services are lacking, such as patrols of illegal off-highway use. These types of situations provoke visitor complaints and dissatisfaction with their recreation experience. Limited funding is available to improve visitor satisfaction or offer new and different recreation opportunities as visitor demand changes.

Conditions of most of the fee sites on the Lincoln are adequate for the current population but it is anticipated that capital improvements to existing sites will not applied in a timeframe that will be able to accommodate an increase in size and amount of recreational vehicles using the Lincoln NF.

Trends

- The dispersed use of the Lincoln NF will likely increase with most visitors continuing to stay in local communities
- Increase in business activity generated by recreation visitors spending money
- Increased desire by recreation visitors for more accessible hiking and biking trails
- Increase in the desire for connected communities and forests i.e., trails that connect the local community to the forest.
- Current fees are adequate to maintain current sites but they are not comparable with what surrounding privately provided recreation opportunities are charging. Fee sites should be re-evaluated for an increase to match other similar privately provided opportunities.
- It is likely that visitation to the Lincoln NF will continue to increase from both local populations and tourism. As that visitation increases there will likely be a public desire to provide more developed overnight recreational opportunities close to local communities.

- It is likely that current fee sites will not grow proportionally with the population and the recreational vehicle sizes.
- It is expected that the demand for ‘full-service’ fee sites that provide water, electric, and sewer will increase.

Social Sustainability

Most visitors come to know the Lincoln NF through their initial experiences in the local tourism communities. The Lincoln NF is known as an ‘introductory forest’ in which most visitors do not know the difference between being the forest, community, or other forested areas. Thus, it is important to provide education and recreation opportunities that visitors will desire so that the forest remains relevant. This relevancy is affected by the Lincoln’s ability to maintain developed infrastructure including recreation sites and trails that meet the visitor’s needs, increases the diversity of the users, and maintains visitor, community, and stakeholder interest in the opportunities provided by the Lincoln NF.

NVUM and Visitor Use and Demographics

Recreation provides significant contributions to local and nearby communities within the Lincoln NF since recreational activities are what bring people to the area.

There are three primary groups of visitors that visit the area (as presented by the 2014 NVUM survey):

- Locals—access to the forest is a very short travel distance, 25 miles or less.
- Near-by neighbors—access to the forest is a travel distance of 26-200 miles.
- Destination visitors—access to the forest is a travel distance of 200 or more miles.

Accordingly, one-quarter of Lincoln NF visitors are “local”; almost 35 percent are considered “near-by neighbors”; and over 40 percent of visitors are “destination” visitors, traveling more than 200 miles to the Lincoln NF.

The 2014 National Visitor Use Monitoring results estimated total visitation to the Lincoln at 767,000 people. According to 2009 NVUM data, the Lincoln NF received 696,000 total visits, an increase of about 10 percent. According to census estimates for local counties between 2010 and 2016, a comparable time period and three counties from which many Lincoln NF visitors come, it appears that the Lincoln NF’s increase in visitation has exceeded local population changes, evidence that a higher percentage of the local population is using the Lincoln NF than did in 2009 (<https://www.census.gov/quickfacts/fact/table/NM/PST045216>).

- Lincoln NF Visitor Use increased 10 percent between 2009 and 2014.
- Otero County, NM population increased 2.5 percent,
- Lincoln County, NM population decreased 5 percent, and,
- El Paso County, TX population increased 11 percent.

Destination visitors likely come to southern New Mexico to visit multiple sites including the Lincoln NF, but also Park Service units (the Sacramento Ranger District is situated on the road between Carlsbad Caverns and White Sands National Monument) and destination tourist towns like Ruidoso and Cloudcroft. Destination activities might include caving, skiing or zip-lining. For many in southeastern New Mexico, west Texas and Chihuahua, Mexico, the cool pines of the Sacramento Mountains are the closest respite from summer heat. In addition to locations of visitors, the percentage of visits based upon the type of recreational activity trended the same, with the vast majority of visitors (84 percent) primarily participated in what is considered dispersed or general forest visits. Generally, this includes

locations where visitors engaging in dispersed activities such as hiking, hunting, OHV use and dispersed camping.

- 84 percent (645,000) visited the general forest area for dispersed use and
- 25 percent (195,000) of those parties visited developed day use sites,
- 8 percent (60,000) used overnight developed sites,
- 3 percent (21,000) were wilderness visits.

Forest staff expect local visitors to participate in more dispersed activities such as driving for pleasure and viewing wildlife and natural features, walking/hiking, biking, and picnicking. Figure 38 shows the overall types of recreational activities by all visitors. Locals are also more likely to participate in activities including wood cutting and gold mining both to acquire products (wood or gold) and as a recreational activity. Local visitors are more likely frequent visitors and being more knowledgeable about the area may go deeper in the forest and farther in on trails than destination visitors who probably use more developed sites that can be found on the Lincoln NF website or other publicly available materials.

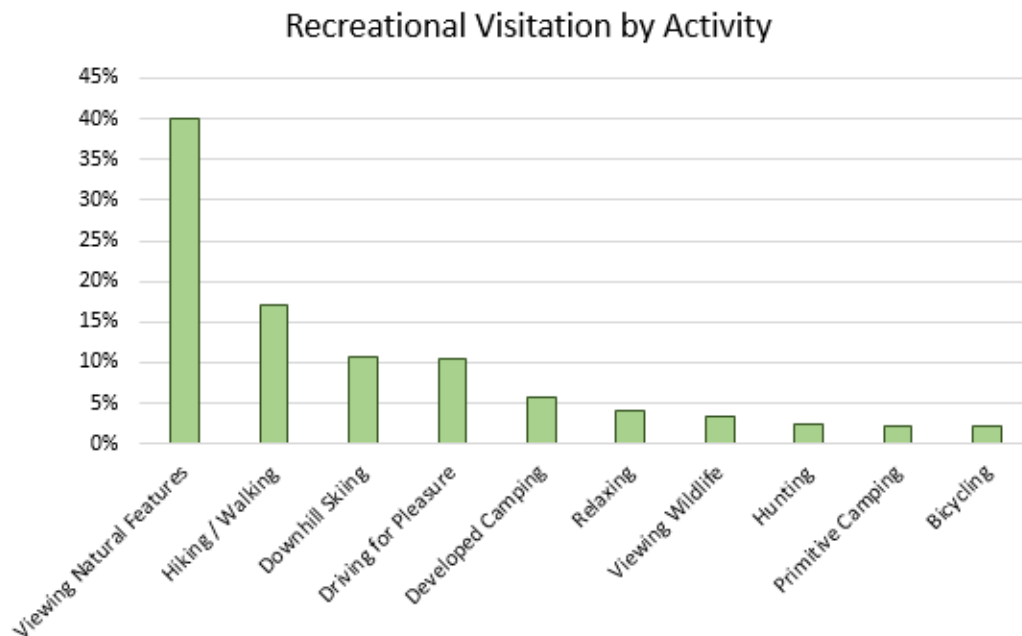


Figure 38. Recreational visitation by activity

The 2014 NVUM results also show that 59 percent of visits are made by males versus 41 percent by females. Hispanic/Latinos (26.5 percent of visitors) are the most common racial or ethnic minority with 2.3 percent black/African American and 0.2 percent American Indian/Alaska Native visitors.

Figure 39 shows the data associated with the percentage of Lincoln NF visits based upon age groups. Children under the age of 16 make up a significant portion of Lincoln NF visitors (27.3 percent), indicating that families with children are participating in recreational activities on the forest (USDA Forest Service 2014a) at a rate very similar to their representation in the general population of New Mexico (25 percent under 18 years old) and Texas (29 percent under 18 years old). Because early experience with outdoor recreation is a strong predictor of future visitation, higher levels of childhood visitation is desired.

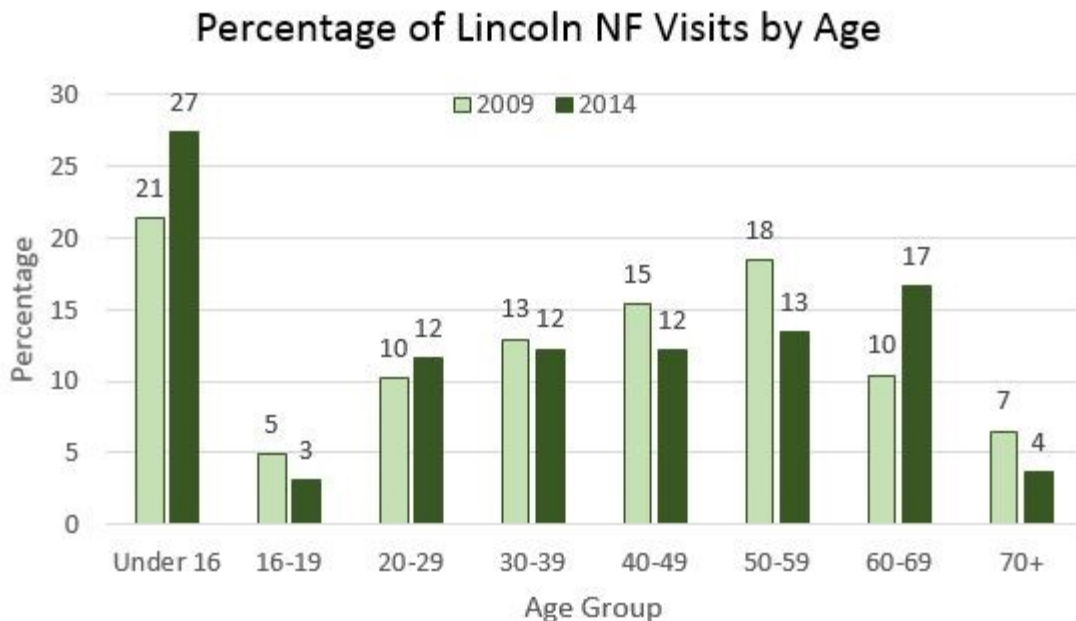


Figure 39. Percentage of Lincoln NF visits by age

Visitors are relatively evenly represented in each decade of life from those in their twenties through those in their fifties with a slight uptick in the sixties when more people are retired, many still physically able and with more free time. Visitation falls off for those over seventy as it may become more difficult to travel and participate in outdoor activities.

Average overall satisfaction of all visitors for 2014 is high with 69 percent of all visits rating their visit as very highly satisfied. On the opposite spectrum, the category with the lowest number of very highly satisfied is that of interpretive displays at 50 percent which did improve from 2009 where it was 43 percent.

Six point seven percent of Lincoln NF visits included someone with a disability, while according to the 2015 American Community Survey, 12.6 percent of Americans have some type of disability (hearing, visual, ambulatory, cognitive, self-care or independent living). Baby boomers are living longer but are more likely to have disabilities than previous generations

(<http://www.prb.org/Publications/Articles/2013/us-baby-boomers.aspx>). To better represent the existing population and to keep baby boomers visiting the Lincoln NF, recreation sites may need to be adapted to make them more easily accessible.

Recreation equity is a measure that helps determine how well national forests are reaching out to their communities; it also serves as an indicator of future recreation use and relevancy in times of changing demographics. The percent of minorities responding to NVUM as visitors to the Lincoln NF was almost 27 percent (USDA Forest Service 2014), which, while much higher than the national average, is much lower than the Hispanic percentage of the local population. From 2010 census data, 16.3 percent of the US population reported being Hispanic, 46.3 percent of New Mexico and 37.6 percent of Texas. Closer to the forest, Otero County reports 34.5 percent Hispanic, Lincoln County 29.8, and El Paso County, Texas, 82.2. As Hispanics are expected to increase as a percentage of the US population, the Lincoln NF will need to better serve this segment of the population to maintain relevancy. This may require more

forest information in both English and Spanish and opportunities for large groups of people to recreate together.

Visits to the Lincoln NF by American Indian/Alaska Natives are also lower than their portion of the local and national populations. This may be surprising in that the Lincoln NF borders the Mescalero Apache Reservation on two sides, but not surprising because many similar recreational opportunities abound on Mescalero Apache Reservation lands. Likewise, blacks/African Americans, Asians, and Hawaiian/Pacific Islanders are also under-represented in NVUM compared to their percentage of the national and local populations.

This information gives the Lincoln NF an opportunity to reach out to a broader constituency than we have in the past. This can be done by looking at demographics of the broader landscape and considering whether there are identifiable reasons why certain groups are not visiting the forest as frequently as others, and whether there are actions that can be taken to engage a broader array of visitors.

Condition of our existing developed sites is good but the public's ability to gain knowledge about them is poor. The trend to provide tourism type guides via the internet and social media is increasing, especially where maps are concerned. The forest service as a whole, including the Lincoln NF, has not kept up with electronic technology trends. The Lincoln NF is constantly improving electronic offerings, such as OnCell Mobile Tour currently being implemented, and needs to continue using the latest technology to provide maps, guides, suggestions of where to visit, activities, etc.

Demographics and Growth

Population growth in the El Paso and Las Cruces metropolitan areas and the expanding urban interface brings with it some emerging uses such as more first time visitors with needs for information and interpretation, and developers buying land for housing adjacent to the Lincoln where there was previously public access.

As the population continues to grow and the demographics of forest users changes, an emerging concern for national forest managers is maintaining relevancy and meeting the needs of communities and visitors. Increasingly, the demographics of forest visitors do not represent the ethnic and cultural make-up of communities. Use patterns change as visitors are using the national forest in shorter durations with larger, multi-cultural groups. One concern addressed in the Southwestern Region Sustainable Recreation Strategy is that national forest visitation has declined as population has increased and visitor surveys show lower visitor satisfaction and visitor retention. Stagnant agency budgets and aging recreation infrastructure compound these emerging issues and make volunteer and partnership efforts crucial to building a sustainable recreation program.

The Lincoln NF also needs to be aware of its niche within a national scope. We are in the middle of Billy the Kid country and offer a scenic by-way through these stomping grounds rich with 'old west' type of lore that continues to the present through a significant population of ranching communities throughout the area. There are a mixture of all types of cultures within the Lincoln and recognizing them and serving these needs both locally and for visitors is important going into the future. Currently we do a fair job at this.

As outlined in the Southwest Regional Sustainable Recreation Strategy, measures for social sustainability for the Lincoln NF include total forest visitation, visitor satisfaction, and recreation equity or the percent of minorities in the forest's market zone versus the percent of Forest visitors who are minorities (USDA Forest Service 2014e).

For example, New Mexico’s climate attracts a large number of seasonal visitors and retired people; approximately 22 percent of the population of the four-county area including Chaves, Eddy, Lincoln and Otero Counties is over the age of 60 (USDA Forest Service 2013f). This is a trend that will continue as the baby-boom generation heads into retirement in the coming years. Conversely, approximately 28 percent of the population of the four-county area is 19 years old or younger. Per the 2014 National Visitor Use Monitoring information above, with 20 percent of visitors over the age of 60 and 27 percent under the age of 16, there may only be slight gaps in community diversity in terms of age and the visitors that are being served. However, when comparing the community diversity to the visitors being served, a more significant gap is indicated. The anticipated visitor use trends and potential implications for the recreation resources on the Lincoln are discussed in more detail in the “Recreation Demand and Trends” section of this Assessment.

Trends

- Ethnic groups visiting the forest, especially Hispanic, do not match local populations and without a plan to outreach to these underserved populations this trend will continue.
- It is likely that visitor use will increase, especially in those seeking climatic relief from the surrounding desert.
- It has been identified that there is user dissatisfaction with interpretive sites and without increased emphasis this dissatisfaction will likely increase.
- It is likely that dispersed recreation use will increase and that will lead to an increase in hardened dispersed camping sites.
- It is likely that growth in the larger communities will continue to change the dynamics of use on the Lincoln NF.
- It is anticipated that climatic relief and seasonality of use will continue, especially with baby boomers and recent retiree’s.

Environmental Sustainability

The underlying conditions of the natural environment are the foundation for sustainable recreation opportunities. Some of these environmental conditions are affected by large-scale events such as climate change and more localized factors including natural disasters and declining ecosystem health. In addition, impacts from unmanaged recreation use, vandalism, and our inability to keep up with maintenance needs of our recreation infrastructure.

The “Southwest Sustainable Recreation Strategy” (USDA Forest Service 2014e) explains that:

“Ecological recreation managers deal with modifying human behavior or designing sites to withstand ecological impacts and reduce energy use by creating sustainable sites and operations.”

Examples of recreation management actions that may be taken to move toward environmental sustainability include travel management planning to provide designated off-highway vehicle routes and areas, additional permit systems or area restrictions to direct use to appropriate sites, concentrating use in developed sites, and increasing management of dispersed camping.

Following are descriptions of environmental conditions and trends influencing recreational settings.

Dispersed Recreation

In 2007, the dispersed camping sites on the Lincoln NF were inventoried to see how many there were, where they were, and what condition they were in. The vast majority of dispersed campsites are in forested areas with just over 60 percent in mixed conifer forest, almost 20 percent in pinyon-juniper, only about 9 percent in grassy areas, less than 5 percent in ponderosa pine, 3 percent in aspen forests and a few unknowns (Figure 40).

Only 15 of 124 sites had more than one visible access route, with one of those sites having eight routes. Even in sites with multiple access routes, significant erosion was not found to not be a problem, with all sites having moderate, low or no evidence of erosion. Twenty-two sites seemed to be used year-round, 49 sites had only intermittent use, 32 sites appeared to be used for hunting seasons, and 21 sites were unknown. The topography of the Lincoln NF limits the number of dispersed sites because much of the land is too steep for camping. Assuming more people will want to visit and camp in the Lincoln NF, existing dispersed sites may be used more heavily in the future, affecting ecological conditions and requiring more clean-up by employees or volunteers.

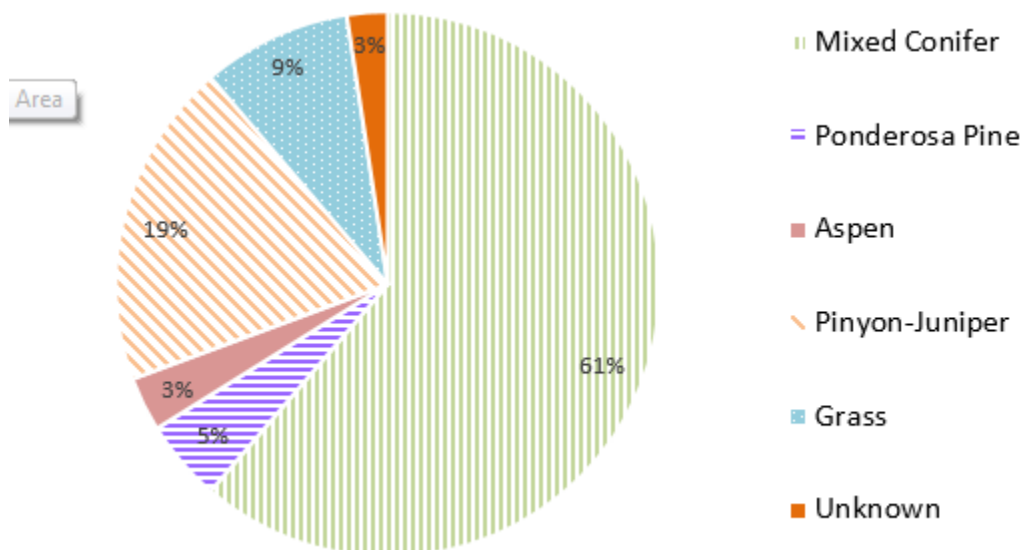


Figure 40. Dispersed Camping and Vegetation Types

Wildfires

Several recent uncharacteristic, stand-replacing wildfires on the Lincoln NF have affected the quality of recreational settings. Notable fires include:

- 2004 Peppin Fire, \$40,000-\$60,000/year to clear 1 mile of trail annually continues
- 2011 Mayhill Fire that destroyed parts of the James Canyon Campground and the first views of the Sacramento Ranger District from the east,
- 2011 Last Chance Fire that burned through the backcountry of Last Chance Canyon and the popular Sitting Bull Falls Day-Use Area,
- 2000 Scott Able Fire which eliminated thousands of prime dispersed recreation acreage, and,
- 2012 Little Bear Fire that consumed portions of the White Mountain Wilderness, Southfork Campground (which is still closed 5 years later), numerous scenic views along the Billy the Kid

National Scenic Byway were affected and 20 miles of trail need regular maintenance to remove dead and fallen trees from the fire.

In order to protect the public during drought conditions, the Lincoln NF may at times put restrictions on fires allowed in the forest. There are stages of fire restrictions ranging from no open campfires (Stage 1) to a full forest closure (Stage 3). Fire restrictions, even Stage 1, impact the recreation experience as campers are unable to enjoy evening campfires, cooking over open flames or using their off-road motorized vehicles. When fire restrictions are in effect at any level, less people choose to visit the forest; they may not want to come if they can't have a campfire, they may be afraid of wildfires. Over the past five years with the exception of 2016, some fire restrictions have been in place on the Lincoln NF generally from May through July. Numerous other specific campground, trail and area public safety closures have also been in place due to fires or flooding following a fire. A more unique circumstance that impacts the recreation experience of all forest visitors are Stage 3 forest closures. Over the past ten years, the Lincoln NF has been closed to all visitors three times for a period of two or more months. In addition to impacting forest visitors, local communities and their economies suffer as well.

Frequently, fire impacts trail conditions, leading to an increased need for trail maintenance, Wilderness assessment (for possible safety hazards) and increased dispersed camping area maintenance. The areas impacted by wildfire are often under closure orders for some time after the fire to protect resources and protect visitors from unsafe situations. This leads to reduced recreation areas and limited travel ways. The aesthetics of burned areas are not such that visitors want to recreate in close view of them, however, this seems to be a short-term phenomenon with many visitors still coming to the forest for climatic relief.

Unmanaged Recreation

In addition to environmental conditions, unmanaged recreation has been identified by the Forest Service as one of four key threats to the Nation's forests and grasslands. The use of off-highway vehicles is seen as a major component of unmanaged use (USDA Forest Service 2006a). Off-highway vehicle use trends (including increasing numbers of participants and changing technology that has allowed access to previously inaccessible areas) impacts recreational settings because of dust, soil disturbance, the spread of noxious weeds, a proliferation of unauthorized routes, and other ecological damage.

The Lincoln NF has seen a substantial increase in off-highway vehicle use over the last several decades. Even though the Lincoln NF has had a travel management plan implemented since 1986, illegal use of closed roads and non-motorized trails, along with a network of unauthorized routes, is still a significant problem. Numerous locals and visitors have expressed frustration at what they view as resource damage, unchecked trespass, constant noise, and the loss of solitude associated with unmanaged motorized vehicle use.

Some unauthorized use is on roads and trails that were closed to the public under the 1986 Travel Plan. While they no longer show up on our travel or MVUM maps, they may still exist on-the-ground and be driveable with no gate, berm or other closure. Visitors unfamiliar with our travel plan could unknowingly drive down a closed road. Because of the forest's limited presence in the field, those who understand our travel plan sometimes drive down closed roads on purpose knowing their chance of getting caught is minimal.

Unauthorized routes often leave tracks and ruts that can remain visible for years. Many portions of the forest, such as the areas between Timberon and Cloudcroft on the Sacramento Ranger District, consist

of braided or crisscrossed patterns of unauthorized routes developed by motorized users. In the Chihuahuan Desert, vegetation is slow to become established or reestablished after it has been damaged. In these areas with fragile soils, the repetitive passage of vehicles has created bare areas, which lack vegetation and are quite visible to the casual observer.

The existence of such tracks and bare areas visible to people traveling through the national forest tends to diminish the natural appearance of the lands. While an occasional track or rut does not detract from scenic quality for most people, concentrations of ruts, tracks, or unauthorized routes on the landscape may detract from what most people expect and desire to see in the national forest environment. Visible ruts and tracks also encourage riders unfamiliar with the travel plan to head out and explore unauthorized routes.

Visitor Use Impacts

High levels of visitor use on the Lincoln NF have the potential to result in impacts, especially in popular, high use areas such as Sitting Bull Falls and Bluff Springs. One approach to address visitor use impacts is to concentrate use at developed sites and along designated roads and trails. Visitor impact studies of campsites and trails have shown that most resource impacts are related to visitor use levels in a curvilinear fashion (Marion 2013). This means that incremental impacts from visitors (such as trampling, loss of vegetation, and creation of social trails) occur quickly with relatively low use levels and continue to increase to a point at which impacts from additional use levels off. The main implication of this use/impact relationship is that nearly all use must be eliminated to achieve significant reductions in most forms of recreation impact (Marion 2013).

Some potential management actions include limiting types of use with higher impacts to specific areas, educating visitors regarding high impact behaviors and encouraging low impact behaviors, encouraging use in impact resistant locations, and limiting use to existing or designated sites or trails. The Lincoln NF staff has implemented many of these management actions, and will continue to consider management actions to allow recreation use while also limiting negative impacts to resources and recreation settings.

High levels of visitor use, especially in areas close to the Ruidoso and Alamogordo, are impacting recreation settings and resources on the Lincoln NF. As the populations in these communities and in New Mexico and Texas continues to increase, it is expected that recreational visitor use of the Lincoln will also continue to increase. The Lincoln staff has started taking management actions to reduce or mitigate these impacts. There will be an ongoing need for the Lincoln's recreation managers to assess recreation demands and trends and adjust management approaches as needed to meet visitor use demands while minimizing impacts. There are also opportunities for user groups and partners to work with the recreation staff to address management challenges and work toward more environmentally sustainable recreation use across the forest.

Trends

- Wildfires will continue and impact views, scenery, recreation opportunities and devastate (long-term) trail systems on the Lincoln NF.
- Hardened dispersed camping sites will continue to be used heavily and new hardened sites will likely increase as use continues to increase. These sites will continue to be concentrated in accessible locations on the forest.

- As use is concentrated in areas surrounding the local communities, demand for park-like services will increase (ex: recycling bins, water filling stations, mountain bike tool stations).
- Unsustainable trail systems and fall-line trails will continue to be replaced with sustainable trail systems to off-set maintenance costs.
- As demand for off-highway vehicle use increases demand for loops in NFS lands will increase. If sites are not proposed and developed, unmanaged recreation will continue to increase exponentially and unauthorized routes will continue to be used.

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 Lincoln National Forest offers a wide diversity of settings, from conifer covered mountains and pinyon-juniper woodlands rising from high desert plains to spectacular canyons. People are drawn to the Lincoln area for its stunning views, cool mountain escape from desert climates and outstanding recreation opportunities. The Forest offers dark night skies and provides the backdrop to many communities and homes. The Lincoln National Forest 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 1986 Lincoln National Forest Plan went into effect, 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 Lincoln 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 Lincoln National Forest intends for the new Scenery Management System analysis to be a valuable resource for the public in considering a need for change to the 1986 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 updated forest wide data layers for managing scenic resources. A digital visual quality objective layer currently exists for the entire forest digitized from the 1980s' visual resource management inventories hard copy maps.

Existing and Potential Scenic Character

As stated earlier, when the Lincoln National Forest Plan was adopted in 1986, 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 (Table 48). 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.

Management area standards and guidelines assign visual quality objectives for each management area, often summarizing the acres for each visual quality objectives occurring within the management area. Digital maps of visual quality objectives are available for the entire Forest. The visual resource inventory completed in the 1980s was done on hardcopy maps. The hardcopy maps were digitized into the GIS Database and acreage of each visual quality objective is summarized below.

Table 48. Visual quality objective definitions and acreage summary for the Lincoln National Forest

Visual Quality Objective	Definition	GIS Acres	Percent of Forest
<i>Preservation (P)</i>	Provides for ecological change only.	104,329	9%
<i>Retention (R)</i>	Man's activities are generally not evident to the casual visitor.	115,055	11%
<i>Partial Retention (PR)</i>	In general man's activities may be evident but must be subordinate to the characteristic landscape.	314,558	29%
<i>Modification (M)</i>	Man's activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color and texture. Man's	346,725	32%

Visual Quality Objective	Definition	GIS Acres	Percent of Forest
	activities should appear as natural occurrences when viewed from foreground or middle ground.		
<i>Maximum Modification (MM)</i>	Man's activity may dominate the characteristic landscape but should appear as natural occurrences when viewed as background.	209,694	19%

All wilderness and Research Natural Areas have preservation visual quality objectives. 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 visual quality objectives. In retention visual quality objectives, 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 visual quality objectives. In partial retention visual quality objectives, 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.

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 Alamogordo, 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 travel ways 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 along the Sunspot and Billy the Kid Scenic Byways, designated wilderness areas and the wilderness study 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.

Existing scenic integrity is the current state of the landscape, considering previous human alterations. It indicates the intactness and wholeness of the scenic character. Previous human alterations often disrupt the character of landscape, and existing scenic integrity measures the degree of that visible disruption.

A landscape with very minimal disruption is considered to have high existing scenic integrity. Landscapes with more noticeable disruption in the scenic attributes have lower existing scenic integrity. Existing scenic integrity is expressed and mapped in terms of very high (Figure 41), high (Figure 42), moderate (Figure 43), low (Figure 44), very low (Figure 45), and unacceptably low.

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 two wilderness areas and inventoried roadless areas that have seen little human influence and make up about 10 percent of the Forest.

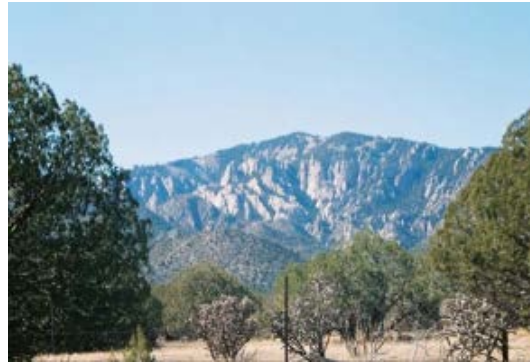


Figure 41. White Mountain Wilderness and Capitan Mountains Wilderness, examples of very high existing scenic integrity.

Most of the Forest area, about 40 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 42. National Forest System Road 540, 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. About 48 percent of the Forest falls into this category.



Figure 43. Black Bear Group Campground, 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 44. Wofford Communication Site, 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 45. Ski Apache, an example of very low existing scenic integrity

Unacceptably low scenic integrity refers to landscapes where the valued scenic character being viewed appears extremely altered. Landscapes at this level of integrity need rehabilitation. No lands were rated as unacceptably low for the Lincoln National Forest.

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.

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 visual quality objectives 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 Lincoln National 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 2009, USDA Forest Service 2014). 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.

Unmanaged recreation 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, graffiti 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 Sacramento Mountains have resulted, at certain elevations, 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 Little Bear Fire of 2012 burned about 40,000 of acres on the Smokey Bear Ranger District in and outside the White Mountain Wilderness. When viewed from the Billy the Kid Scenic Byway, 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.

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 Little Bear Fire of 2012 burned through 40,000 acres on the Smokey Bear Ranger District. This high severity, uncharacteristic wildfire caused widespread tree and vegetation mortality, facility damage, and resulting hazard trees and has affected the scenery viewed from Billy the Kid Scenic Byway, Ruidoso and other communities, Ski Apache, 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, trails and developed recreation areas 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 Mayhill Fire of 2011 in the Sacramento Mountains on Sacramento 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 roads, which affects opportunities for viewing scenery.
- The Last Chance Fire of 2011 burned on the Guadalupe Ranger District resulting in shrub mortality with ongoing post flooding and erosion issues. It also burned and flooded portions of the Sitting Bull Falls Recreation Area which has since been rebuilt, but which affected opportunities for viewing scenery for over a year.
- Insect and disease tree mortality has occurred across two 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 events 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.

Scenic Character Contribution to the Socioeconomic Landscape

Among the approximately 1.1 million acres of National Forest System lands on the Lincoln National Forest, about 104,000 acres are designated wilderness or wilderness study area including the White Mountain, Capitan Mountains and the Guadalupe Escarpment, which provide for distinctive scenic landscape features and unaltered, natural scenic character. There are two Scenic Byways and seventeen potential wild and scenic rivers within the Lincoln National Forest.

The Forest Plan manages for natural appearing scenery or retention visual quality objectives 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 visual quality objectives, 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 Lincoln National Forest area. The Lincoln National Forest 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, downhill skiing, developed camping, relaxing, and driving for pleasure (USDA Forest Service 2014). According to 2014 National Visitor Use Monitoring, over

73 percent of visitors participated in viewing natural features or scenery with 40 percent of visitors listing viewing scenery as main activity. Viewing natural features was the most popular activity, with viewing wildlife being the second most popular activity. Additionally, over 24 percent of forest visitors reported using a scenic byway (USDA Forest Service 2014). According to 2009 National Visitor Use Monitoring over 76 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 2014).

Key Findings

The Lincoln National Forest has a moderate sized recreation program. The range of recreation opportunities on the Lincoln complements opportunities available on adjacent national forest lands managed by different administrative units, Bureau of Land Management, National Park Service, State of New Mexico, Tribal lands, counties, and cities. While serving many local visitors, and contributing to the quality of life for local residents, the Lincoln also plays an important role in sustaining the recreation and tourism-related economy within the four-county area. Motorized and non-motorized recreation trail opportunities is extremely popular, and a high demand for these activities is expected to continue into the future. Demand for developed and dispersed camping opportunities in climatic relief areas is also expected to remain high. Motorized and non-motorized recreation trail opportunities and developed and dispersed camping opportunities will continue to be the primary recreation opportunities provided by the Lincoln National Forest.

Challenges in reaching economic sustainability will continue as federal budgets and staffing levels decline. The recent improvements to a majority of the Lincoln National Forest's developed recreation facilities and development of the Sustainable Recreation Action plan has reduced the deferred maintenance costs across the forest and will help the program become more economically sustainable.

Due to the Forest's location near growing metropolitan areas, the Lincoln National Forest will be actively pursuing opportunities to remain relevant to the changing population demographics. With continued population growth, there will be increasing pressures on natural resources, especially within the urban interface. Moving toward environmental sustainability will require ongoing public educational efforts, coordination with other land management agencies, and proactive management to protect areas that have not yet been impacted by these pressures.

Management challenges will continue to increase as the population of these metropolitan areas and New Mexico continues to increase. There are many opportunities to work in partnership with communities, partner organizations, and user groups to address the challenges and work toward a more economically, socially and environmentally sustainable recreation program.

Development along the Forest boundary, increases in natural events like flooding and wildfires, and recreation use beyond capacity will negatively impact scenic character on the Lincoln National Forest.

Stakeholder Input

This section summarizes input, perspectives, and feedback relevant to this assessment topic and received from the public between March 2015 and October 2016. Input was gathered from multiple public and group meetings, from online submissions, and from emails. Key expressed issues and

concerns included health and intact wilderness areas and their ecosystems, access and multiple uses, effective communication, collaboration and involved decision-making. See the following sections for a more detailed list of these concerns, management suggestions.

Issues/Concerns

General

- Increase in all forms of outdoor and nature-based recreation
- Excellent public access for hunters
- Proliferation of illegal trails by OHV users and loss of solitude and quiet-use areas
- Poor conditions and limited recreation opportunity at fire-impacted areas on the Forest (e.g., Bonito Lake)
- No travel management plan or strategy

Motor Vehicles

- Too much motor vehicle use and associated development on the Forest
- Loss of areas with roadless characteristics and recreational value due to vehicle use
- Closing of routes and fewer loops which limits OHV opportunities and experience
- Trails are too narrow—ample routes/access for OHVs less than 50 in., but limited for “side-by-side” (58-68 in.) Utility Task Vehicle (UTV) and jeep access
- Increase in OHV/ATV use on the forest
- Impacts to vegetation and hydrology due to 300’ travel allowance for motor vehicles use off of forest routes

Trails

- Degraded, eroded, unsustainable, and intermittent trails
- A lot more trail signs and numbering than in the past
- Limited connectivity between Lincoln NF trails and neighboring lands (e.g., Fort Stanton National Conservation Area)
- Limited emphasis on Leave No Trace ethics and public education/outreach
- Closure of roads/routes due to ATV/OHV concerns, impacting other user types
- Problems/delays removing deadfall from trails
- Too few mountain biking trails and limited connections (e.g., Smokey Bear Ranger District)
- Limited parking and turnarounds at trailheads, especially for trailers
- Limited trail maps at trailheads
- Few shorter loop trails which limits recreation opportunity and experience
- Most trails are well-maintained
- Proliferation of illegal trails by OHV users and loss of solitude and quiet-use areas

Ski Area

- Currently limited summer activities and events at Ski Apache, but more than in the past
- Campgrounds closed due to past fires and delays in their reopening (e.g., South Fork)
- Unfair visitor limits and fees at campgrounds and facilities
- Campfires left unattended
- Limited parking and turnarounds at trailheads, especially for trailers

Backcountry Aviation

- Lack of backcountry aviation airstrips and access

Target Shooting and Gun Clubs

- Shooting range is too close to residences/private land (e.g., Ruidoso Gun Club), safety and noise concerns (use of automatic weapons), shooting after hours, lack of enforcement and following rules (special use permits)
- Minimal enforcement of the use of and access to gun club/ shooting ranges

Wilderness

- Increased (now and future) demand for wilderness

Scenic Character

- Currently limited opportunities for dark sky stargazing activities
- Reduced scenic quality/value due to overgrown forest

Regulation, Education, Enforcement

- Trash and illegal dumping
- Limited enforcement of route closures, Motor Vehicle Use Map (MVUM) designations, and travel rules
- Limited law enforcement and personnel and coordination with local authorities to ensure enforcement of travel and other policies
- Low priority of youth programs and outreach
- Minimal to nonexistent contact between Forest users and Forest employees

Management Recommendations

General

- Provide for more quiet use and solitude-based recreation activities
- Implement/refine the travel management plan
- Emphasize wildlife, habitat, water, and recreation values over others

Motor Vehicles

- Identify roadless areas and/or close routes to improve recreational value and maintain ecosystem integrity
- Institute an OHV route volunteer program, foster partnerships
- Listen to users of the Forest
- Institute an OHV permit system and use revenues to restore damage and address illegal dumping/litter issues
- Allow OHV retrieval of game
- Reduce vehicle class size instead of closing routes

Trails

- Improve signage to indicate trail locations
- Partner with the Bureau of Land Management to enhance trail opportunities and connectivity (e.g., Fort Stanton National Conservation Area)

- Offer more training for employees on Leave No Trace ethics and practices
- Provide more trail-based recreation opportunities (e.g., Smokey Bear Ranger District)
- Develop additional high quality, sustainable mountain biking trails
- Extend mountain biking trail systems into backcountry areas
- Make mountain biking trails easily accessible from community areas, streets, and roads
- Add more loop and/or connector trails

Ski Area

- Promote and collaborate on more special events on USFS lands, including summer events and opportunities at Ski Apache
- Lease Lincoln NF lands for commercial development and use including campground facilities

Backcountry Aviation

- Specifically address aviation as a recreational activity in the plan revision
- Maintain and improve existing and develop new backcountry airstrips for public use and recreational aviation (and safety and emergency response)
- Use volunteers to help manage backcountry aviation sites and airstrips

Target Shooting and Gun Clubs

- Move gun club/shooting ranges to less populated areas, regulate hours of use to normal business timeframes, install sound barriers, and prohibit use of automatic weapons or deny special use permits (e.g., Ruidoso Gun Club)

Rock Climbing

- Allow/promote and do not overregulate rock climbing areas and activities
- Work and partner with rock climbing groups to help promote and manage the resource

Scenic Character

- Provide dispersed camping and other sites with open sky use (undeveloped astronomy sites) (e.g., off of Sunspot Highway)

Regulation, Education, Enforcement

- Implement more restrictions to protect forest resources
- Hire more personnel to enforce travel rules and decisions
- Increase priority/focus on youth programs and education
- Include law enforcement effectiveness in forest plan monitoring
- Allow OHV retrieval of game

Conditions/Trends

Beginning in November of 2015 and concluding in January 2016 the Lincoln NF provided survey forms to assess the stakeholder's opinions on the 15 Areas of Interest. This data was compiled and assigned both an Area of Interest (AOI) as well as an Issue grouping.

Travel management, mostly associated with unauthorized use of roads and trails, has the highest number of comments and suggestions with 14 and out of that 9 consider this issue to be getting worse. Recreation general had 13 comments but is difficult to summarize because it is a miscellaneous type of

category. Second to travel management is the permitting of recreational use which is considered to be getting worse. Finally, trail use is trending upward. Other categories are difficult to determine trend due to having only one or two responses.

Summary of Findings for Recreation

Over the past several decades, societal and technological changes as well as changes in user groups and types have changed the way visitors recreate on the Lincoln NF. This chapter has introduced the Lincoln NF recreation settings, opportunities by district, and recreation type and use patterns. Concepts and data such as the Recreation Opportunity Spectrum, National Visitor Use Monitoring and Sustainable Recreation were introduced to provide an overall picture of the current recreation offering on the Lincoln NF and why those offerings exist in the locations that they do and to evaluate and identify trends in economic, social, and environmental sustainability.

Based on these current conditions discussed in the previous sections, conclusions and trends in the information can be drawn to help frame what the recreation landscape on the Lincoln NF should be in the future. It has been identified that the dispersed user group is the primary user group of the forest and recreate in a variety of forms from hunting and fishing to hiking and scenic driving. The variety of dispersed uses can create conflicts between types of use and these user conflicts are anticipated to continue and increase. Also, although economically and socially sustainable, recreation opportunities on the Lincoln NF are threatened by unstable environmental conditions including wildfires, concentrated dispersed uses, and unmanaged recreation. The following bullets have been identified as trends in recreation that may point to a need to change the recreation opportunities in the future.

Overall Trends

- Increase in business activity generated from the spending made by recreation visitors
- Increased desire by recreation visitors for more accessible hiking and biking trails
- Increase in the desire for connected communities and forests i.e., trails that connect the local community to the forest
- Current fees are adequate to maintain current sites but they are not comparable with what surrounding privately provided recreation opportunities are charging. Fee sites should be re-evaluated for an increase to match other similar privately provided opportunities
- It is likely that visitation to the Lincoln NF will continue to increase from both local populations and tourism. As that visitation increases there will likely be a public desire to provide more developed overnight recreational opportunities close to local communities
- It is likely that current fee sites will not grow proportionally with the population and the recreational vehicle sizes
- It is expected that the demand for 'full-service' fee sites that provide water, electric, and sewer will increase
- Ethnic groups visiting the forest, especially Hispanic, do not match local populations and without a plan to outreach to these underserved populations this trend will continue
- It is likely that visitor use will increase, especially in those seeking climatic relief from the surrounding desert
- It has been identified that there is user dissatisfaction with interpretive sites and without increased emphasis this dissatisfaction will likely increase
- It is likely that dispersed recreation use will increase and that will lead to an increase in hardened dispersed camping sites

- It is anticipated that climatic relief and seasonality of use will continue, especially with baby boomers and recent retiree's
- Wildfires will continue and impact views, scenery, recreation opportunities and devastate (long-term) trail systems on the Lincoln NF
- Hardened dispersed camping sites will continue to be used heavily and new hardened sites will likely increase as use continues to increase. These sites will continue to be concentrated in accessible locations on the forest
- As use is concentrated in areas surrounding the local communities, demand for park-like services will increase (ex: recycling bins, water filling stations, mountain bike tool stations)
- Unsustainable trail systems and fall-line trails will continue to be replaced with sustainable trail systems to off-set maintenance costs
- Unmanaged recreation and damage associated with this is increasing/worsening
- As demand for off-highway vehicle use increases demand for loops in NFS lands will increase. If sites are not proposed and developed, unmanaged recreation will continue to increase exponentially and unauthorized routes will continue to be used
- Motorized use will continue to increase in both designated and unauthorized areas and this use will likely spill over into the other districts
- The Travel Management map will not likely respond to changes in recreational vehicles and demand for designated areas as quickly as needed or desired
- A lack of law enforcement presence and forest protection officers will encourage use of unauthorized user created routes
- Without intervention, conflicts between dispersed user groups will continue and likely increase
- It is anticipated that the desire for increased interconnectedness between the local communities and the forest for easier access to trails
- Increase in the demand for multi-use/mountain biking sustainable trails systems with loops.
- Increase in the desire for more technical trails
- Increase in user-conflicts on non-motorized trail systems, especially those located in close proximity to local communities
- Conflict in use between private land owners and such use as shooting ranges is on the rise
- Supporting recreation with high technology items such as downloadable and georeferenced trail guides, drone use areas and more is in great demand
- Greater need to provide non-English language sources

CHAPTER 7 - Designated Areas

Introduction

The Lincoln National Forest (Lincoln NF) includes several designated areas that have certain purposes and restrictions. Understanding these purposes and restrictions is fundamental to understanding management needs and opportunities associated with designated areas. This Assessment documents the locations, purposes and types of existing designated areas on the Lincoln NF and identifies the range of uses, management activities or management restrictions associated with the designated areas, including any overlapping management requirements of multiple designations. Known needs or opportunities for additional designated areas are also identified. Key subjects assessed include:

- Wilderness Areas,
- Research Natural Areas,
- Nationally Designated Trails,
- Caves,
- Wild and Scenic Rivers

The scale of analysis for this chapter will be that of the four counties touching the Lincoln NF, unless otherwise noted, and draws information and data from federal, state, county and other agencies, local communities and Lincoln NF corporate data from the National Resource Manager (NRM) database as well as corporate Geographic Information System (GIS).

Key Concepts and Definitions

Designated Area: The Forest Service Land Management Planning Handbook (1909.12) defines designated areas as:

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

Wilderness Area Defined by the Wilderness Act of 1964 as:

(c) A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. 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.

Types of Designated Areas

The types of designated areas that may be present or potentially designated in National Forest System (NFS) lands are listed in the following section. They include areas designated statutorily (by Congress) and administratively (by the Forest Service). National Monuments may be congressionally or administratively designated. Other types of designated areas may exist because of specific legislation or other administrative action that is unique to the plan area. Designated areas within the four county assessment area are shown in Figure 46.

Statutorily (Congressionally) Designated Areas

- National Heritage Areas
- National Monuments
- National Recreation Areas
- National Scenic Areas
- National Scenic And Historic Trails
- Wilderness or Wilderness Study Areas
- Highway Systems (Interstate and National)
- Wild and Scenic Rivers

U.S. Forest Service Administratively Designated Areas:

- Critical Habitat Under Endangered Species Act (USFWS Designated)
- Experimental Forests Or Ranges
- Inventoried Roadless Areas
- Wild Horse And Burro Territories
- Regional Forester Designated Areas
- Significant Caves
- Botanical Areas
- Geological Areas
- Scenic Byways - Forest Service Or National
- Scenic Areas
- Research Natural Areas
- Zoological Areas
- Recreation Areas
- Paleontological Areas
- National Recreation Trails
- National Natural Landmarks
- National Historic Landmarks
- Historical Areas

In the case of statutorily designated areas, the forest plan may include a recommendation to Congress regarding a designation. These areas are then managed as proposed designations until Congress either formally designates the area or releases it from further consideration; whereas administrative designations may be made by the Regional Forester as land use allocations in the forest plan.

Designated or Eligible Areas on the Lincoln NF include:

- Wilderness Areas (2)
- Wilderness Study Area (1)
- Eligible Wild And Scenic Rivers (17 totaling 132.8 Miles)
- National Recreation Trails (2)

- Inventoried Roadless Areas (12)
- Significant Caves (246)
- Proposed Research Natural Areas (3)
- National Forest Scenic Byway And 1 National Scenic Byway (2)
- Critical Habitat Areas Under Endangered Species Act (2)

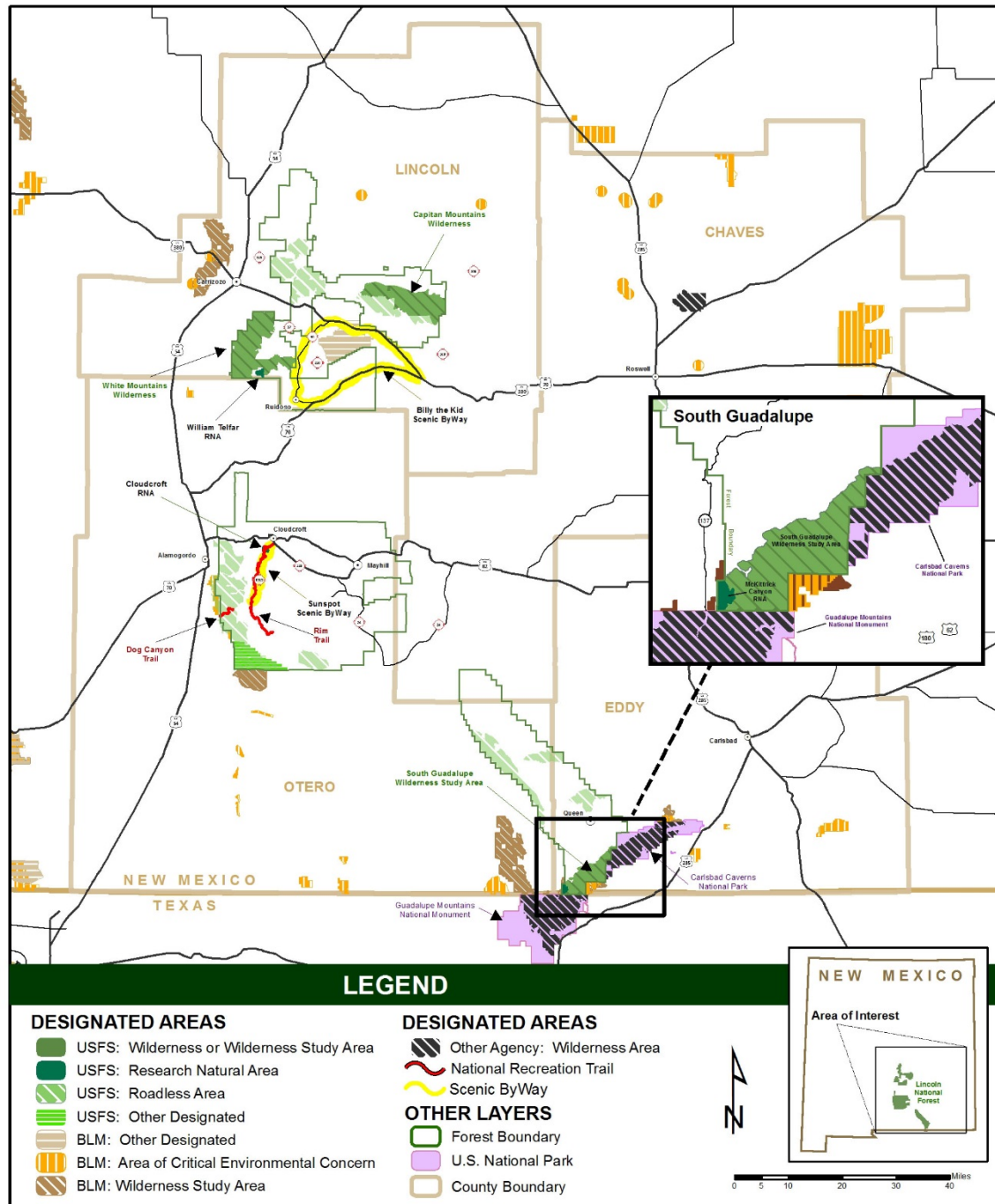


Figure 46. Designated areas in the four county assessment area

Social and Economic Contributions of Designated Areas

Summary

Designated areas contribute to social, economic, and ecological sustainability by showcasing outstanding natural features, allowing visitors to learn about their natural and cultural history, providing outdoor recreation opportunities, contributing to the tourism economy by drawing local, regional, national and international visitors, preserving and protecting unique or intact natural systems, and contributing to science and the development of sound land management practices.

Designated areas provide important but usually immeasurable contributions to the social and economic sustainability of the Lincoln NF. The designated areas on the Lincoln NF, especially wilderness, scenic byways, and significant caves serve as destinations for visitors. While scenic byways will continue to receive high visitor use levels, the opportunities for primitive and unconfined recreation offered by wilderness will attract a smaller subset of the surrounding populations. During the forest plan revision process, inventories and evaluations will be conducted for wilderness, wild and scenic rivers, and research natural areas to determine if additional areas should be designated, and, in some cases to determine if proposed areas should be carried forward into the new forest plan. Additional types of designated areas may be inventoried and evaluated during forest plan revision for potential designation.

Ecosystem Services

Ecosystem services for designated areas provide regulating services, such as storage of carbon, water filtration, climate regulation etc. to function with some level of protection. Designated areas often provide high-quality water, soil, and air resources as well as playing a role in conserving biodiversity and facilitate connectivity.

Designated areas can provide important social and economic services, including significant recreational and scenic opportunities, places to connect with nature and spirit, and contribute to the local tourism industry. They also offer the ability to connect with history and provide places for research.

Statutorily Designated Areas (Established by Congress)

Wilderness

The concept of wilderness in the National Forest System was first implemented in 1924 with the administrative designation of the Gila Wilderness in New Mexico. In 1964 Congress passed the Wilderness Act designating a National Wilderness Preservation System. Congress passed the New Mexico Wilderness Act of 1980 designating additional lands to the National Wilderness Preservation System in New Mexico.

Designated wilderness areas contribute to ecological sustainability by providing large expanses of natural landscapes that reflect ecological conditions that would normally be associated with the area without human intervention. They serve as a contrast to other areas that have been intensively managed or developed. They provide direct benefits by preserving intact ecological systems and the plants and animals that are dependent on them. Designated wilderness areas also contribute to social sustainability by providing outstanding opportunities for solitude or a primitive and unconfined type of recreation. They also provide intrinsic values to people who like knowing that these areas exist and will be preserved for future generations (Wilderness.net 2017). As part of the National Wilderness Preservation System, designated wilderness may contribute to the economic sustainability of the surrounding communities by drawing visitors who are interested in wilderness experiences, and also

through the potential for access to funding from individuals and groups that have an interest in preserving wilderness resources.

Designated wilderness areas provide unique opportunities for non-motorized quiet recreation, solitude and challenge. These areas provide recreation opportunity spectrum settings of primitive and semi-primitive non-motorized classes. The Wilderness Act prohibits permanent roads and the use of vehicles and any other forms of motorized equipment and equipment used for mechanical transport. These include 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. However, wheelchair use by people needing it is allowed in designated wilderness, consistent with Americans with Disabilities Act. There is no law or policy that prohibits motorized use up to the boundary of designated wilderness. Public Law 96-550, the 1980 New Mexico Wilderness Act, states that Congress does not intend that designation of wilderness areas in the State of New Mexico lead to the creation of protective perimeters or buffer zones around each wilderness area. The fact that non-wilderness activities or uses can be seen or heard from areas within a wilderness shall not, of itself, preclude such activities or uses up to the boundary of the wilderness area.

Lincoln NF Wilderness Areas

There are two congressionally designated wilderness areas totaling approximately 83,252 acres (8 percent of the Lincoln NF), including the White Mountain and Capitan Mountains. Most of the White Mountain was designated under the 1964 Wilderness Act, with additional acres and the Capitan Mountains designated under the 1980 New Mexico Wilderness Act (USDA Forest Service 2014b). The 1986 Lincoln NF Plan includes the complete acreage of each designated wilderness, including the additional acreage designated by the 1980 New Mexico Wilderness Act. Of the approximately 767,000 visitors to the Lincoln NF, over 21,000 enjoy visiting wilderness. There are also two congressionally designated National Park Service wilderness areas adjacent to the south end of Lincoln NF, Carlsbad Caverns and Guadalupe Mountains.

FS Chief Bosworth established the Wilderness Stewardship Challenge in 2004. The Challenge called for each wilderness area administered by the each national forest to meet a score of 60, based on points awarded in 10 categories. The categories include fire plans, invasive plants, air quality, education plans, solitude, recreation site surveys, outfitters, plan standards, workforce, and information management. The Wilderness Stewardship Challenge was completed in 2014 and both Lincoln NF wilderness areas passed with scores over 60. Education plans and air quality plans were developed for both wilderness areas, and trail and campsite inventories continue to improve. The next phase, Wilderness Stewardship Performance, is intended to improve conditions beyond the minimum stewardship levels that were met by the Wilderness Stewardship Challenge. This new measure offers a wide array of interdisciplinary elements that the Lincoln NF was able to choose from, based on the wilderness area and stewardship priorities. The elements selected for each wilderness area will be discussed in the following sections.

White Mountain Wilderness

The White Mountain Wilderness was designated by Congress as part of the Wilderness Act of 1964. Originally it was made up of 30,359 acres and in 1980 the New Mexico Wilderness Act added an additional 16,860 acres bringing its total acreage to 47,219. The White Mountain Wilderness is located on the Smokey Bear RD near the Village of Ruidoso. Sierra Blanca, the highest peak in the White Mountains, is visible for many miles, and is one of the most widely recognized landmarks in southern New Mexico. Elevations range from 6,000 feet near Three Rivers Campground to 11,580 feet on Lookout Mountain, resulting in diverse plant and animal communities.

The White Mountain Wilderness Management Plan was prepared in the early 1970s. This outdated plan was not updated after the issuance of the 1986 Forest Plan. No additional management plans have been created for this wilderness since. However, The Wilderness Challenge from 2004, several elements of concern were identified in a Wilderness Stewardship Performance plan in 2016. The section below summarizes those elements.

Wilderness Stewardship Performance

In 2015, the Lincoln NF selected elements to continue progress on stewardship of resources in the White Mountain Wilderness and to preserve its character, beyond what was currently being done. The following interdisciplinary elements were selected as important areas to improve upon for this specific wilderness area:

Threats to Natural Quality:

- Invasive species, specifically invasive plants and feral pigs continue to be one of the key threats to wilderness character, and require long term focus and effort to manage.
- Natural role of fire—fire is a significant natural force in this wilderness and continued focus on effective management of wildland fire is critical to maintaining the natural and untrammeled qualities of wilderness. In addition, there are adjacent resources at risk.

Although not selected as core elements affecting natural quality, both air quality values and fish and wildlife have been noted and will be monitored. Air quality values is an ‘elective’ element and the Lincoln will continue to adhere to the Air Quality Monitoring Plan created for the Wilderness Challenge from 2004. The White Mountain Wilderness is a Class 1 airshed, meaning it is designated by the Clean Air Act as deserving the highest level of air quality protection. The existing air quality strategy is sufficient to track potential degradation in the future. In regards to fish and wildlife, continued focus on restoration of naturalness is critical from a wildlife perspective. Strategies for restoration of the natural quality relating to wildlife habitat are known to be already developed for key threatened, endangered, and sensitive species.

Threats to Undeveloped Quality

- Recreation sites are identified as a concern and receive high use. There is concern that with planned improvements to maintenance of the existing trail system, use will increase, and existing campsites will receive even more pressure. Another concern is displaced use into concentrated areas because of the effects of fire on previously used areas.
- Trail management has been and continues to be a challenge due to the continued impacts of fire on trail conditions.

Non-compliant infrastructure and motorized equipment/mechanical transport use authorizations were also discussed but not selected as core elements. Non-compliant infrastructure includes a cabin, spring box, and unneeded range improvements. This existing infrastructure is well documented and is not considered an issue at this time. Infrastructure will continue to be tracked as an elective element and in relation to opportunities for primitive and unconfined recreation. Regarding use authorizations, they do occur very rarely and primarily for emergency or fire related circumstances. Minimum Requirements Analyses (MRAs) are completed when minimum tools are requested for work in this wilderness area. Currently there is a Regional Forester approved analysis for aerial gunning of feral hogs by the Department of Agriculture’s Animal and Plant Health Inspection Service and a pending analysis for

treatment of non-native invasive plants in the White Mountain Wilderness. It is anticipated that the aerial gunning and the selected tools for invasive plant treatment will continue for the foreseeable future.

Threats to Untrammelled Quality:

- Agency Management Actions were required for selection and includes an annual letter to from the Forest Supervisor to Lincoln NF employees discussing the importance of trammeling and reporting these actions. In addition, trammeling is required to be discussed at a Forest Leadership Team meeting.

Threats to Solitude Quality:

- Opportunities for primitive and unconfined recreation was selected as evidence of management actions (including fire management) and non-compliant infrastructure are concerns affecting solitude quality.

It is noted that good opportunities for solitude are known to exist and is not considered an issue in the White Mountain Wilderness.

Element of Special Provisions:

- Outfitter and Guides were selected as a potential future threat to wilderness. Although a capacity analysis was conducted in 2016 and did not indicate capacity was met, inspections of outfitter and guides should occur more often than they do currently.

Element of Administration:

- Workforce capacity, education, and wilderness character baseline are elements that were required to be selected to meet minimum administrative standards.

The elements chosen for the White Mountain Wilderness are reflective of the needs that were initially identified in the 2004 Wilderness Challenge. The Lincoln has taken key steps in stewardship of the White Mountain Wilderness by hiring a permanent full-time wilderness/trails position and by focusing time on applying for grants and implementing strategies to increase wilderness performance. It is anticipated that future gains in performance will be achieved with minimum stewardship occurring within the next 5 years.

The following sections discuss recreation access, opportunities, and use, which have future potential impacts to wilderness stewardship and the elements selected.

Recreation Opportunities and Access

The White Mountain Wilderness is a very accessible wilderness area with U.S. Highway 54 and three State Highways (532, 48 and 37) providing access to county roads and national forest roads that lead to wilderness entry points. Offering 10 trailheads and two equestrian areas with corrals, the White Mountain Wilderness, offers diverse recreation opportunities that attract visitors with a variety of interests. The primary recreation opportunity spectrum class in the wilderness is semi-primitive non-motorized. Most use occurs in the summer and fall. Wilderness visitor use is judged to be generally light to moderate, but is increasing especially within the first 2 miles of the wilderness. Most use is by day hikers from Lincoln County and visitors staying in the Village of Ruidoso area. Individuals and organized groups use the White Mountain Wilderness for a considerable amount of day hiking, horseback riding

and backpacking. Some of the more popular sites and trails include the Crest Trail and the Three Rivers Trail within the wilderness, and Southfork Campground and Argentina Trailhead adjacent to the wilderness boundary.

Based on current use patterns and several years of solitude surveys in this wilderness area, it is anticipated that the wilderness visitors will continue to be day hikers and visitors staying in the Village of Ruidoso area, with a small increase in overnight backpackers. Qualitatively, it is expected that visitor use will increase beyond the first 2 miles of wilderness trails, as the first 2 miles will be congested as visitor use increases. It has also been noted that hunters seeking a more traditional experience are venturing further into the White Mountain Wilderness and spending less time in general forest areas. It is anticipated that this type of hunting experience will fluctuate based on wants and desires of the hunting community.

Trails

Twenty five trails, totaling 53 miles were moderately to severely damaged by wildfire. These trails have received little to no maintenance since being damaged by fire and post-fire flooding in 2012. A trail risk matrix and assessment, completed initially in 2013 and revisited in 2017, has informed the decision to keep many of the fire damaged trails off the maintenance list for the reasonably foreseeable future based on trail condition, number of hazard trees, rolling debris and the potential for exposure. It is anticipated that the majority of the fire-damaged trails will be reestablished and/or rerouted in the next decade. This is based on trail use patterns, community demand, and the timing for the burned area to heal. Because the fire damaged the most popular wilderness trails in the White Mountain Wilderness, visitors to the wilderness began using wilderness trails that had not received maintenance on a regular basis. This redirection of use has prompted trail maintenance activities to rapidly increase in these former underutilized areas. Overall, trail condition on non-fire damaged trails in the White Mountain Wilderness is good with only minimal trails being poor.

Wilderness trail use in the future is expected to increase, with maintenance needs increasing proportionally. In addition, it is anticipated that as fire-damaged trails are reestablished, use will spread out across the trail system in the wilderness area.

Visitor Use

The National Visitor Use Monitoring (NVUM) surveys from both 2009 and 2014 support the claim of increased use even with the Little Bear fire in 2012 affecting much of the White Mountain Wilderness. Table 49 shows the changes in overall wilderness use.

Table 49. NVUM Site Visit Numbers for Wilderness Areas (2007 and 2014)

2007 NVUM Wilderness Visits	2014 NVUM Wilderness Visits
1,504	1,752

There are no designated campsites within the wilderness or any restrictions on campsite locations. No registration or permit system is in place for users and it is not anticipated that there will be a need for this type of management as the day-use dispersed nature of the visitors is not likely to change much over time. An inventory of existing campsites was conducted over a period of years between 2010 and 2013. Most of the heavily used sites are adjacent to streams and near scenic vistas. It is likely that use will increase in concentration primarily adjacent to streams and management actions in the future may need to address potential threats to water quality and riparian vegetation.

A Forest Order was implemented in 1993 to limit the number of horses to 15 for any overnight party entering the wilderness, to require users with 5 or more animals to use processed feed.

Natural qualities of the wilderness including air quality and water quality are not a substantial concern. The current Forest Plan was amended to allow for naturally ignited fires to be managed for resource benefits. However, due to the proximity to the wildland urban interface of communities such as Alto and Ruidoso, current fire management policy calls for full suppression of all ignitions within the wilderness.

Local Populations

The wilderness borders the community of Alto and other rural communities to the east and these communities have moved from rural and isolated housing and ranching to fully developed sub-divisions of both permanent and seasonal residences. On the eastern edge of the White Mountain Wilderness it is easy to hear cars, car horns and other such sounds from within the area. Many property owners back up to the wilderness boundary, often entering the wilderness on day hikes and short excursions. Many visitors are unaware of the wilderness boundary and the purpose for designated wilderness. As this interface between subdivisions and the wilderness boundary continue to grow and expand it will be important to increase efforts to educate the local communities and visitors about the importance of wilderness.

Wildfire Impacts

In 2012, the Little Bear Fire burned 17,644 acres of the Wilderness. Over 54 percent of the acres burned experienced moderate to high fire severity making this a stand replacement fire. The drainages and trails within these stand replacement zones sustained major impacts in subsequent years from flash flood events and falling trees. The Wilderness Area and fire area are shown in Figure 47.

An additional impact to the White Mountain Wilderness after the Little Bear Fire has been the abundance of invasive plants that have taken over, especially in the moderate to severely burned areas. No surveys have been done so no data is available to support that outside of observed populations.

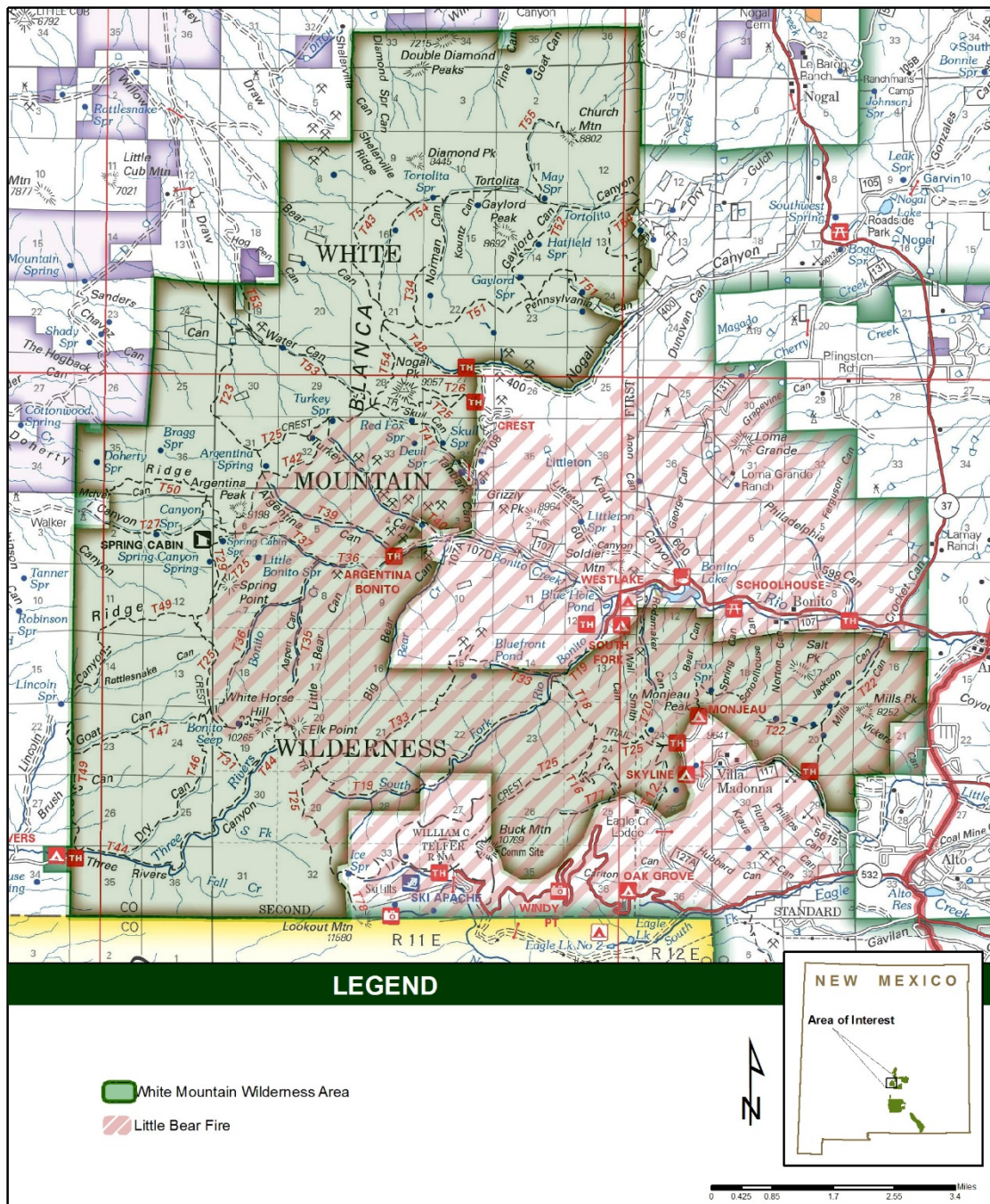


Figure 47. Map of the White Mountain Wilderness Area with the Little Bear Fire

Other Uses

Grazing is limited in the White Mountain Wilderness, with three allotments including acreage within the boundaries of the wilderness, totaling just under 5,000 acres. Current grazing permits allow for about 70 head of cattle to graze these areas. Infrastructure is limited to an old spring development and fences in various states of repair. An existing road within the White Mountain Wilderness is allowed under a special use authorization for access to a private inholding within the wilderness.

Capitan Mountains Wilderness

Capitan Mountains Wilderness was designated in 1980 and contains 36,034 acres on the Smokey Bear RD. It is the birthplace of the world famous Smokey Bear, having been found as a cub in a tree near Capitan Pass by local fire fighters in 1950.

The Wilderness straddles much of the Capitan Mountains, which have a unique geologic structure. Most basin and range type of mountains orient themselves north to south but the Capitan Mountains are oriented perfectly east to west. Numerous canyons cut into the north side of the rocky range, while rocky outcroppings distinguish the region to the south. The Wilderness measures approximately 12 miles wide (east to west) and 2 to 6 miles high (north to south), with elevations varying from about 5,500 feet near the eastern boundary to 10,083 feet on Capitan Peak

Wilderness Stewardship Performance

As was done for the White Mountain Wilderness, the Lincoln NF selected elements to continue progress on stewardship of resources in the Capitan Mountains Wilderness to preserve its character, beyond what was currently being done. The following interdisciplinary elements were selected as important areas to improve upon for this specific wilderness area:

Threats to Natural Quality:

- Invasive species, specifically invasive plants (musk thistle) and feral pigs continue to be one of the key threats to wilderness character, and require long term focus and effort to manage.
- Natural role of fire—fire is a significant natural force in this wilderness and continued focus on effective management of wildland fire is critical to maintaining the natural and untrammeled qualities of wilderness. In addition, there are adjacent resources at risk.

Although not selected as core elements affecting natural quality, both air quality values and fish and wildlife have been noted and will be monitored. Air quality values is an 'elective' element and the Lincoln will continue to adhere to the Air Quality Monitoring Plan created for the 10 Year Wilderness Stewardship Challenge (10YWSC). The Capitan Mountains Wilderness is a Class 1 airshed and the existing Wilderness Air Quality Related Values strategy is sufficient to track potential degradation in the future. In regards to fish and wildlife, continued focus on restoration of naturalness is critical from a wildlife perspective. Strategies for restoration of the natural quality relating to wildlife habitat are known to be already developed for key threatened, endangered, and sensitive species.

Threats to Undeveloped Quality

- Recreation sites are identified as a concern and receive high use. A survey was completed by the forest and a regional strike team; however continuing data collection and analysis will be needed to monitor trends. There is concern that with planned improvements to maintenance of the existing trail system, use will increase, and that combined with terrain limiting campsite opportunities, existing recreation sites may become an issue.
- Trail management has been and continues to be a challenge due to the continued impacts of fire on trail conditions.

Non-compliant infrastructure and motorized equipment/mechanical transport use authorizations were also discussed but not selected as core elements. Non-compliant infrastructure includes a shed and a spring box. There is a need to survey for anything additional however it is not considered an issue at this

time. Infrastructure will continue to be tracked as an elective element and in relation to opportunities for primitive and unconfined recreation. Regarding use authorizations, they do occur very rarely and primarily for emergency or fire related circumstances.

Threats to Untrammelled Quality:

- Agency Management Actions were required for selection and includes an annual letter to from the Forest Supervisor to Lincoln NF employees discussing the importance of trammeling and reporting these actions. In addition, trammeling is required to be discussed at a Forest Leadership Team meeting.

Threats to Solitude Quality:

- Opportunities for primitive and unconfined recreation was selected as evidence of management actions (including fire management) and non-compliant infrastructure are concerns affecting solitude quality.

It is noted that good opportunities for solitude are known to exist and is not considered an issue in the Capitan Mountains Wilderness.

Element of Special Provisions:

- Outfitter and Guides were selected as a potential future threat to wilderness. Although a capacity analysis was conducted in 2016 and did not indicate capacity was met, inspections of outfitter and guides should occur more often than they do currently.

Element of Administration:

- Workforce capacity, education, and wilderness character baseline are elements that were required to be selected to meet minimum administrative standards.

The elements chosen for the Capitan Mountains Wilderness are reflective of the needs that were initially identified in the 10YWSC. The Lincoln has taken key steps in stewardship of the Capitan Mountains Wilderness by hiring a permanent full-time wilderness/trails position and by focusing time on applying for grants and implementing strategies to increase wilderness performance. It is anticipated that future gains in performance will be achieved with minimum stewardship occurring within the next 5 years.

The following sections discuss recreation access, opportunities, and use, which have future potential impacts to wilderness stewardship and the elements selected.

Recreation Access and Opportunities

The Capitan Mountains Wilderness is a remote wilderness area that does not receive a lot of use. This is primarily due to its inaccessibility, limited trails, and lack of water. Access is limited to high clearance vehicles at only a few locations on National Forest System roads.

There are no designated campsites within this wilderness or any restrictions on campsite locations. No registration or permit system is in place for users. It is unlikely that visitor use will ever get to a point of requiring a registration or permit system. It is not anticipated that there will be a measurable change in visitor use patterns in the future in the Capitan Mountains Wilderness, based on its remoteness, inaccessibility, user types, and lack of water.

Local Populations

The Capitan Wilderness still retains its remote character with little population development near the boundary. That being said, nearby areas such as Capitan, NM have experienced population increases and perhaps will generate greater use of this wilderness as few outsiders venture into the area.

Wildfire Impacts

In 2004, the Peppin Fire burned 26,835 acres of the 36,043 acre Capitan Mountains Wilderness (74 percent) (Figure 48). This fire damaged all or portions of all 12 trails within the wilderness totaling 41 miles of directly burned trails. Efforts to clear trails have been ongoing but condition and access is poor not all in part to fire damage. The Capitan Wilderness is one of the few places within the project area that contains significant tallis slopes, or rocky/gravelly slopes, which are inherently unstable for trails but is also one of the charming characteristics of this more remote area.

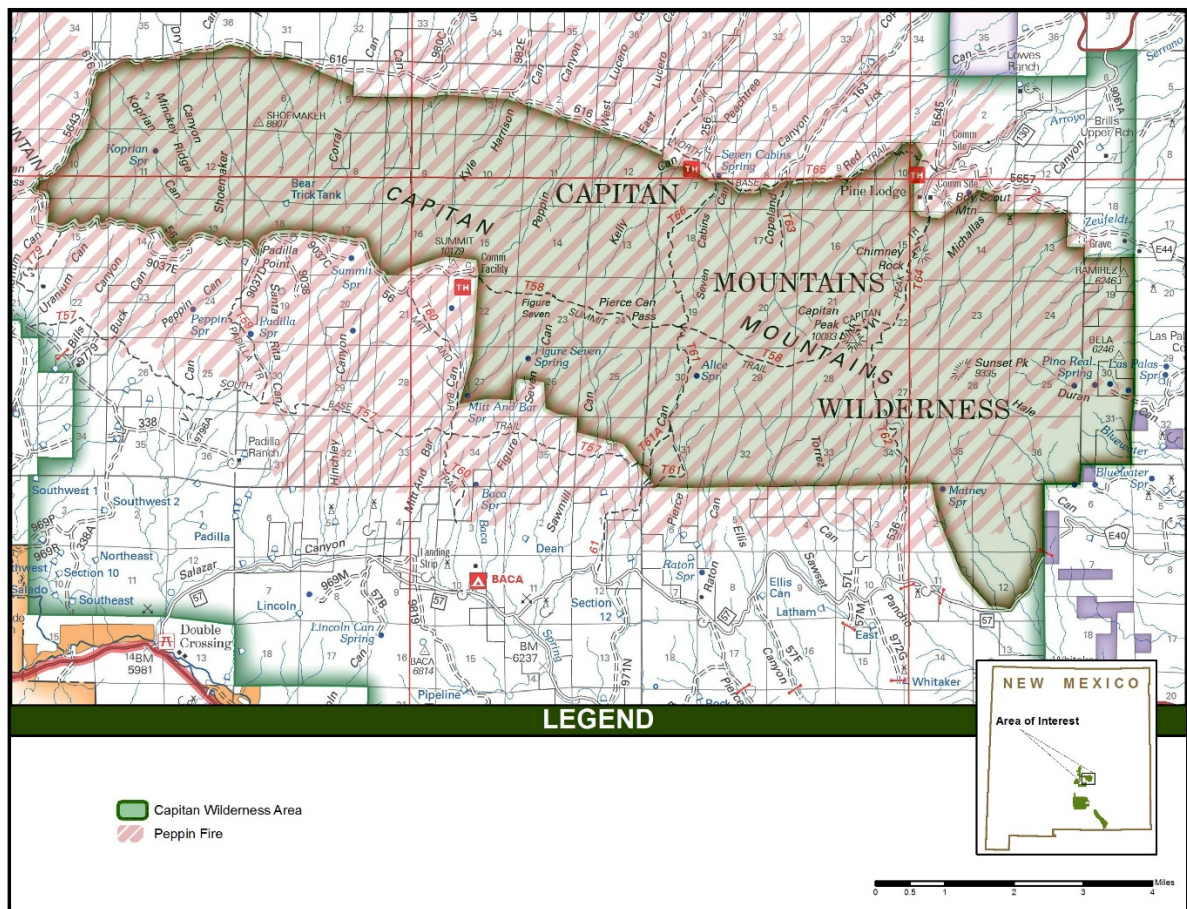


Figure 48. Map of the Capitan Wilderness Area with the Peppin Fire

Other Uses

Grazing is limited in the Capitan Mountains Wilderness, largely due to limited water sources. Four allotments include acreage within the boundaries of the wilderness, totaling approximately 3,200 acres. Current permits allow for approximately 550 head of cattle to graze, although a significant portion of these allotments are outside of the wilderness boundary. Unpermitted grazing by cattle occurs in other parts of the wilderness where allotments lie adjacent to it and fences are not present or not maintained. It is anticipated that this type of unpermitted grazing will continue, as fences will continue to fall into

states of disrepair. Infrastructure is limited to an old spring development and fences in various states of repair.

Surveys Conducted in the White Mountain and Capitan Mountains Wildernesses

An inventory of existing campsites was conducted over a period of years between 2010 and 2013 for both the Capitan and White Mountain Wildernesses. The inventory gathered information pertinent to invasive weeds, vegetation and soil conditions, trash, and many more.

Campsites and Conditions

Campsite inventories were conducted in both wilderness areas and 141 dispersed campsites were documented. Conditions at the majority of the sites had little or no impact on surrounding vegetation. Less than half of the identified sites have small fire rings. Only 32 of the sites had noticeable trash at the location. It was documented that there were 14 larger campsites that could accommodate large groups with two other campsites so hardened and repeatedly used that they were determined to be significant sites.

Although there are many identified sites that have been used for dispersed camping, the conditions of those areas, including trash, vegetation, and soil impacts were minimal. Only a few sites were identified and should be rehabilitated. While visitor use is greater in the White Mountain Wilderness than in the Capitan Mountains Wilderness, it is not expected that overnight dispersed camping will increase at a rate that would cause any significant resource damage.

Invasive Plants

Also surveyed within the two wilderness areas were the presence of invasive weeds. The following was inventoried (Table 50):

- 143 total sites were found
- Types found include bull thistle, cheat grass, musk thistle, Scott's thistle and unknown/other
- Musk Thistle is clearly the dominant invasive weed within the wilderness areas having 72 (55 percent) of the sites.

Table 50. Survey of Invasive Plants within the Wilderness Areas

Type	Sparse	Moderate	Extreme	Total Sites
Bull Thistle	7	8	3	18
Cheat Grass	11	7	5	23
Musk Thistle	18	37	17	72
Scott's Thistle	3	2		5
Other	10	1	3	14

Note: the total number of sites does not add up to 143 due to blank fields

It is difficult to assess overall condition of the wilderness with one set of survey data. However, overall condition assessments are anticipated to be forthcoming in environmental analyses of non-native invasive species.

Trends in Wilderness Areas

- Threats to Natural Quality will increase exponentially as non-native invasive plants such as musk thistle proliferate in both wilderness areas.
- Wildland fire will continue to play a role in the wilderness areas.
- Threats to Undeveloped Quality will likely increase along the edges of the White Mountain Wilderness as use and urban interface increases.
- Trail condition and maintenance will continue to be a challenge due to the impacts of fire on trail systems in both wilderness areas.
- It is likely that recreation sites will continue to be created in the wilderness areas but will not be significantly hardened.
- Trammeling actions will continue to be minimal with emergency actions being the primary actions in both wilderness areas.
- Opportunities for solitude will continue to be good throughout the White Mountain Wilderness and will likely continue to be excellent in the Capitan Mountains Wilderness.
- It is anticipated that the workforce capacity will not increase with the administrative needs in both wilderness areas.
- Human development (roads, subdivisions, etc.) is increasing adjacent to the White Mountain Wilderness.
- Use within the White Mountain Wilderness is increasing.

Wilderness Areas Adjacent to the Lincoln NF

Carlsbad Caverns Wilderness

The Carlsbad Caverns Wilderness, located on National Park Service-administered land, abuts the Lincoln NF for a distance of approximately 5 miles along the western boundary of the wilderness. The Carlsbad Caverns Wilderness was designated in 1978 with the National Parks and Recreation Act and includes 33,125 acres. The Carlsbad Caverns National Park, a World Heritage Site since 1995, has 120 documented caves, including the world-famous Carlsbad Cavern and Lechuguilla Cave. The Lechuguilla Cave is 135 miles long and over 1,600 feet deep, and Carlsbad Cavern is the largest, readily accessible cave chamber in North America. Caves found within the wilderness areas of the park are managed as wilderness. Almost three-fourths of the park is designated wilderness. Trails provide foot access only. The park has about 43 miles of hiking trails, of which about 25 miles are in wilderness. In addition, the 12-mile-long Guadalupe Ridge Trail follows the edge of the wilderness to the northwest (Wilderness.net 2017).

Carlsbad Caverns Wilderness is conterminous with the Lincoln NF's Guadalupe Escarpment Wilderness Study Area, which also connects to the Guadalupe Mountains Wilderness of Guadalupe Mountains NP. In addition, the Bureau of Land Management has three wilderness study areas that adjoin the Lincoln's Guadalupe Escarpment Wilderness Study Area. This vast area provides excellent opportunities for non-mechanized recreation, solitude, and primitive recreation, including hiking, backpacking, horseback riding, hunting, and bird watching/wildlife viewing.

The Lincoln NF, the National Park Service, and the Bureau of Land Management are working together to connect a series of trails within the areas above to establish a long-distance trail across the remote landscape. The proposed trail is approximately 71 miles long and will predominately use existing trails and some roads.

Guadalupe Mountains Wilderness

The Guadalupe Mountains Wilderness, located on National Park Service-administered land, abuts the Lincoln NF for a distance of approximately 4 ½ miles along the northern boundary of the wilderness. The Guadalupe Mountains Wilderness was designated in 1978 (in the National Parks and Recreation Act) and includes 46,850 acres. Unlike the wilderness areas mentioned above, the Guadalupe Mountains Wilderness is located completely in the State of Texas. More than half of the Guadalupe Mountains National Park is wilderness, the largest and oldest in the state and the only one in western Texas.

The wilderness is located approximately 55 miles southeast of Carlsbad, New Mexico and 110 miles east of El Paso, Texas. The very rugged terrain reaches 8,749 feet on Guadalupe Peak, the highest point in Texas. More than 80 miles of trail, some in the wilderness, give access to the mountains (Wilderness.net 2017). There are outstanding opportunities for solitude, and recreational opportunities include hiking, backpacking, horseback riding, birdwatching, photography, and nature study.

Wilderness Study Areas

Guadalupe Escarpment Wilderness Study Area (WSA)

The 20,913 acre Guadalupe Escarpment Wilderness Study Area was reviewed by Congress as part of the New Mexico Wilderness Act of 1980 (Figure 49). The New Mexico Wilderness Act of 1980 stated “the Secretary of Agriculture shall review the Guadalupe Escarpment Wilderness Study Area as to its suitability or non-suitability for preservation as wilderness, and report the findings to Congress. Subject to valid existing rights, the Guadalupe Escarpment Wilderness Study Area designated by this section shall, until Congress determines otherwise, be administered by the Secretary of Agriculture so as to maintain its presently existing wilderness character and potential for inclusion in the National Wilderness Preservation System: provided, that within the area, current levels of motorized and other uses and improvements shall be permitted to continue subject to such reasonable rules and regulations as the Secretary of Agriculture shall prescribe”.

The primary reason Congress gave for designating the Guadalupe Escarpment as a Wilderness Study Area was the question of oil and gas reserves. The following reason is quoted from the legislative history as found in the Congressional Record:

“On the Texas-New Mexico border, the substitute designates a 21,000 acre Guadalupe Escarpment Wilderness Study Area. Although this area, which links Carlsbad Caverns and Guadalupe Mountains National Parks, was recommended for wilderness by the Forest Service, it was agreed that further study is a preferable designation at this time. Wilderness study will allow time to determine whether the area has a high potential for oil and gas.” (EIS for the 1986 LNF Plan)

In 2001, approximately 27,300 acres of National Forest System lands were withdrawn from location and entry under the United States mining and mineral leasing laws for a period of 20 years, in order to protect the Guadalupe Cave Resource Protection Area. The withdrawal area includes the Guadalupe Escarpment Wilderness Study Area’s 20,913 acres along with 6,387 acres adjacent, to the north.

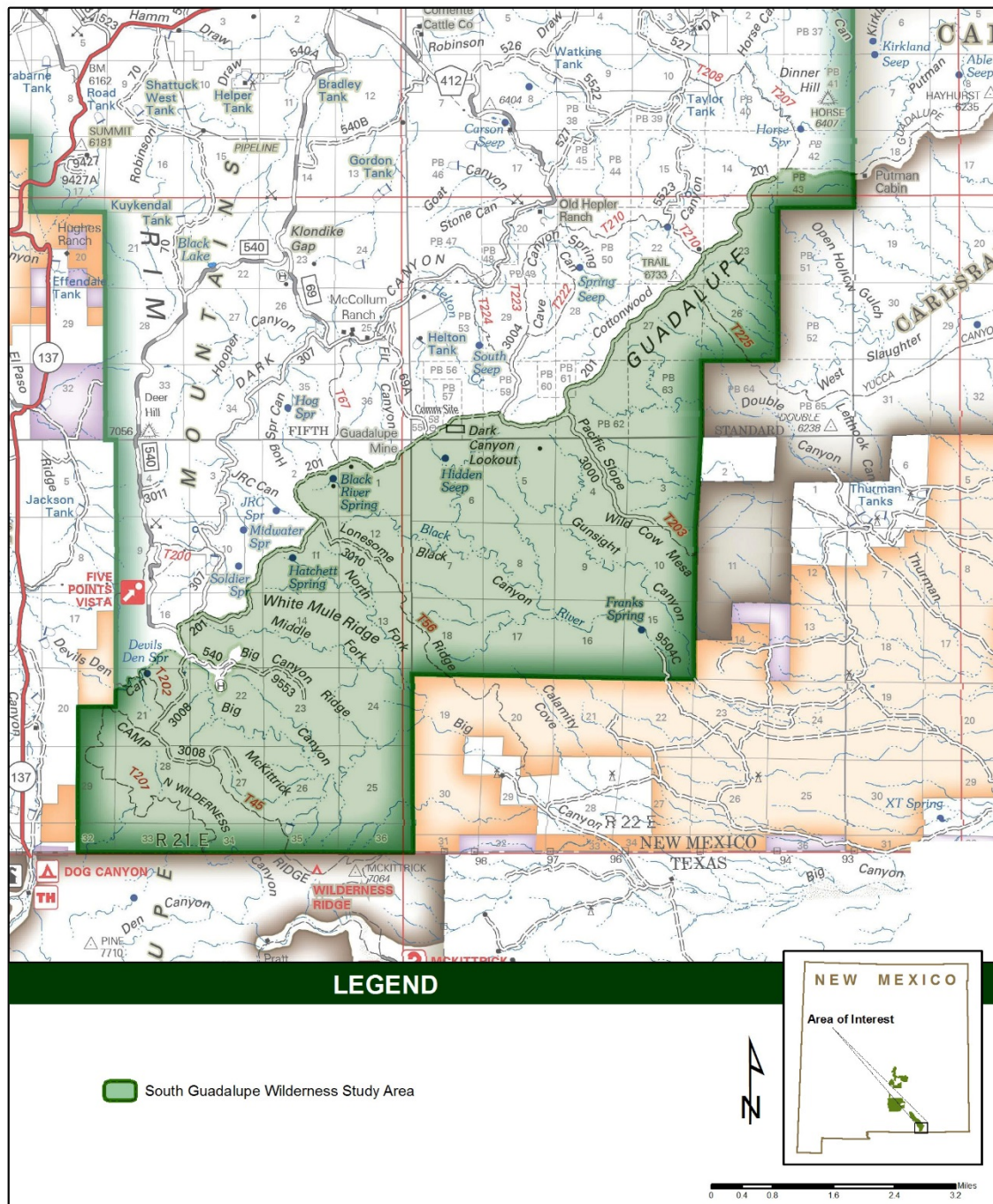


Figure 49. Guadalupe Escarpment Wilderness Study Area

The Guadalupe Escarpment WSA is extremely rugged with majestic vistas. Access to the area is by trail or rough class 2 roads. The area encompasses the majority of the more significant caves on the district. The 1986 proposed Upper McKittrick Research Natural Area falls within the Guadalupe Escarpment Wilderness Study Area (see RNA section, this chapter). This WSA is remote and conditions at the time of proposal were likely within the historic range of variation for the ecological types that occur there. Management as a WSA includes maintaining wilderness characteristics while allowing limited grazing

and trail work. The wilderness characteristics and condition of the WSA have remained stable even with a handful of smaller fires, much in part to its extremely rugged and remote location.

Uses

The Guadalupe Escarpment WSA was proposed to protect the unique geology and ecology of the extensive cave system, and provide research opportunities. Additional management emphasis provides for the management of dispersed recreation activities compatible with the cave resource (LNF LMP, 1986). The primary use in the area is by cavers coming to see the internationally renowned caves. Cave trips are required to be permitted to limit access so as to prevent significant impacts to the delicate cave environments.

The area is also used by big game hunters during hunting seasons. Several traditional hunting camps are located in the WSA either along the border roads or along spur roads into the WSA.

One new development in the area is the designation of the Guadalupe Ridge Trail. This trail spans the distance between the Guadalupe Mountains National Park through the Lincoln NF and continues through the Carlsbad Canyon National Park. Within the Lincoln NF, this trail follows an existing set of trails which act as the boundary of the WSA.

Trends

Use within the Guadalupe Escarpment WSA may increase with the introduction of the Guadalupe Ridge Trail. Application has been made to have the GRT designated as a National Recreation Trail. This designation along with the increase in publicity is likely to increase visitation. The district is also pursuing placing the Dark Canyon Lookout in the cabin rental program. This should also increase traffic through the area. The 1986 Lincoln NF Forest Plan also proposed the closure and obliteration of 5 miles of travelways which would enhance wilderness character.

Wilderness Study Areas Adjacent to the Lincoln NF

Adjacent to the Guadalupe Escarpment Wilderness Study Area, are three more Wilderness Study Areas managed by the Bureau of Land Management. The three Bureau of Land Management Wilderness Study Areas do not meet the 1964 Wilderness Act minimum criteria of being greater than 5,000 acres or of sufficient size as to make practicable their preservation and use in an unimpaired condition. Accordingly, a wilderness recommendation for those three Bureau of Land Management Wilderness Study Areas is dependent on the recommendation for the Guadalupe Escarpment Wilderness Study Area (USDA FS 1986).

The Devil's Den Canyon Wilderness Study Area abuts the Lincoln NF for a distance of approximately 1 mile along the eastern boundary of the wilderness study area. The Devil's Den Canyon Wilderness Study Area, 320 acres in size, is located approximately 40 miles southwest of Carlsbad and adjoins the Lincoln NF's Guadalupe Escarpment Wilderness Study Area. Devil's Den Canyon contains the mouth of a major drainage on the west side of Guadalupe Escarpment and has a variety of desert, piñon and juniper, and canyon bottom vegetation.

The McKittrick Canyon Wilderness Study Area, 200 acres in size, is located approximately 1 mile south of the Devil's Den Canyon Wilderness Study Area. It is contiguous with the Guadalupe Escarpment Wilderness Study Area along its eastern boundary. McKittrick Canyon consists almost entirely of steep

side slopes and contains Chihuahuan Desert grassland and scrub, as well as piñon-juniper woodlands and deciduous riparian vegetation.

The Lonesome Ridge Wilderness Study Area, 3,505 acres in size, is located about 4 miles east of the Devil's Den Canyon Wilderness Study Area. The area features stark landscape transitions from Chihuahuan Desert shrub at lower elevations to sheer limestone cliffs. The steep, rugged mountains with dramatic rock outcrops are highly scenic. The Wilderness Study Area is contiguous with the Guadalupe Escarpment Wilderness Study Area and the National Park Service's Guadalupe Mountains Wilderness in Texas.

The Culp Canyon Wilderness Study Area, 10,937 acres in size, is located about 25 miles from Alamogordo in southern New Mexico and is characterized by gently rolling hills and steep mountain slopes dissected by numerous canyons and arroyos. Vegetation consists of desert grasses and shrubs. It is located in the McGregor Military Range, an area established for the Army to conduct military training, including live-fire exercises. However, off-road vehicle travel and military weapons firing is not permitted within its boundaries. The Culp Canyon Wilderness Study Area is contiguous to the Lincoln National Forest on the southern border of the Sacramento RD.

Administratively Designated Areas (Agency Designated)

National Trails

National recreation trails are existing regional and local trails designated by the Regional Forester under Forest Service Manual 2353.04g which comes from the National Trails System Act established by Congress in 1968. The act authorizes the creation/designation of national, historic, and recreation trails. National scenic and historic trails can only be designated by Congress, but the Regional Forester can designate national recreation trails to recognize exemplary trails of local and regional significance.

Dog Canyon Recreation Trail

The Dog Canyon National Recreation Trail has been used for thousands of years by Native Americans as an access route from the desert environment of the Tularosa Basin to the Sacramento Mountains. It even served as an Apache stronghold during the Indian War period. The trail was designated as a national recreation trail in 1981. The Dog Canyon Trail is a steep trail that passes through multiple vegetation zones as it rises some 3,000 feet in 5.2 miles. It provides views of Alamogordo and the Tularosa Basin. The lower trailhead is located at Oliver Lee Memorial State Park. The trailhead at the top is on Joplin Ridge.

The Dog Canyon National Recreation Trail is a popular trail primarily in the spring and fall months when temperatures are cooler. The trail is open to hikers and equestrian users, but equestrian use is low due to the steepness and narrowness of the trail and the lack of water within the canyon. Hikers generally enjoy the trail for day trips only.

Maintenance, when possible, is done by youth crews from various conservation corps, volunteer groups like the New Mexico Rails-to-Trails Association, and Forest Service personnel. The Sacramento RD applies for grant funding to support maintenance and improvement work when possible. Condition of this trail is considered to be good. It has no impacts from wild fires, insect and disease or flooding.

Rim National Recreation Trail

The Rim National Recreation Trail, designated in 1978, was the first Forest Service trail in New Mexico to be designated as a National Recreation Trail under the National Trail System Act of 1968. The trail itself is a combination of old Indian paths, railroad grades, and homestead trails all linked together by new sections of trails built from the 1960s to 1980s. The trail passes through mixed conifer (Douglas-fir, white fir, southwestern white pine), quaking aspen and meadows. It runs north to south along the top of the Sacramento Mountains offering beautiful glimpses of the Tularosa Basin. Currently, the Rim Trail is 31.2 miles long. Sections have been added to the trail over the years, the latest addition being in 2000. Originally 14 miles of the trail was designated as a National Recreation Trail. When a new addition was added to the beginning of the trail in 2000, the designated section became mile marker 1.1 – 15.1. Except for the first 1.1 miles, this trail is designated for hikers, horses, mountain bikes, and motorcycles.

Rim Trail 105 is very popular, and its use is increasing. It has been highlighted in numerous trail websites, and is popular with hikers, equestrian users, mountain bikers, motorcyclists, and skiers. Use is heaviest in the summer months, but it is also popular in the fall when tree colors change. Skiers and snowshoers enjoy the trail in the winter months for quiet adventures in the forest.

Annual maintenance is done by Forest Service personnel, boy scouts, military volunteer groups, youth conservation corps, and others on a regular basis. Maintenance is also performed by annual recreation event permit holders. Condition of this trail is considered fair and has dropped from good to recent and large outbreaks of insects and diseases affecting the visual characteristic in moderate proportions along the trail.

Trends

- Rim Trail’s scenic quality is decreasing in areas affected by large insect and disease outbreaks.
- Rim Trail’s use is increasing

Inventoried Roadless Areas

Inventoried roadless areas were authorized by the 2001 Special Areas-Roadless Area Conservation Final Rule, 36 CFR Part 294. The “inventoried” part of the name comes from the Roadless Area Review and Evaluation that the Forest Service conducted in the 1970s. Inventoried roadless areas contribute to ecological sustainability by providing clean drinking water and other ecosystem services, and serve as biological strongholds for wildlife. They provide large, relatively undisturbed landscapes that are important to biological diversity and the long-term survival of many at-risk species. They also serve as barriers against the spread of nonnative invasive plant species and provide reference areas for study and research. Inventoried roadless areas also contribute to social sustainability by providing opportunities for dispersed outdoor recreation, opportunities that diminish as open space and natural settings are developed elsewhere.

Characteristics of roadless areas:

- Soil, water, and air resources;
- Sources of public drinking water;
- Diversity of plant and animal communities;
- Habitat for threatened, endangered, and sensitive species and species dependent on large undisturbed areas of land;
- Primitive and semi primitive motorized and non-motorized classes of recreation;

- Reference landscape for research study or interpretation;
- Natural appearing landscapes with high scenic quality;
- Traditional cultural properties and sacred sites; and
- Primitive and semi primitive motorized and non-motorized classes of recreation;
- Reference landscape for research study or interpretation;
- Natural appearing landscapes with high scenic quality;

The Roadless Area Conservation Final Rule prohibits road construction, reconstruction, and timber harvest (with exceptions) in inventoried roadless areas, because these activities have the greatest likelihood of altering and fragmenting landscapes, resulting in immediate long-term loss of roadless area values. Roads and motorized trails can be present within inventoried roadless areas. The Roadless Rule does not prohibit motorized travel on existing roads or motorized trails.

Roadless Areas of the Lincoln NF

Official roadless area boundaries were established in the 2000 Forest Service Roadless Area Conservation Final Environmental Impact Statement. Although the boundaries of the roadless areas will not be reconsidered during plan revision, these areas will be evaluated for potential suitability as wilderness areas. Figure 50 depicts the roadless areas on Lincoln NF, and Table 51 provides additional information.

The roadless areas on the Lincoln NF are located in places that generally do not receive a high amount of use by the visiting public and with regard to public lands management, all but one of these inventoried roadless areas allow for road maintenance. Some of the roadless areas contain minor infrastructure such as trick tanks and drinkers and have had some minor vegetation treatments. It is likely that visitor use in these roadless areas will remain low and hunting in these areas will remain at steady levels in the future. Hunting use is not likely to exponentially increase in these areas.

Vegetation in roadless areas will increase overtime, with recommended treatments unlikely to keep up with growth, as these areas are not easily accessible and do not take priority for vegetation management.

The general condition of the IRAs is variable within and among IRAs and follows the condition of the ecological types in the local environment. Ecological Response Units (ERUs, USDA FS 2014) are the combined potential vegetation and fire regime that are the foundation for ecosystem analysis in this assessment. ERUs are analyzed for condition (departure from historic range of variation) in Volume I, Chapter 3 Terrestrial Vegetation. Departure is calculated for each ERU at both plan (Lincoln NF) and local unit (watershed) scales. The ERU and local unit percent composition is provided below in Table 51 for each IRA for reference to the ERU departure summaries in Volume I, Chapter 3. Wilderness status and recent fire extent is provided as well.

Threats to the IRA characteristics mandated for protection by the Inventoried Roadless Rule include the occurrence of new and existing unauthorized user-developed motorized routes. However, current trends are for increased specific management actions under implementation of the Travel Management decision landscape restoration/management decisions to rehabilitate and reduce existing unauthorized routes, and prevention of the occurrence of new ones.

Table 51. Location and characteristics of inventoried roadless areas on the Lincoln NF

Roadless Area Name	Roadless Area Number	Ranger District	Local Units	Ecological Response Units	USFS Acreage/ Percent Wilderness and Wilderness Study Area	Fire, Year and Percent Burned
Capitan Mountains	69	Smokey Bear	Rio Hondo (53%) Arroyo del Macho (47%)	Ponderosa Pine Forest (31%) Mixed Conifer-Frequent Fire (25%) Sparsely Vegetated (20%) Pinon-Juniper Woodland (18%)	49,247/71%	Peppin Fire, 2004, 92%
Carrizo Mountain	67	Smokey Bear	Tularosa Valley (71%) Arroyo del Macho (29%)	Ponderosa Pine Forest (32%) Mixed Conifer-Frequent Fire (29%) Pinon-Juniper Woodland (24%) Mountain Mahogany-Mixed Shrub (14%)	17,268/0%	n/a
Culp	79	Sacramento	Tularosa Valley (93%) Salt Basin (7%)	Sparsely Vegetated (50%) Chihuahuan Desert Scrub (31%) Pinon-Juniper Woodland (20%)	3,248/0%	Timberon Fire, 2009, <1%
Grapevine	78	Sacramento	Tularosa Valley	Chihuahuan Desert Scrub (92%) Sparsely Vegetated (8%)	2,088/0%	n/a
Jefferies Canyon	73	Sacramento	Salt Basin (99%) Rio Peñasco (1%)	Mountain Mahogany-Mixed Shrub (55%) Mixed Conifer-Frequent Fire (30%) Pinon-Juniper Woodland (10%) Mixed Conifer with Aspen (3%) Ponderosa Pine Forest (2%)	8,928/0%	n/a

Roadless Area Name	Roadless Area Number	Ranger District	Local Units	Ecological Response Units	USFS Acreage/ Percent Wilderness and Wilderness Study Area	Fire, Year and Percent Burned
Last Chance Canyon	76	Guadalupe	Upper Pecos (100%)	Pinon-Juniper Woodland (44%) Pinon-Juniper/Evergreen Shrub (26%) Mountain Mahogany-Mixed Shrub (18%) Juniper Grassland (11%)	8,926/0%	Last Chance Fire, 2011, 100%
Little Dog and Pup Canyon	74	Guadalupe	Salt Basin (97%) Upper Pecos (3%)	Semi-Desert Grassland (64%) Pinon-Juniper Grassland (20%) Chihuahuan Desert Scrub (12%) Sparsely Vegetated (4%)	25,398/0%	n/a
North Rocky Canyon	75	Guadalupe	Upper Pecos (100%)	Pinon-Juniper Grassland (51%) Semi-Desert Grassland (49%)	8,060/0%	Rocky Fire, 2008, 38% Acrey Fire, 2011, 43%
Ortega Peak	71	Sacramento	Tularosa Valley (100%)	Sparsely Vegetated (50%) Chihuahuan Desert Scrub (26%) Pinon-Juniper Woodland (20%) Ponderosa Pine Forest (6%)	11,536/0%	n/a
South Guadalupe Mountains	77	Guadalupe	Upper Pecos (98%) Salt Basin (2%)	Mountain Mahogany-Mixed Shrub (77%) Mixed Conifer-Frequent Fire (8%) Ponderosa Pine/Evergreen Shrub (8%) Pinon-Juniper/Evergreen shrub (7%)	20,913/100%	n/a

Roadless Area Name	Roadless Area Number	Ranger District	Local Units	Ecological Response Units	USFS Acreage/ Percent Wilderness and Wilderness Study Area	Fire, Year and Percent Burned
Tucson Mountain	68	Sacramento	Arroyo del Macho (38%) Tularosa Valley (32%) Rio Hondo (30%)	Pinon-Juniper Woodland (45%) Ponderosa Pine Forest (43%) Pinon-Juniper Grassland (7%) Mountain Mahogany-Mixed Shrub (3%) Mixed Conifer-Frequent Fire (2%)	16,893/0%	n/a
West Face Sacramento Mountains	72	Sacramento	Tularosa Valley (100%)	Sparsely Vegetated (55%) Pinon-Juniper Woodland (22%) Chihuahuan Desert Scrub (17%) Ponderosa Pine Forest (5%)	41,146/0%	n/a
White Mountain Wilderness – Existing Wilderness	91	Smokey Bear	Tularosa Valley (61%) Rio Hondo (39%)	Mixed Conifer-Frequent Fire (34%) Pinon-Juniper Woodland (29%) Ponderosa Pine Forest (18%) Spruce-Fir Forest (13%) Montane-Subalpine Grassland (5%) Pinon-Juniper Grassland (2%)	30,864/100%	Little Bear Fire, 2012, 38%

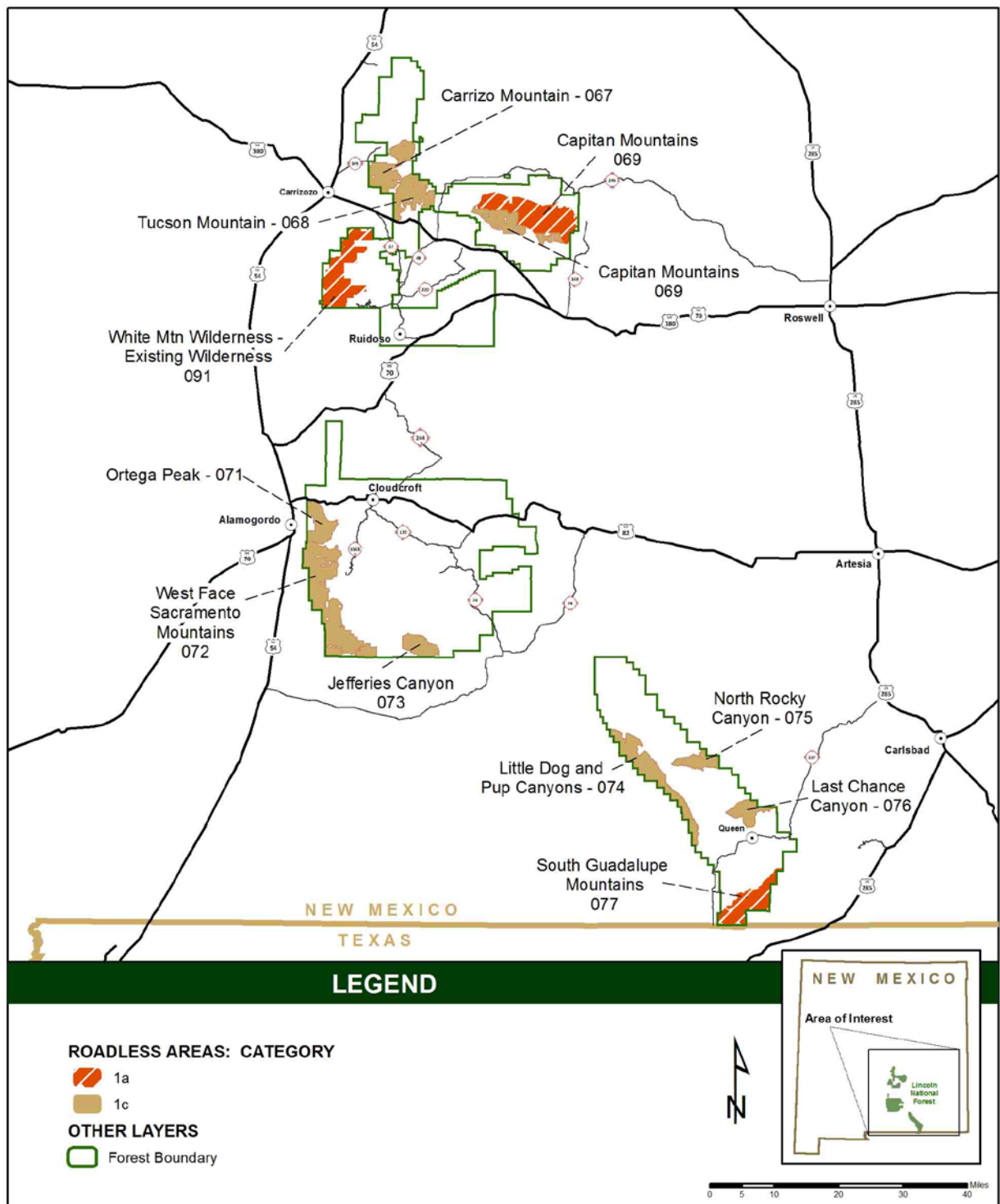


Figure 50. Roadless areas on the Lincoln NF

Cave and Karst Resources

Karst is a landform produced by the dissolution of soluble bedrock types such as limestone, dolomite, marble, gypsum, or salt. Features often associated with karst terrains include, sinkholes or closed depressions, caves, dry valleys, sinking streams, springs, and resurgences. Groundwater recharge in karst areas often occurs rapidly as surface water enters karst features and is quickly transported through open conduits to either shallow or deep aquifers. This water can then remain underground or emerge back to the surface in springs, seeps, or wells.

A cave resource is any resource occurring within a cave. A cave is defined as any naturally occurring void, cavity, recess, or system of interconnected passages occurring beneath the surface of the Earth large enough to permit an individual to enter, whether or not the entrance is naturally formed or human-made (FCRPA, 16 U.S.C. 63 § 4301 et seq.). Cave resources can be biological, geological, mineralogical, paleontological, cultural, hydrologic or other resource attribute specific to that cave.

The limestone karst regions west and southwest of the city of Carlsbad including the Guadalupe Ranger District, are known worldwide for their cave resources. Once a living reef on the edge of an inland sea, the Guadalupe Mountains are home to over five hundred known limestone caves ranging from a few feet long to one hundred and thirty miles of surveyed passage in length and up to sixteen hundred feet in depth. More than 120 significant limestone caves are found within lands managed by the Guadalupe Ranger District. Many of these caves occur in the rough canyons flanking the North and South sides of the Guadalupe Ridge Anticline on the South end of the Guadalupe District. Caves on the southern end of the Guadalupe District range from very large, simple chambers to complex mazes of interconnecting passages. Several caves have been mapped to lengths of over 3 miles with a few approaching 10 miles. Some caves inventoried are relatively level while others plunge downward to maximums of 600 feet below the entrance via technical vertical shafts and steep inner slopes.

Due to their unique sulfuric acid speleogenesis, the limestone caves of the Guadalupe Mountains have been and continue to be intensely studied by speleologists, hydrologists, and geologists. Being free of the erosional affects often associated with caves formed by flowing water, the caves offer scientists the opportunity to clearly study the Capitan Reef from the inside out.

Unique mineralogy, the absence of organics, and isolation from surface influence in some of the deeper caves contribute to unique environments that foster the growth of extremophile microbial colonies. These colonies are of great interest to microbiologists. Many of the microbial communities discovered by researchers in the caves of this region have proven to be new species.

Calm post development environments have allowed for most of the limestone caves to develop extensive speleothem (cave formation) displays. The spectrum and variety of speleothems is immense. Massive one hundred foot tall column formations are present as well as delicate selenite needle formations that are as thin as a human hair and sometimes several feet long. The aesthetic value associated with these speleothems draws cavers from all over the world who come to explore the Guadalupe's wild caves as well as thousands of tourists who come to visit the speleothem filled chambers of Carlsbad Caverns.



Figure 51. A large room and lake beneath the Guadalupe Ranger District. Note: Caver in blue shirt at left/center for scale.

The Capitan Aquifer, the main domestic water source for the city of Carlsbad, is recharged primarily via the cave and karst features located in the Guadalupe Mountains.

In addition to known caves, many significant limestone karst features such as sinkholes, fractures and fissures, as well as unique geological features including extensive systems of joints and lineaments indicate that many more cave systems exist with no currently known extensions to the surface under the Guadalupe Ranger District.

The Sacramento Ranger District is home to roughly 10 known caves. While formed in limestone like their Guadalupe District counterparts, these caves are largely formed via tectonic events or from downward seeping surface waters. While not as decorated or large as caves in the Guadalupe's, caves on the Sacramento Ranger District play an important role hydrologically and as a vital habitat for cave adapted wildlife such as bats. Some of these caves receive a moderate amount of recreational visitation. Most caves on the Sacramento Ranger District are less than 1000 feet in length.

The Smokey Bear Ranger District contains around 30 known limestone caves and many known karst features. The most well-known cave located beneath the surface of the District is Fort Stanton Cave. While the only known entrance to Fort Stanton Cave System, currently surveyed to over 30 miles in length, is located on lands managed by the Bureau of Land Management, several miles of surveyed passage has been found under the jurisdiction of the Lincoln National Forest. Other caves, ranging in length from a few hundred to a few thousand feet are found on the Smokey Bear Ranger District

scattered around the Fort Stanton Area. Some of these caves are moderately decorated with both gypsum and calcite formations. Most caves in this area exhale significant amounts of air, indicating that they are connected to deeper cave systems.

Cultural evidence found in and around a few caves on the Lincoln National Forest area suggests moderate to significant use by Native Americans and Euro-Americans stretching back hundreds and thousands of years. Native Americans in the area used caves for food storage and processing areas, water sources, shelter, religious and ceremonial sites, and burial. Euro-Americans used caves for shelter, livestock pens and watering areas, trash dumps, tourist attractions, and recreation.

Some Lincoln National Forest caves have functioned as natural faunal traps for several thousand years. These caves have produced a unique stratified record of past mammal populations extending back through the Pleistocene era. Some caves have yielded bones of mammals that are now extinct or no longer common in the area.

Cave resources are fragile due to their association with other resources such as groundwater hydrologic systems and biological communities. Caves are complex ecosystems not only because of the fragile nature of their components (i.e., paleontological and archaeological deposits, speleothems [formations inside caves], and biological resources) but also because of the length of time the ecosystem needs to respond to changes in its condition. As such, caves, karst terrain and their associated resources are considered nonrenewable.

Indicators for Cave and Karst Current Conditions

Indicators can be/are used to determine the current condition of a variety of cave and karst resources.

Indicators including the change in width and intensity of designated trails, broken speleothems, modifications of cave passage dimensions, presence or absence of human influenced materials (i.e. trash, mold, etc.), results of cave restoration activities, and disturbances to cultural or paleontological resources, can be indicators of the impact of human visitation on caves. Visual inspection of these indicators in caves, when utilized with results of past inspections, can be used to determine both subtle and significant changes within a cave environment. The most effective means of visual inspection combined with documentation is photo monitoring. Photo monitoring of specific cave resources and areas within caves allow observation of several indicators over time.

The presence and intensity, or absence within a cave environment, of certain bacteria usually associated with the presence of humans can be an indicator of the impact of human visitation on the cave micro biota in certain areas.

Monitoring of cave biota can help determine trends for both the health of the cave ecosystem itself and the environment immediately around it. Bat population monitoring, for example, can indicate that management activities may need to be adjusted such as cave gate design, visitor use and seasonal closures, or surface use around a cave entrance.

Measurements in both quantity and quality of water within caves and at cave resurgences and springs and wells within karst areas help assess impacts of surface and subsurface activities on cave environments. These impacts can include change of surface flow patterns that increase or decrease subsurface flow, introduction or remediation of contaminants, and changes to natural recharge of karst

aquifers.

Since many riparian areas in the Lincoln National Forest are results of karst groundwater discharge, the overall health of these riparian areas can be indicators of the current conditions of their associated karst system.

Current Resource Condition

The Lincoln National Forest began taking an active role in the protection and management of caves on the Guadalupe Ranger District in the early 1970s. Prior to that, many of the caves were discovered, explored, surveyed, and studied by various caving enthusiasts belonging to a variety of Grottos, or caving clubs, organized under the National Speleological Society. Several caves have been visited by Euro-Americans since the late 1800s and a few were utilized for commercial tours during a dude ranch operation in the early 1900s. Due to these activities, several major caves had sustained minor vandalism prior to the creation of what was initially the Guadalupe National Forest, and certainly before the Lincoln National Forest's recognition of the need for protection of cave resources.

In 1972, a Forest Closure Order was placed on all caves under the jurisdiction of the Lincoln National Forest. This order requires prior authorization for any individual to enter any cave located on the Lincoln National Forest. A system was set up in which a locally issued "cave entry permit" gave this authorization. An entry authorization, or commonly referred to as "cave permit", system is currently in place that allows the public to apply for entry to specific caves for specific times. This allows the Lincoln National Forest to inform the applicant of risks involved in the exploration of caves as well as to distribute information to protect specific resources in specific caves. The number of entries can also be controlled to match carrying capacities for certain caves in this manner. Lockable gates are installed on exceptionally sensitive caves when the entrance or passage size makes it practical. This practice has occurred on the Guadalupe Ranger District since the late 1960s. Currently 23 caves have gates. The purpose of the gates, and the entry authorization system, is to protect both the public and the cave resources by maintaining a system to control access. Prior to the installation of these gates, access was uncontrolled, resulting in heavy visitation of some caves, sometimes by careless visitors, and increased degradation to the resource. Since the authorization system was implemented, much improvement has been made in the condition of these resources. Restoration projects such as trash and graffiti removal have proven much more successful since access is controlled and several caves are beginning to show significant improvements due to these activities. However, many significant caves within the Lincoln National Forest do not have gates and some commonly receive unauthorized use by irresponsible users often leaving behind trash, straying off trail systems, and/or not respecting seasonal closures for sensitive wildlife species.

Initial carrying capacities set up for entry authorizations proved to be too high for many of the caves on the Guadalupe Ranger District. Extremely heavy authorized use, especially during the late 1970s and 1980s resulted in noticeable impact throughout the most popular caves on the Lincoln. This impact came in the form of soil and mud tracking into sensitive formation areas, broken and missing cave formations, trash and human waste being left behind, and compaction of cave soils and sediments off of established trails. Due to these impacts, in the mid-1990s, several popular caves were reclassified under the Lincoln National Forests cave classification system, and were removed from caves where recreational visitation was authorized. This action was meant to be temporary until restoration work could be accomplished within these caves and more realistic carrying capacities could be established. Since that time, volunteer groups have donated thousands of hours of time completing restoration in these caves. Several have been placed back into the recreational visitation group. Monitoring has shown that lower carrying capacities, coupled with an on-going "trip leader training" program has resulted in

low additional impact to cave resources. Unfortunately several caves still show impact from decades of overuse. Dedicated volunteers continue to restore these areas on a monthly basis.

While most damage to Lincoln National Forest caves has been caused due to over use by generally well intentioned users, some damage has been malicious and significant. Over the years, several gates have been breached and significant damage in the form of graffiti and formation breakage has occurred in a few of the more accessible caves. As much of this damage that could rectified has been. Graffiti has been removed and many formations have been carefully epoxied back into place where they can continue to naturally repair themselves. However, several areas within a few caves maintain strong visible evidence of vandalism.

Many caves, due to their more recent discoveries combined with early gating and proper management, remain in near pristine condition. Extravagant displays of exceptionally delicate formations can still be found adorning picturesque passages as can fully articulated skeletal remains of mammals that went extinct 10,000 years ago.

The permit system has also allowed for the protection of sensitive bat populations roosting within gated and ungated caves. Once disturbed populations in several caves have begun to return to their historical numbers or greater by management actions limiting access during roosting times. This is also true in relation to other wildlife species such as Mexican Spotted Owls who use several caves on the Guadalupe Ranger District to raise young.

2001, the Forest Service, in conjunction with the Bureau of Land Management, withdrew from mineral entry and closed to fluid mineral leasing, the majority of the Guadalupe Ranger District cave area in an effort to protect cave resources from impacts associated with those activities. Mining and drilling activities in the Carlsbad area has tremendously bisected and impacted nearly all karst lands. Because of this withdrawal and closure in 2001, the southern end of the Guadalupe Ranger District remains the only significant, intact and nearly pristine karst area in the Guadalupe Mountains to be found outside of either Carlsbad Caverns National Park or Guadalupe Mountains National Park.

Caves on the Smokey Bear and Sacramento Ranger Districts receive significantly less use but also less intensive management. Several caves on both of these Districts show evidence of moderate human impact. Some caves have been excavated by pot hunters and evidence of these activities remain. It is not uncommon to find arrows or other graffiti spray painted on walls of these caves as novices attempt to find their way around. While none of the caves on either of these Districts have entry gates, cavers have concealed entrances to caves on the Smokey Bear District in an attempt to eliminate casual visitation. A significant number of caves on the Smokey Bear District are in near pristine condition.

Trends

General interest in caves and cave resources has steadily increased within the area. The formation of Carlsbad Caverns National Park in the 1930s set an international reputation for the Carlsbad area as being a “cave area”. Media attention has also drawn focus to the cave resources located here. Large production companies such as National Geographic and the British Broadcasting Company have produced documentaries on the caves of the Guadalupe Mountains that have aired internationally.

Recreational visitation to caves has also increased as more awareness of the existence of these resources has been brought to public attention. However, since the placement of gates and the implementation of a cave entry permit system in 1972, visitation numbers have remained fairly steady in relationship to carrying capacities. For example, during the 1980s, carrying capacities were set high. Visitation reached these capacities but stayed steady due to a limited number of authorizations. The

same is true through the 1990s, but at a lower number due to lower carrying capacities. As seen in many outdoor activities, there has been an overall slow-down in the engagement of younger generations in caving activities. Social media has slowly led to an increase in youth engagement in these activities and it is anticipated that this trend will continue. Most popular caves on the Lincoln National Forest are not currently receiving visitation at their current carrying capacity limits. While visitation will likely increase over the next several years, proper management will have these numbers plateau at these capacities. Many caves on the Lincoln National Forest are currently not visited recreationally. This can be a result of the cave not having visitor appeal or that it is not currently in a management class that allows for recreational visitation. Limited scientific and exploration trips continue in these resources. However, it is anticipated that recreation visitation will be allowed in the future to some of these caves, increasing visitation to specific caves, but likely relieving visitation pressure to others.

Projects involving caving activities and volunteerism within the cave program has remained steady since the 1960s. Large scale projects including cave restoration, exploration, surveying, cartography, and documentation are ongoing. Partnerships with various groups such as local grottos and the Southwestern Region of the National Speleological Society continue to be renewed when applicable.

A slow increase of commercial cave visitation through Special Use Permits issued to outfitter and guide services is occurring on the Guadalupe Ranger District. This will likely increase over time. However, these services must work within established carrying capacities for specific caves, so it is not anticipated that this will result in an overall increase of visitation.

Interest in conducting scientific research within caves has dramatically increased since the 1980s. Yearly, proposals are received to conduct various degrees of research within caves in the Lincoln National Forest. An increasing number of research requests in the field of microbiology have occurred since the recognition of caves as being a frontier for these kinds of studies.

Oil and Gas drilling has rapidly engulfed areas surrounding the Guadalupe Ranger District. While there has been only a minor amount of these activities occurring on the Forest itself, lands in other jurisdictions have been heavily developed. If the closure to fluid mineral leasing that was placed upon the cave area of the Guadalupe Ranger District in 2001 is allowed to expire, it can be expected that interest in leasing these areas will significantly increase. Development would likely occur within the core of the karst area in the southern Guadalupe.

Forecast

Under current management, significant caves and karst areas within the Lincoln National Forest would continue to receive recognition and protection.

Trends indicate a continued increase in interest of cave and karst resources. Educational outreach stressing the importance of these resources would continue. Cave visitation numbers would remain steady for caves under the cave permit system since access is controlled. As caves become more popular, entry authorization requests are likely to increase. Visitation to permitted caves will remain constant unless management decisions change carrying capacities in response to resource conditions. Visitation to caves currently not often visited will likely increase. Without proper education, negative impact to these resources could also increase. Potential cave closures due to the possible spread of White Nose Syndrome could dramatically cut visitation on a temporary basis to certain caves.

Project caving such as those activities listed above would continue under the supervision of the Lincoln

National Forest. Protection of the resource and the public would continue to be a goal while still allowing for these activities to occur. Restoration projects would continue to improve the condition of certain caves that have been impacted by past visitation. Volunteers would still be used to carry out many important aspects of the cave program.

New caves will likely be found as exploration of the rugged canyons continue. A need for survey, mapping, inventory, and often times, gating is likely to continue.

Scientific research would also continue and could increase as new discoveries are made and technologies developed.

Research Natural Areas (RNA)

Research natural areas are part of a national network of ecological areas designated in perpetuity for research and education and to maintain biological diversity on NF System lands. Research natural areas are principally for non-manipulative research, observation, and study (Forest Service Manual 4063). The 1986 Lincoln NF Plan includes the following definition for research natural areas: An area set aside by the Forest Service to preserve a representative sample of an ecological community; primarily for scientific and educational purposes (USDA Forest Service 1986). Research natural areas contribute to ecological sustainability by providing minimally disturbed areas for study, an ecological baseline, and comparison for forest management techniques on adjacent lands.

For designation of research natural areas, the responsible official provides a recommendation through the forest plan. The forest plan revision process will evaluate whether additional areas are appropriate for designation as research natural areas. The Regional Forester designates research natural areas, with concurrence of station directors (Forest Service Manual 4063). Discussion of the potential need for additional research natural areas in the Southwest Region of the Forest Service is included in the “Documented Needs or Opportunities for Additional Designated Areas” section below.

Per the 1986 forest plan, management direction for the proposed (but never officially designated) three RNA’s, one within each Ranger District. The purpose of these proposed designations was to provide opportunities for non-disruptive research and education. Use restrictions are imposed as necessary to keep areas in their natural or unmodified condition. There is no harvest of forest products including fuelwood. The three areas are listed in Table 52.

Table 52. Proposed research natural areas on the Lincoln NF

Proposed Research Natural Area	Acres	Ranger District	County	Vegetation Type	Reason for Evaluation
William G. Telfer	641	Smokey Bear	Lincoln	Spruce-Fir and Thurber Fescue	Contains examples of spruce-fir and associated plant communities at their southernmost geographical limits in North America.

Proposed Research Natural Area	Acres	Ranger District	County	Vegetation Type	Reason for Evaluation
Haynes Canyon	597	Sacramento	Otero	White Fir	Contains an outstanding example of a mixed conifer forest, close to its southern limit within the National Forest system.
Upper McKittrick	787	Guadalupe	Eddy	Mountain Mahogany	Contains an outstanding example of a mountain mahogany community. This is an important chaparral ecosystem in the Southwest.

William G. Telfer (Buck Mountain) Proposed Research Natural Area

This area contains spruce-fir forests on sites and exposures mostly between 10,000 and 10,600 feet elevation. This boreal forest environment is insular in nature and contains examples of spruce-fir and associated plant communities at their southernmost geographical limits in the United States, including the most extensive stand of the corkbark fir/cardamine groundsel plant community. Old-growth stands contain massive specimens of the largest corkbark fir in the United States. In addition to old-growth, other spruce-fir stands exist in intermediate and late seral stages. Other vegetation within this Research Natural Area (RNA) includes meadows dominated by Thurber fescue or bluegrass and small groves of aspen. An open forest of Douglas-fir and Thurber fescue occurs as forest border along the upper slopes of Buck Mountain. A small, semi-permanent stream within the RNA is one of the headwater tributaries of North Fork Ruidoso Creek. The RNA was proposed to represent the Spruce-Fir Forest type (now Ecological Response Units or ERUs; see Chapter 3, Volume I, Terrestrial Vegetation) through all stages of succession, including unique stands of over 300 year old corkbark fir. The Spruce-Fir ERU makes up 68 percent of the RNA. The original conditions were within the historic range of variation (USDA FS 2014), with predominately mature and old growth forest. Also represented is the Montane-Subalpine Grassland ERU (22 percent). The grasslands were in moderate condition when proposed as tree encroachment into the meadow had already been documented (Dyer and Moffett, 1999) and the introduced Kentucky bluegrass was present on site though not dominant. There is a small amount of the Mixed Conifer-Frequent Fire ERU in the RNA (10 percent). It consisted primarily of mid to late successional forest when proposed. Fire history suggests that fire suppression had not been a factor in forest dynamics, at least through 1999 (Dyer and Moffett 1999).

In 2012, the entire RNA was burned to varying degrees of severity in the Little Bear Fire. Table 53 shows the amount burned with 52 percent and 31 percent being burned severely and moderately, respectively. The entire boreal forest environment, including the majority of the old-growth stands of corkbark fir has been altered by high severity fire. This stand-replacing fire has altered the entire RNA to a condition where natural, un-modified late successional forest is no longer available. The current condition was determined by re-evaluating mid-scale vegetation mapping after the Little Bear Fire. Approximately 40 percent of the Spruce-Fir area is in early or mid-successional states, which is more than what might be expected historically (see Volume I, Terrestrial Vegetation chapter). The Montane-

Subalpine grassland likely improved in condition, as fire would have periodically removed encroaching woody vegetation. The Mixed Conifer- Frequent Fire forest still shows 90 percent in late successional closed forest of even age, although typically there would only be about 5 percent on the landscape. Currently there is no grazing activity on the RNA, and motorized access by road is limited to agencies that operate an adjacent telecommunications site, including road maintenance (hikers can walk up the road). Two hiking trails across the RNA and allow non-motorized access, but otherwise have a limited insignificant impact on the RNA. The RNA may not meet the needs for which it was created as a study site for old growth Spruce-Fir forest. This proposed research natural area will be reevaluated during the plan revision to determine whether it should be carried forward in the planning process and formally designated as a Research Natural Area.

Table 53. Burn Severity Acreages for the Telfer RNA

Burn Severity	Acreage Burned	% Burned
Unburned/unchanged	11	2%
Low	95	15%
Moderate	201	31%
Severe	333	52%

Haynes Canyon Proposed Research Natural Area

This area is a portion of the former Cloudcroft Experimental Forest originally withdrawn for research purposes in the 1970s. Tall, open old growth stands of the white fir/Rocky Mountain maple habitat type alternate with younger seral stages in a patchwork mosaic suggesting erratic patterns of past wildfires. This forest offers a variety of opportunities for the study of successional patterns and fire effects. Successional trends strongly suggest a nearly pure forest of white fir to be developing within the older stands.

This area contains mixes of white fir habitat types on mostly steep mountain topography with elevations between 7,900 and 9,500 feet. Forests of white fir/Rocky Mountain maple habitat type occur generally on the north-facing slopes. South-facing slopes are populated mostly by Gambel oak stages of white fir/Gambel oak communities. The lower slopes and forested ravines contain stands of the white fir/bigtooth maple communities. In the narrow canyon bottoms, bluegrass sod extends between stringers of Douglas-fir, occasional ponderosa pine, and white fir.

The RNA was proposed to represent mixed conifer forest as an outstanding example of the white fir/Rocky Mountain maple habitat type. The condition of the RNA when proposed was within the historic range of variation for the Ecological Response Units (ERUs, See Chapter Three of Volume I, Terrestrial Vegetation) represented in the RNA (USDA FS 2014). The ERUs in the Haynes Canyon are Mixed Conifer-Frequent Fire (87 percent) and Mixed Conifer with Aspen (13 percent), in mostly late seral condition, with early and mid-seral stages in a mosaic pattern as a result of past wildfires. The condition of this area remains generally unchanged except for natural succession since its initial proposal date acquiring further old growth characteristics with no history of wildfire or insect and disease disturbances. There is no grazing in the RNA and there have been no vegetation management activities since proposal. There is a recreational trail through the RNA and its adjacency to a major local highway and private land makes it easily accessible to recreationists, but the steepness of the canyon and density of the forest restrict

off road or trail impacts. Barring a large disturbance such as a severe wildfire, windthrow or flooding, the RNA should retain the late and old growth characteristics it represents. This proposed research natural area will be reevaluated during the plan revision to determine whether it should be carried forward in the planning process and formally designated as a research natural area.

Upper McKittrick Proposed Research Natural Area

The Upper McKittrick Research Natural Area comprises approximately 787 acres in the Guadalupe Mountains at the southern border of New Mexico, adjacent to Texas. It encompasses an extensive stand of mountain mahogany and associated chaparral shrubs, which are yet to be represented in the Southwestern Region Research Natural Area system. Many areas in the Forest Service Southwestern Region have mountain mahogany cover, but most have been heavily grazed in the past and are currently grazed. However, Upper McKittrick is far enough from water that it does not receive livestock use. The high floral abundance and diversity, together with geographic position and considerable variability in topographic relief and aspect, provide a rich array of factors for study.

Upper McKittrick is surrounded by steep, shrub covered limestone cliffs. Most of the area is dominated by mountain mahogany together with wavy leaf oak and other associated chaparral shrubs, grasses and a variety of forbs. Pinyon-juniper woodland is found above the Research Natural Area to the northeast, and pockets of ponderosa pine on occur on north-facing slopes in the canyon. Vegetation along the narrow canyon bottoms includes large trees and abundant and varied herbs and grasses.

The Upper McKittrick Research Natural Area falls within the Guadalupe Escarpment Wilderness Study Area. It was proposed as an example of relatively untouched chaparral (currently mapped as Mountain Mahogany ERU) as influenced by the adjacent Chihuahuan desert. Mountain mahogany makes up about 91 percent of the RNA. Additional ERUs include the Mixed Conifer-Frequent Fire ERU and the Little Walnut-Ponderosa Pine riparian ERU (5 and 3 percent, respectively). Topography and lack of water have limited historic grazing, and none is permitted there now. The condition of this area at its initial proposal date was within the historic range of variation for the ecosystems in the RNA (U.S. Department of Agriculture, Forest Service. 2014b). Current conditions have changed little since proposal with no history of wildfire or insect and disease disturbance. The ERUs are currently within the historic range of variation and could function as reference sites for those ERUs. This proposed research natural area will be reevaluated during the plan revision to determine whether it should be carried forward in the planning process and formally designated as a research natural area.

Trends

- William Telfer RNA has declined in condition and quality after the Little Bear Fire, primarily due to the loss of old growth. Condition should improve with time in all ecological types although fire suppression may not allow natural function in the Mixed Conifer and Montane Grassland ERUs. Judicious allowance of wildfire as a resource tool may be a preferable alternative to the suppression requirement in the current Lincoln NF plan.
- Haynes Canyon and Upper McKittrick RNAs will likely improve or remain within historic condition in the absence of large disturbance such as severe wildfire or flooding. Current Forest Service management is unlikely to cause any degradation in condition in either RNA.

Scenic Byways

The National Scenic Byways Program is administered by the U.S. Department of Transportation (USDOT), 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. Complementing the USDOT program is the USDA Forest Service National Forest Scenic Byways Program that was established in 1988 to showcase driving routes located on National Forest lands that provide access to outstanding scenic corridors and important natural, recreational and historic features.

There is one National Scenic Byway and one National Forest Scenic Byway associated with Lincoln NF.

Billy the Kid National Scenic Byway

The Billy the Kid Trail National Scenic Byway, designated in 1998, is an 84.0 mile long loop in the heart of Lincoln County. The Wild West lore of gunfights, horses, outlaws, Buffalo Soldiers and Smokey Bear comes to life along the Billy the Kid Byway, where legends play against a spectacular backdrop of snowy peaks, rolling rivers, orchards and ranchlands. From Lincoln, one of the best-preserved Old West towns in the country, to the bustling ski-town of Ruidoso and the rich history at Ft. Stanton, the byway offers a view of the legendary West, both past and present. (www.newmexico.org) Visitors can start their tour of the byway at the Billy the Kid National Scenic Byway Visitors Center located in Ruidoso Downs.

A Corridor Management Plan for the Billy the Kid Byway was developed in 1997 in partnership with the byway communities. The Plan covered every aspect of the scenic byway providing management direction and projects for a 5 year period. In 2000, the Billy the Kid Byway received a grant to revise its management plan. The Corridor Management Plan Phase II was completed in 2001, highlighting new projects to work on and additional needs for the scenic byway over the following 5 years. No additional management plans have been prepared for the scenic byway since 2001.

Only a small portion of this byway falls on Lincoln NF lands along New Mexico State Highway 48. Continued collaboration and management of this small area needs to be done in partnership the local communities to ensure that the essence of this area is maintained. Visual conditions were affected along this route by both the Little Bear Fire in 2012 (NM48) and the White Fire in (2011) along U.S. Highway 82 but are on the upswing since these fires.

Portions of the Billy the Kid Scenic Byway's outstanding scenery opportunities were affected by the Little Bear Fire in 2012.

Sunspot Highway National Forest Scenic Byway

The first ten national forest scenic byways were designated in 1989. New Mexico State Highway 6563, known as Sunspot Highway, was one of these first of these ten. Sunspot Highway is a 13.6 mile long two-lane highway traversing the front rim of the majestic Sacramento Mountains providing travelers with a variety of scenic opportunities and panoramic views. With their beauty, history, and cool climate, the Sacramento Mountains provide a variety of opportunities for the visitor such as camping, hiking, wildlife viewing, motorized use, and winter recreation. At the end of the scenic byway, travelers will find the Sunspot Observatory, the Apache Point Observatory, and the Sunspot Visitor Center and Museum. A management plan has never been created for this national forest scenic byway.

The draw of this byway is dominated by visual qualities both in views of the Tularosa Basin as well as for viewing the aspen colors in the autumn of each year. These aspens have grown in old fire scars and many are beginning to reach older ages and will eventually die. Some areas are showing signs of mixed conifers growing into the aspen stands, a perfectly normal transition but detrimental to the scenic quality of this byway.

Trends

- Visual qualities beginning to decline along the Sunspot Scenic Byway due to encroachment of mixed conifers within aspen stands.

Critical Habitat designated under the Endangered Species Act

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 to identify and protect critical habitat. Critical habitat includes areas that have been determined to be needed for a species life processes. 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 on the Lincoln NF. Additional details regarding these species are found in the At-risk Species chapter of Volume I.

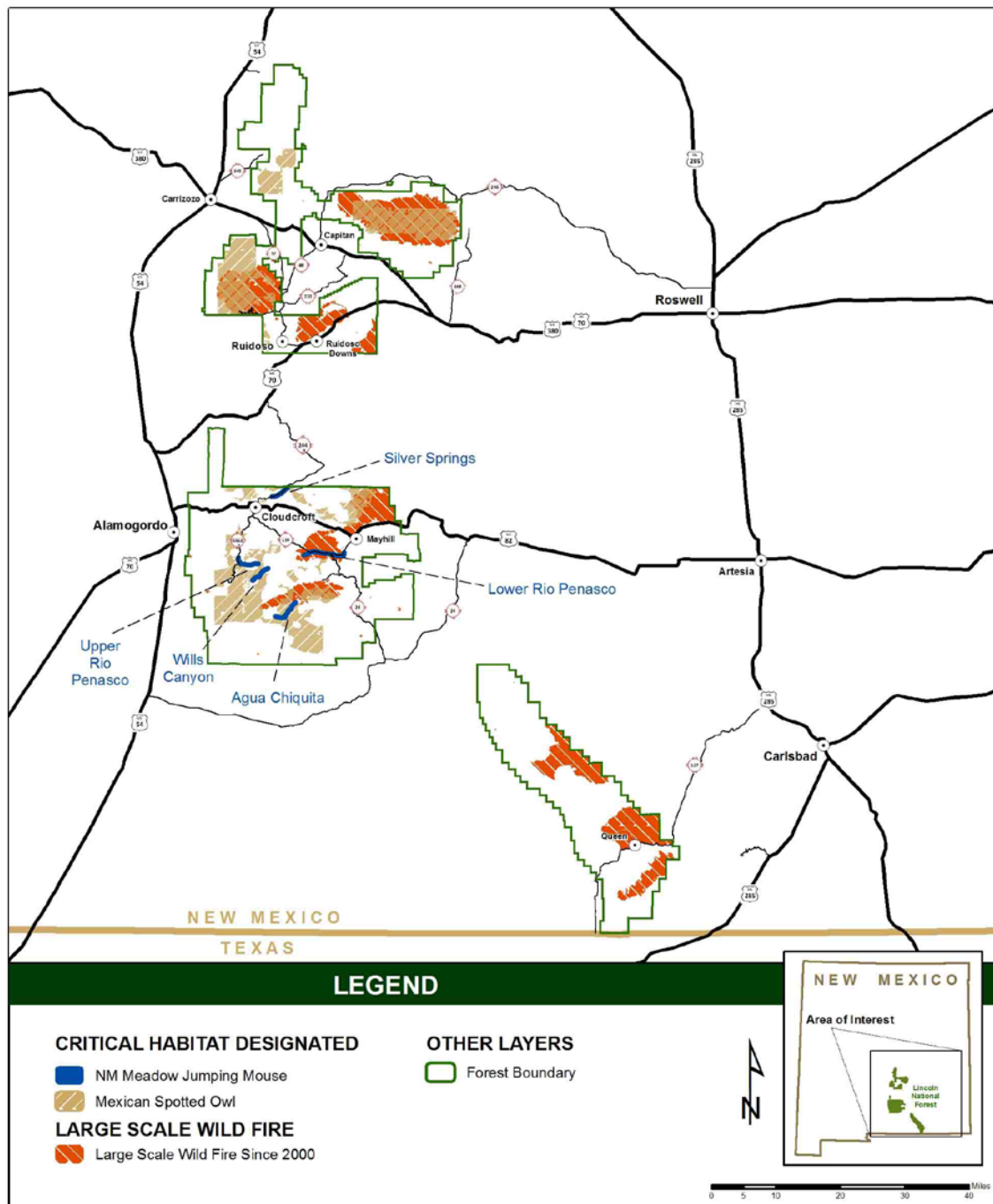


Figure 52. Critical habitat designated on the Lincoln NF

Mexican Spotted Owl

In 2004, the U.S. Fish and Wildlife Service designated 8.6 million acres of Federal lands as critical habitat for the federally threatened Mexican Spotted Owl (MSO) in Arizona, Colorado, New Mexico, and Utah (USFWS 2004). A total 203,620 acres of designated critical habitat exists on the Lincoln NF (Table 54). This encompasses habitat that has been determined to contain primary constituent elements of critical habitat, required for survival by the Mexican spotted owl, which is mixed conifer and pine-oak forest types, canyons and cliffs, and riparian areas.

Mapping of key vegetation types in critical habitat was done using the concept of Ecological Response Units (ERUs, see Volume 1, Chapter 3, Terrestrial Vegetation). ERUs are primary vegetation types stratified by characteristic fire regime. When we combine our ERUs with the critical habitat area we find that the key ERU type is Mixed Conifer – Frequent Fire (MCD) with lesser amounts of Ponderosa Pine Forest and Pinyon Juniper Oak (Table 54). These, and other types not shown with significantly less area indicate that the boundaries of the critical habitat area need to be better defined in the future to match more current vegetation types.

Table 54. Percentage of MSO Critical Habitat by ERU Type (greater than 10%)

ERU Type	Acreage	Percentage
Mixed Conifer – Frequent Fire (MCD)	110,847	54%
Ponderosa Pine Forest (PPF)	38,859	19%
Pinyon Juniper Oak (PJO)	31,915	16%

The greatest risk to sustaining a healthy critical habitat is to emphasize treatments within the MCD to reduce wildfire. Wildfire is probably the greatest threat to this habitat and to date with a total of 80,427 acres being burned within the habitat area. Out of that there has been a loss of 19 percent to moderately burned areas and 12 percent to severely burned areas (Table 55). The moderately burned areas tend to recover quickly but can reduce habitat in the short term. Severely burned areas can remove habitat for the long term. The current trend of this habitat area is in decline just because of the loss of habitat. This trend has been noticed and in the past two years the Lincoln, with approval from the U.S. Fish & Wildlife Service, has begun vegetation treatments within MSO Pac’s to help alleviate this threat.

Table 55. Percentage of MSO Critical Habitat Burned by Intensity

Fire Intensity	Acreage	Percentage
Moderate	15,425	19%
Severe	9,820	12%
Total	25,245	31%

New Mexico Meadow Jumping Mouse

In 2016, the U.S. Fish and Wildlife Service designated 13,973 acres as critical habitat along 169.3 miles of flowing streams, ditches, and canals for the federally endangered New Mexico meadow jumping mouse in New Mexico, Arizona, and Colorado. There are 986 acres of designated critical habitat on the Lincoln NF and 934 acres on adjacent private land, for a total of 1,920 acres however, it must be noted that even though habitat exists on private, private land rights absolutely exist and no federal agency may manage these areas.

The designated areas fall within 5 individual stream segments in the Sacramento Mountains, covering a total of 22.5 miles of stream length. These stream reaches include:

- Lower Rio Peñasco
- Upper Rio Peñasco
- Agua Chiquita
- Silver Springs
- Wills Canyon

The key ERUs for these areas are Riparian and Montane Sub-Alpine Grassland, immediately adjacent to water. The greatest threat to this species is to the loss of its grassy vegetation near precious water sources. In 2014 the U.S. Fish and Wildlife Service began ordered the fencing of these areas to protect the habitat. It must be noted that work has been done to allow cattle to access the waters in these areas through ‘lanes’, smaller open areas that allow access to the waters but limit damage to the habitat. The habitat of these areas has been in decline due to long-term drought conditions and is not expected to be improved in the near future.

Trends

- Critical habitat areas for the Mexican Spotted Owl is under threat from fire hazard and from insect and disease
- Critical habitat areas for the NM Meadow Jumping Mouse have decreased due to long term drought conditions

Wild and Scenic Rivers

The National Wild and Scenic Rivers System was created by Congress in 1968 to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. There are three classifications of wild and scenic rivers:

1. Wild,
2. Scenic,
3. Recreational

For a river to be eligible for wild and scenic river designation, it must be free flowing and, with its adjacent land area, must possess one or more outstandingly remarkable values. Outstandingly remarkable values are specific to each river segment and may include scenic, recreation, fish, historic, and cultural values (USDA Forest Service 2014b).

Wild and scenic rivers contribute to both ecological and social sustainability by preserving the outstandingly remarkable values into the future. As part of the National Wild and Scenic Rivers System, these areas may contribute to the economic sustainability of the surrounding communities by drawing visitors who are interested in visiting areas with wild and scenic rivers, and also through the potential for access to funding from individuals and groups that have an interest in preserving wild and scenic river resources.

Currently, there are no designated wild and scenic rivers on the Lincoln NF.

Eligible Wild and Scenic Rivers

In 1993, the Southwestern Region of the Forest Service conducted a preliminary analysis of eligibility and classification for wild, scenic, and recreational river designation based on a comprehensive statewide inventory of potentially eligible rivers for inclusion in the Wild and Scenic Rivers System. The first step in the evaluation was to determine eligibility for inclusion. To be eligible, a stream must be free-flowing and must possess one or more of the outstandingly remarkable values described previously. For those segments determined to be eligible, the second step of the evaluation was to determine the classification of wild, scenic, or recreational based on the criteria from the Wild and Scenic Rivers Act (USDA Forest Service 1993d).

The Nationwide Rivers Inventory is a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more outstandingly remarkable natural or cultural values judged to be of more than local or regional significance. The listing is maintained by the National Park Service. Under a 1979 Presidential Directive, and related Council on Environmental Quality procedures, all Federal agencies must seek to avoid or mitigate actions that would adversely affect one or more nationwide rivers inventory segments.

The forest plan revision process will include a comprehensive evaluation of the potential for rivers in the plan area to be eligible for inclusion in the National System (Forest Service Handbook 1909.12, chapter 80). This evaluation process requires all rivers named on the standard U.S. Geological Survey 7.5 minute quadrangle map to be included for evaluation. If a previous eligibility study was conducted, those segments that were part of that previous study do not need to be reevaluated, unless there have been changed circumstances that may affect their eligibility. The 1993 preliminary analysis of eligibility and classification for wild, scenic and recreational river designation will be used to inform the river evaluation for the plan revision, and any changed circumstances that may affect the eligibility of river segments will be considered and documented. The Lincoln NF, in its initial evaluation of eligible river segments included all named on USGS quads within Lincoln NF lands and as such, meets the requirements and is not required to conduct any further evaluations during this plan revision process.

The following river segments, during the 1993 study, were determined to be eligible for inclusion in the Wild and Scenic Rivers System during the 1993 preliminary analysis (USDA Forest Service 1993d) of eligibility and classification (Table 56 and Figure 53).

Table 56. Eligible Wild and Scenic Rivers for the Lincoln NF and their Eligibility Category

STREAM REACH NAME	ELIGIBILITY CATEGORY	CONDITION
Big Canyon	Wild	Damaged by Wildfire
Bluewater Creek, Hale Canyon	Wild	Damaged by Wildfire
Dog Canyon	Recreational	
Duran Canyon	Wild	Damaged by Wildfire
Fresnal Canyon	Recreational	
Last Chance Canyon	Wild	Damaged by Wildfire
Monument Canyon	Recreational	
North McKittrick	Wild	
Pancho Canyon	Scenic	Damaged by Wildfire
Rio Peñasco	Recreational	
Rio Ruidoso	Recreational	Damaged by Wildfire
Sacramento River	Recreational	

STREAM REACH NAME	ELIGIBILITY CATEGORY	CONDITION
Sitting Bull Falls	Wild	Damaged by Wildfire
South Fork Bonito Creek	Recreational	Damaged by Wildfire
Three Rivers	Recreational	
Turkey Canyon	Wild	
Upper Dark Canyon	Wild	Damaged by Wildfire

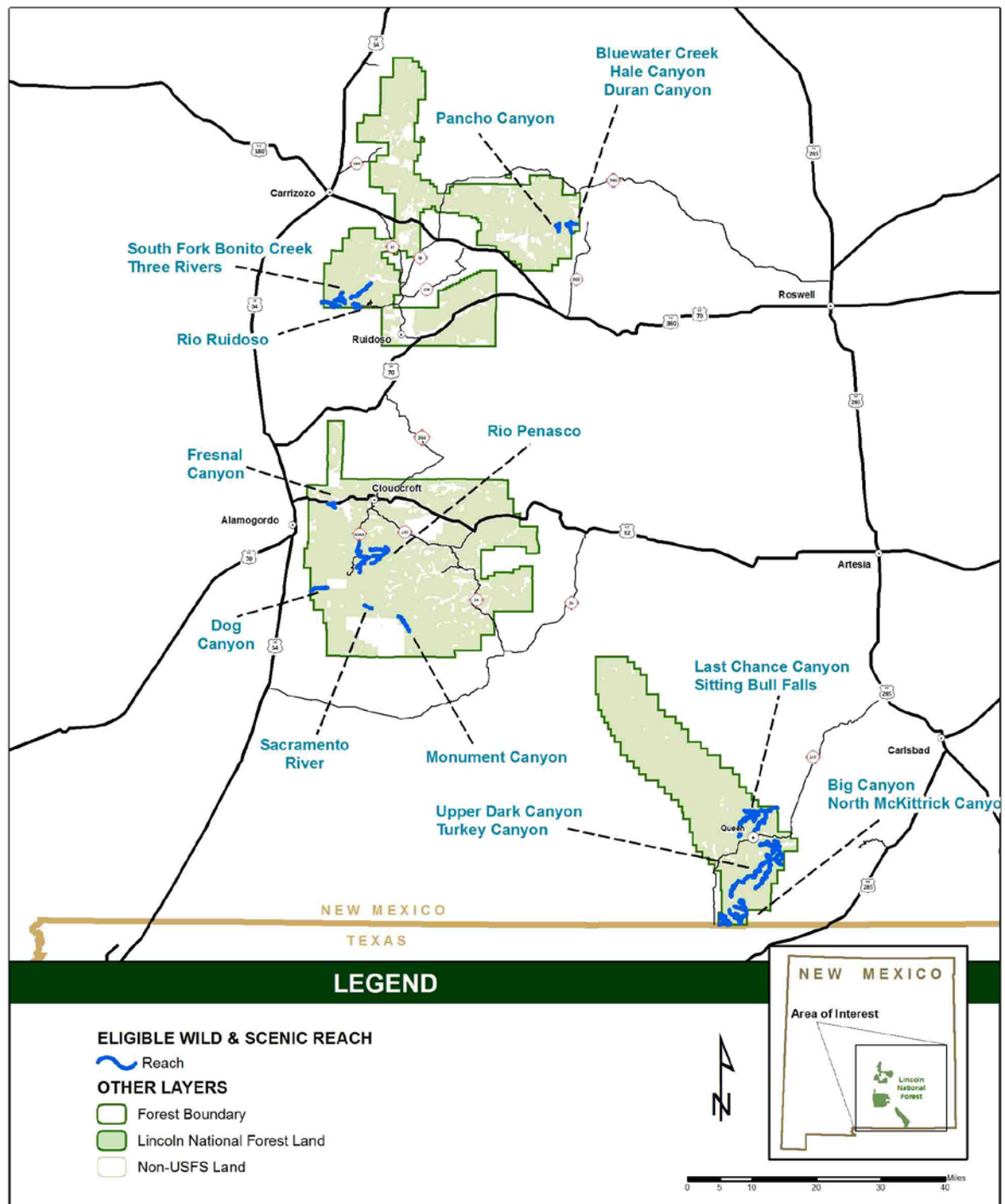


Figure 53. Eligible Wild and Scenic Rivers on the Lincoln NF

These rivers have not been designated as Wild and Scenic; however, they are listed on the National Park Service - National Wild River Inventory as potential candidates to the River System (USDA Forest Service 2014b). Management of these areas to protect their unique characteristics of wild and scenic will need to continue within the new forest plan.

Condition

Impacts to the listed rivers will also be reevaluated to determine any change to designation. The following have received at least 50 percent by wild fire:

- Duran Canyon,
- Pancho Canyon and
- South Fork Bonito Creek.

Functioning at risk or impaired are the following reaches:

- Hale Canyon,
- Last Chance Canyon,
- Sitting Bull Falls,
- Rio Ruidoso and
- Upper Dark Canyon

Additionally, river segments closest to populations areas have been experiencing dewatering conditions as populations levels have grown in the last 25 years.

The final step in the river evaluation process is to determine suitability for inclusion in the Wild and Scenic Rivers System. This step has not been completed for the eligible segments described above.

Trends

- Wild and Scenic eligible stream segments are declining in quality due to wild fire activity

Documented Needs and Opportunities

The Lincoln NF is not aware of any published documents or County, State, City, or Tribal plans that identify the need or potential need for additional designated areas specifically within the plan area. During public meetings, the Lincoln NF received multiple comments related to potentially important areas within the forest planning area. Additionally, the Southwestern Region of the Forest Service conducted an internal assessment of the potential need for additional research natural areas. These areas are listed below.

Important Areas Identified through Public Involvement

During the public involvement phase of the assessment (community forums and web site input) the Lincoln NF received input from the public related to potential needs or opportunities for additional designated areas. Areas within the Lincoln that have been mentioned multiple times through this process are listed below.

- Dark Canyon, Russia Canyon, Lucas Canyon, Wilmeth Canyon, Bensen Ridge, Hubble Canyon and surrounding ridges on Sacramento RD
- Guadalupe Escarpment Wilderness Study Area on Guadalupe RD
- Bug Scuffle Hill, Dry Burnt Canyon, Lick and Elk Canyons, and McDonald Flats on Sacramento RD

Potential Designated Areas Identified in current Forest Plan

- Recent analysis by Region 3 ecologists ranked the need for additional RNAs by representation of ecological types (ERUs). There was lowest need rank for Mixed Conifer-Frequent Fire (Haynes Canyon) and Spruce-Fir (Buck Mountain) ERUs and highest need rank for the Mountain Mahogany ERU (Upper McKittrick).

- The proposed research natural areas will be reevaluated during the plan revision to determine whether they should be carried forward in the planning process and formally designated as Research Natural Areas.
- The 1986 Lincoln National Forest Land and Resource Management Plan indicated the Last Chance Canyon should be evaluated for designation as a special botanical area. Botanical areas are administrative designations of land that contain plant specimens, plant groups, or plant communities that are significant because of their form, color, occurrence, habitat, location, life history, arrangement, ecology, rarity, or other features. Although this area is included in the current forest plan, a map of the area was not formally established and it was not officially evaluated or designated. This area will be reevaluated during the plan revision to determine if it should be carried forward in the planning process and formally designated as a botanical area.

Stakeholder Input

This section summarizes input, perspectives, and feedback relevant to this Assessment topic and received from the public between March 2015 and October 2016. Input was gathered from multiple public and group meetings, from online submissions, and from emails. Key expressed issues and concerns included health and intact wilderness areas and their ecosystems, access and multiple uses, effective communication, collaboration and involved decision-making. See the following sections for a more detailed list of these concerns, management suggestions.

Concerns/Issues:

Wilderness and WSAs

- Devastating fire and weed proliferation in wilderness due to limited management activities, with impacts to nearby/adjacent private lands
- Too much wilderness, too much near private land
- Designated wilderness is underrepresented in both Region 3 and New Mexico, relative to the rest of the nation

Roadless Areas and Characteristics

- Loss and development of, and impacts to, areas with roadless characteristics
- Currently minimal road encroachment and relatively pristine conditions in some areas (e.g., Dark Canyon, Wilmeth Canyon areas), but impacts are beginning to occur from OHV activity and illegal uses

Conditions/Trends

Beginning in November of 2015 and concluding in January 2016 the Lincoln NF provided survey forms to assess the stakeholder's opinions on the 15 Areas of Interest. Forest Health was the dominant issue but also the ability to more easily do thinnings and treatments within wilderness areas, the problem of invasive plants, trail condition, general recreation and fire safety were all topics of concern. The general consensus on trend is that both wilderness areas were in much better condition in the past with the trend getting worse (due to large scale fire activity – see chapter for more on this).

Summary of Findings for Designated Areas

Conditions and trends are key to move into the next phase of our plan revision process because it tells us what may need to change and what may be working fine under current management direction. Conditions and trends have been discussed in detail within this chapter along with any trends that

follow. In the overall trends section following are bulleted quick references to these trends. For further detail, please refer to the chapter sections for these subjects.

Overall Trends

- Trail conditions have stabilized after fire damage and have begun to steadily improve.
- Human development (roads, subdivisions, etc.) is increasing adjacent to the White Mountain Wilderness decreasing the characteristic of solitude in areas.
- Use within the White Mountain Wilderness is increasing.
- Use within the South Guadalupe Escarpment WSA may increase with the introduction of the Guadalupe Ridge Trail.
- Visual qualities beginning to decline along the Sunspot Scenic Byway due to encroachment of mixed conifers within aspen stands.
- William Telfer RNA has declined in condition and quality due to the Little Bear Fire
- Wild and Scenic eligible stream segments are declining in quality due to wild fire activity
- Rim Trail's scenic quality is decreasing in areas affected by large insect and disease outbreaks.
- Rim Trail's use is increasing
- Caves being used for research is on the rise
- Critical habitat areas for the Mexican Spotted Owl is under threat from fire hazard and from insect and disease
- Critical habitat areas for the NM Meadow Jumping Mouse have decreased due to long term drought conditions
- Non-English speaking documents, announcements need to be improved
- Heritage tourism is under represented on the Lincoln NF
- User conflict will continue to rise both in terms of the type of use within an area but also between forest and private lands.
- The Lincoln NF has been unable to support recreation with high technology items such as downloadable and georeferenced trail guides and drone use areas even though this demand will likely increase
- Heritage tourism is under represented on the Lincoln NF and will likely continue to be underrepresented

CHAPTER 8 - Infrastructure

Introduction

Infrastructure, for this Assessment and chapter, can be defined as the physical facilities and systems constructed needed to support the use of National Forest System lands. There are five major categories of facilities and systems discussed and analyzed here listed as follows:

1. National Forest System Roads,
2. National Forest System Trails,
3. Aviation Facilities,
4. Administrative and Recreation Facilities and
5. Other Facilities

Within this chapter, we will discuss the socio economic contributions of the infrastructure, current condition, current status, data gaps and trends within all of the five areas listed above. Social and Economic summaries are provided at the beginning of this document and trends will be quickly summarized within the final infrastructure summary in a quick bullet statement format. More detailed trend information will be found throughout all of the sections. The scale of analysis is at the Planning Scale, which refers to lands administered by the Lincoln NF, unless otherwise noted.

Information sources used to conduct the assessment generally comes from Natural Resources Manager (NRM), a database of all national forest infrastructure and the official data of record.

The data used within this section is limited to existing available information, and gaps in data and information do exist which are identified in the related sections. Other key indicators used in this document to assess or “measure” the condition and trends of the Forest’s infrastructure are described in the associated sections of this chapter. Some of the indicators are miles of road by maintenance level and, condition rating for bridges, miles of non-motorized trail by trail class, miles of trail meeting standard, and facilities condition rating.

Key Concepts and Definitions

Deferred Maintenance Costs can be defined as costs associated with maintenance of facilities that were not performed and thus delayed for a future period.

Operations are costs associated with activities related to the normal performance of the functions for which a facility or item of equipment is intended to be used.

Annual maintenance costs are associated with work performed to maintain serviceability, or repair failures during the year in which they occur.

Deferred maintenance costs are associated with maintenance that was not performed when it should have been or when it was scheduled and which, therefore, was put off or delayed for a future period.

Capital improvements are the construction, installation, or assembly of a new fixed asset, or the significant alteration, expansion, or extension of an existing fixed asset to accommodate a change of purpose.

Social and Economic Contributions of Infrastructure

National Forest System roads are used for management and commercial uses by various entities and as such have substantial social and economic impacts to the Lincoln NF and areas surrounding the forest. Forest Service staff use National Forest System roads for a variety of administrative purposes; including fire management, law enforcement, and resource and facilities management. Ranching, utility, telecommunication, and mining permittees and operators depend on National Forest System roads to maintain their permitted operations. Many National Forest System roads are also used by permittees as part of special use authorizations for activities such as hunting guide access, outfitter provided off-highway vehicle opportunities, and special use recreation events such as bicycle races.

Trails offer both a means of transportation for activities such as hunting and wildlife viewing to name but two but also a destination in and of themselves for local and out of area visitors. This draw during all seasons of the year brings in substantial economic influx to the areas for visitors seeking relief of the desert heat in the summers, fall color tours and snow activities in the winter. A number of events such as the Enduro Motorcycle Race, Cactus to Cloud foot race, High Altitude Rough Rider biking race and a geocached event called Finders Keepers utilize the trail system on the Sacramento Ranger District. On the Smokey Bear Ranger District there is extensive use of the trail system such as the local group Trail Snails which host weekly hikes along with permitted use such as 12 Hours in the Wild West. These uses have a direct economic impact to the local areas through hotels, food and much more.

It is important that the needs of the public are met and that trails and other infrastructure are accessible and maintained for users of all ages and abilities. It will also be critical to find a way to balance ecological needs with an ever growing use of motorized Off-Highway Vehicles.

Social and economic impacts of aviation facilities is an unknown quantity because the Lincoln NF simply has no such facilities on the land. However, adding to a transportation network facilities such as back country air strips will clearly bring visitors to the area with a positive economic contribution.

Administrative and recreational facilities such as official offices, administrative sites, developed campgrounds, etc. provide significant economic and social contributions to all of the area communities. Areas of impact include housing and local businesses benefit greatly from economic contributions of Lincoln NF employees. Social impacts can be equally great providing diverse and new influx of people to communities, schools, churches, etc.

National Forest System Roads

This section assesses the transportation system for the Lincoln NF, which is defined as “The system of National Forest System roads, National Forest System trails, and airfields on National Forest System lands” (USDA Forest Service 2010). Additional transportation facilities on the Lincoln addressed in this assessment include roads that provide access to the national forest but are part of another governmental entity’s transportation system and not under Forest Service jurisdiction. Roads in this category include U.S. and state highways, and county and local government roads.

Deferred maintenance needs were taken from the NRM database. Again, due to declining workforce, some of the maintenance needs on the systems may have not been entered in the database; therefore, dollar amounts are only an estimate.

A National Forest System road is defined as “A forest road other than a road that has been authorized by a legally documented right-of-way held by a state, county, or local public road authority” (USDA

Forest Service 2010). Furthermore, a forest road is defined as “A road...wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources” (USDA Forest Service 2010). Assessment of these roads includes significant integrated structural items such as bridges.

National Forest System roads are vital to the public as they are the primary means for access to the national forest. The public uses National Forest System roads to access recreation interests such as camping, fishing, hunting, hiking, backpacking, mountain biking, rock climbing, sightseeing, driving off highway with off-highway vehicles, and visiting historic and natural interest areas. National Forest System roads are also used by the public for personal and commercial fuel wood gathering, mining, pine nut gathering, and traditional Native American uses.

There are approximately 2,686 miles of currently existing National Forest System roads under Forest Service jurisdiction on the Lincoln NF. The roads are managed and maintained to various road standards, or maintenance levels, depending on management objectives. The roads range from paved roads regularly maintained to rough high-clearance roads with little to no regular maintenance, depending on the type of access necessary. Further discussion of maintenance levels is located under “Road Conditions” later in this section.

In addition to National Forest System roads, many unauthorized routes exist that are not part of the Lincoln NF transportation system but the Lincoln NF has not done an inventory and compilation of this data. Some roads were constructed for the purpose of permitted resource extraction, such as mining or timber roads and were considered temporary roads that would no longer be needed after the permitted use ceased. Many remain on the landscape and offer a tempting opportunity for unauthorized use of motorized vehicles such as ATVs and motorcycles. These roads are not part of the transportation system and are not analyzed in the infrastructure assessment.

Travel Management

In response to an increase in environmental impacts as a result of unrestricted motorized travel on National Forest System lands, the Forest Service revised its travel management regulations. These regulations were published in November 2005 in the Federal Register under the heading, “Travel Management; Designated Routes and Areas for Motor Vehicle Use; Final Rule.” The regulations require all Forest Service units to designate a system of National Forest System roads (system roads), National Forest System trails and areas on National Forest System lands for motor vehicle use and to publish this designated system of roads, trails and areas on a motor vehicle use map. (216 FR 68264)

Currently, the Lincoln has a forest-wide designated road or trail system in effect since 1986; cross-country motorized travel is not permitted except for snowmobile use and dispersed camping up to 300 feet from designated motorized routes. Snowmobiles are restricted from certain areas like campgrounds, cross-country ski trails, endangered species areas, places where Forest Closure Orders are in effect (USDA Forest Service 1986), and where statutorily prohibited. Motor vehicle travel on the Lincoln has been limited to authorized routes since implementation of the Lincoln NF Plan Amendment #1 in May 1987 (USDA Forest Service 2008a).

Travel Analysis Process and Travel Management on the Lincoln NF

To comply with the 2005 Travel Management Rule, the Lincoln NF compared existing Forest Plan direction with the provisions of the Rule and engaged in a travel analysis process to analyze its existing

designated system of roads and trails. The travel analysis process uses a science-based approach to assess the current transportation system and identify issues, benefits, problems, and risks associated with each National Forest System road. The process is not a decision and is not subject to National Environmental Policy Act requirements; however, it assists with the development of a proposal for travel management and provides a baseline assessment of current conditions

The Lincoln NF completed the travel analysis process and final report in January 2008. The report provided a recommended minimum road system for the Lincoln NF. The recommendations from the travel analysis report will be used during plan revision to inform the development of desired conditions, goals, and other plan components related to management of the Forest's transportation system.

After completing the Travel Analysis Process (TAP), the Lincoln NF verified that the existing policy was consistent with all provisions of the Rule and assessed how it and the existing road system had been working. In response to public comments from workshops, correspondence, and other opportunities for input, as well as, internal resource management reviews, it was determined the existing policy and system had provided access and served natural resource management programs well. Public input and internal analyses helped point out specific locations where changes needed to be considered. Proposed changes were to be addressed on a project-by-project basis. (USDA Forest Service 2009a) As such, the Lincoln NF published a decision notice to continue its existing designated motorized use policy in the Alamogordo Daily News on September 15, 2009 (Alamogordo Daily News 2009).

The Lincoln NF intends to reassess the existing road system by updating its travel analysis process and report in the near future, in a process separate from Forest Plan Revision. As legally mandated, the Forest will continue implementing the travel management rule. New direction (USDA FS 2016) has added a different approach from a 'minimum road system' referred to as 'likely to use' or 'not likely to use'. The Lincoln NF is updating their TAP to meet these newer guidelines and definitions but because it was not available at the beginning of this Assessment, is not being discussed here.

Road Condition

The Lincoln NF road system consists of approximately 2,686 miles of roads under USFS jurisdiction. Individual roads are maintained to varying levels of service to serve standard passenger vehicles or high-clearance vehicles considering factors such as speed, surface type, user comfort and convenience. Accordingly, maintenance levels are assigned to each road. The maintenance level is indicated by assigning a number from 1 to 5, with 1 indicating the lowest level of maintenance and 5 indicating the highest level of maintenance. Roads may be currently maintained at one level (operational) and planned for maintenance at a different level (objective). The objective level is the maintenance level desired based on road management objectives, and operational maintenance level is the level at which the road is currently maintained based on available budget, resources and environmental concerns (USDA Forest Service 2009b).

Maintenance levels are fully described in Forest Service Handbook 7709.59, section 62.32, effective 02/05/2009. The maintenance levels are described in brief below:

- **Maintenance Level 1** – These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level.

- **Maintenance Level 2** – Assigned to roads open for use by high-clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not provided with the exception that some signing, such as W-18-1 “No Traffic Signs” may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Traffic normally is minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level.
- **Maintenance Level 3** - Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. The “Manual on Uniform Traffic Control Devices” (MUTCD) is applicable. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations.
- **Maintenance Level 4** - Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. “Manual on Uniform Traffic Control Devices” is applicable. The most appropriate traffic management strategy is ‘encourage’. However, the ‘prohibit’ strategy may apply to specific classes of vehicles or users at certain times.
- **Maintenance Level 5** – Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. “Manual on Uniform Traffic Control Devices” is applicable.

On the Lincoln NF, maintenance level 2, 3, and 4 roads are open to both highway-legal vehicles and non-highway-legal motor vehicles unless they are paved. Non-highway-legal motor vehicles are defined as all-terrain vehicles or off-highway vehicles that do not meet all the requirements to be “street legal” as defined in the New Mexico off-highway vehicle guide “Off-Highway Vehicle Guide and Places to Ride in New Mexico” published February 2011 (NM Department of Game and Fish 2011). The only paved roads are campground roads and the road to the Sitting Bull Falls Picnic Area. As of 2016, non-highway-legal motor vehicles are permitted on paved roads only where a local authority or the state transportation commission has passed an ordinance allowing such use on specific roads in specific communities (State of New Mexico 2016).

A road’s operational maintenance level most closely reflects the current on-the-ground conditions of the road. Using mileage and operational level data from the NRM database and GIS data (queried August 2015), the 2,686 miles of National Forest System roads on the Lincoln NF currently consist of those operational maintenance levels as identified in Table 57.

Table 57. Miles of National Forest System roads within the Lincoln NF by Operational and Objective Maintenance Levels

Maintenance Level	Miles of Road Per Operational Maintenance Level	Miles of Road Per Objective Maintenance Level
5	0	0
4	18	18
3	306	323
2	925	897
1	1,095	1442

Maintenance Level	Miles of Road Per Operational Maintenance Level	Miles of Road Per Objective Maintenance Level
Total	2,686	2,686

Analysis of road data comparing operational maintenance level to objective maintenance level provides an indication of road conditions on the Lincoln NF (Table 57). For example, of the 925 miles of operational maintenance level 2 roads (open, high-clearance roads); 98 of those miles (approximately 2 percent) have an objective maintenance level of 1 (closed to vehicular traffic). This indicates that current conditions do not meet management objectives of properly placing roads in storage.

Conversely, a comparison of low operational maintenance level roads with higher maintenance level objectives can be made. Approximately 17 miles of operational maintenance level 3 roads have objective maintenance levels of 3 or higher. This indicates maintenance is not being performed to a degree that would elevate the roads to the higher level of service desired, primarily accommodating passenger vehicle traffic. An example of this is a road leading to a high use recreation site and has an objective maintenance level of 3; however, maintenance demands are such that the Lincoln's limited resources can only accommodate keeping the road in maintenance level 2 condition.

Finally, of the 324 miles of operational maintenance level 3 and 4 roads, or roads maintained for standard passenger cars, 17 miles have an objective maintenance level higher than their current operational level. This indicates that more than 99 percent of maintenance level 3 and 4 roads (standard passenger cars roads) are maintained to management level objectives.

Insufficient budgets and too many roads have affected the ability of the Forest to maintain all system roads to their objective maintenance level. The Lincoln NF had a base road funding level of \$745,400 in fiscal year 2016. This amount is expected to remain flat with fluctuations over time. Assuming all roads were brought up to their objective maintenance level, an estimated \$3.6 million would be needed annually to maintain the Lincoln NF road system. This cost is based on average maintenance costs by maintenance level derived from historical data for projects, national averages, and corporate knowledge.

Most of the routine maintenance is currently performed on the most traveled roads. On average, approximately 400 miles of road or approximately 17 percent of all roads are maintained per year. The miles of roads maintained could change as budgets fluctuate or as priorities change on the Lincoln NF or throughout the Forest Service.

Routine maintenance is achieved with various resources including contractors, forest road crew personnel, permittees via road use permits, and working cooperatively with counties via Cooperative Forest Road Maintenance Agreements. The number of miles of National Forest System roads located on the Lincoln that are maintained by counties in a given year average approximately 250 miles.

Non-routine road maintenance is generally limited to emergency repairs to address safety issues, repair critical resource damage, or restore access after a storm event. All maintenance is prioritized, placing emphasis on addressing traveler safety and resource protection. As a result, very few road maintenance tasks are completed solely to address user comfort and a backlog of maintenance needs (deferred maintenance) continues to grow. Deferred maintenance costs are associated with maintenance that

was not performed when it should have been or when it was scheduled and which, therefore, was put off or delayed for a future period.

Deferred maintenance needs required to bring the existing National Forest System roads on the Lincoln NF to their objective maintenance level exceeds \$40 million. This maintenance includes replacing damaged crossings, replacing damaged drainage structures such as culverts and associated drainage features (like inlets, outlets, and erosion control measures), repairing pavement, replacing pavement that has deteriorated beyond repair, replacing and maintaining aggregate surfacing, repairing erosion, replacing and maintaining signs, and addressing roadside safety concerns.

There are areas of the Lincoln NF where significant infrastructure investment in paved roads was made. These roads include access to high-use developed recreation areas for camping, picnicking, trail use, and other recreational activities. To-date the Lincoln has been able to retain its ability to maintain pavement throughout these areas by limiting the number of miles paved. Across the entire national forest, only about 7 miles (2 percent) of maintenance level 3 and 4 roads are paved that are under Forest Service maintenance jurisdiction.

The remaining 324 miles of unpaved maintenance level 3 and 4 roads are surfaced with aggregate material or have a native surface. Aggregate surface roads equate to approximately 95 miles (29 percent), and 229 miles (71 percent) have a native surface. The native surface roads require routine maintenance and their lack of structurally significant surfacing materials creates a challenge for maintaining surface smoothness. The aggregate and native surface roads could generally be classified as being in moderate condition; approximately 80 percent are to standard at any given period of time.

The following three pages show the distribution of the U.S. Forest Service system of roads for each Ranger District. The analysis and numbers here reflect data for the Lincoln NF but the maps are presented by district to better show the locations of roads by operational maintenance levels.

Bridges

Bridges are an integral part of the transportation system and have a significant impact on public safety. As such, the condition of bridges under the jurisdiction of the Forest Service is another indicator of the condition of the national forest road system. The Lincoln NF currently has 13 road bridges. Each bridge is rated on the condition of several components such as the substructure, superstructure, deck, and channel. A condition rating between 0 (failed condition) and 9 (excellent condition) is assigned to each of these bridge components in accordance with the National Bridge Inventory System. There is no overall condition rating assigned to a bridge as each bridge component is evaluated independently.

Eight bridges on the Lincoln NF are currently rated with all major components in fair condition (numerical rating of 5) and 5 bridges with all major components in good condition. No road bridges on the Lincoln are closed to traffic due to their condition rating or safety concerns.

Recently, three bridges over 50 years old were replaced. However, nine bridges over the 50-year mark remain in service and 1 additional bridge in service is greater than 40 years old. Historically, the theoretical design life of a bridge has been 50 years. This design life indicates that based solely on age as a condition, 10 Lincoln NF bridges are currently in need of replacement or will be in need of replacement within the next 10 years.

Data Gaps

Data is always changing and being updated as new information is provided from field validation. The summaries and conclusions herein are based on a snapshot of the data in 2015. The Lincoln's staff follows established protocols and processes for obtaining and managing data and works to achieve accurate data within the capabilities of existing budgets.

Road Trends and Sustainability

The predominant trend affecting the Lincoln NF's transportation system is relatively flat budget used for all road management needs including repairs, maintenance, and improvements. The road construction and maintenance budget increased on average only 2 percent (considered to be flat due to inflation) between 2006 and 2016 and is expected to continue to remain flat into the future (Figure 54). At the same time, there is increased emphasis on implementing resource protection measures, higher demand for access to the national forest, increased traveler expectations for higher maintenance level road conditions, and an increased demand of roads as recreational opportunities. Increased use of forest roads will escalate the amount of maintenance and repairs needed further widening the gap of deferred maintenance on the Lincoln NF.

LINCOLN NF ROAD BUDGET 2006 - 2016

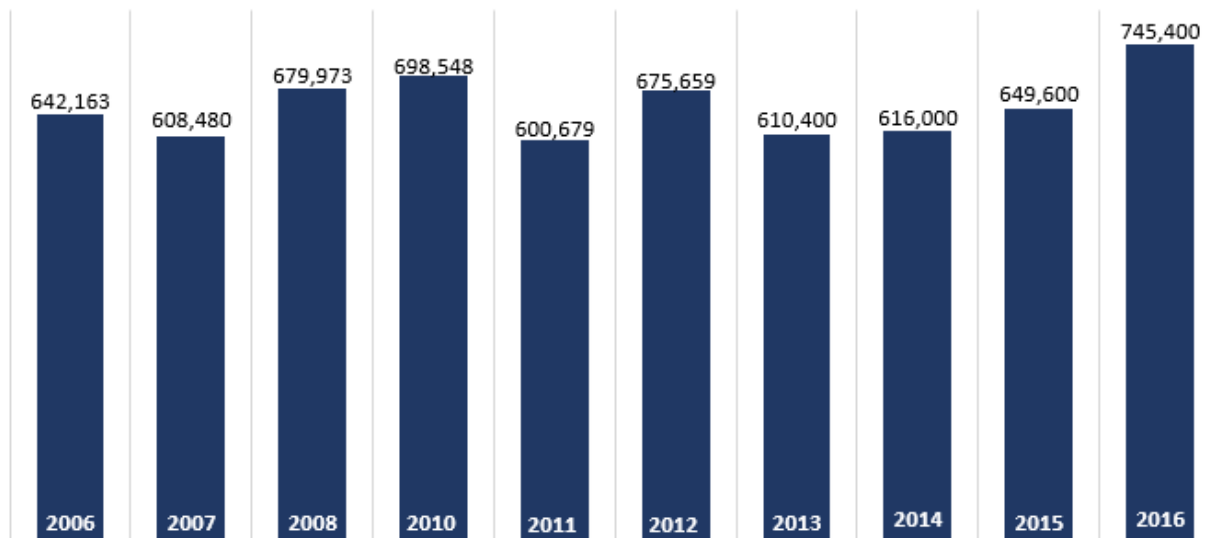


Figure 54. Transportation Budget From 2006-2016

Because of limited budget and funding source availability, there is a trend to use most road maintenance funding on roads open to passenger car use, or maintenance level 3 to 5 roads. This stems from the goal to keep roads maintained that have the highest demand and address health and safety issues. Additionally, recently enacted transportation bill, Fixing America's Surface Transportation Act, allowed the Forest Service to designate a subset of maintenance level 3 to 5 roads that access high-use Federal recreation sites and Federal economic generators and offered an additional funding source for roads that meet eligibility requirements. The eligibility requirements again brought focus to passenger car, level 3 to 5 roads.

There is a trend to look for opportunities to reduce maintenance needs by reducing the overall size of the national forest road system by transferring jurisdiction, or by closing roads intermittently, or decommissioning unneeded roads. There is also a need to reduce maintenance requirements and negative impacts to natural resources by using best management practices for all road maintenance and reconstruction projects. Examples of best management practices include measures to protect water quality, design of proper drainage structures to provide for aquatic passage, and requiring washing of equipment to prevent the spread of invasive species. Because agency funding is not sufficient to meet current road maintenance needs, the Lincoln NF is increasing efforts to obtain outside funding, and establish partners and volunteers to manage and maintain National Forest System roads.

Current funding is not sufficient to address bridge maintenance or replacement needs. As previously described, 9 bridges over the 50-year mark remain in service under Forest Service jurisdiction and 1 additional bridge in service is greater than 40 years old. Assuming a 50-year design life, 10 Lincoln NF bridges are currently in need of replacement or will be in need of replacement within the next 10 years based on age alone. Lack of resources available to maintain the road system overall also prevents substantial maintenance of bridges, which would imply a trend to worsening bridge conditions and reduced life span of that experienced by well-maintained structures.

The demand on the road system is likely to continue increasing. Growing populations in the El Paso/Juarez metropolitan area will result in an increase in visitors and subsequently an increase in the use of the national forest transportation system. Forest restoration projects such as Jim Lewis and Southern Sacramento and hazardous fuels reduction requirements could also contribute to the increase in road usage. The increased road usage can in turn increase road maintenance demands and may require construction of new roads or reopening of previously closed roads.

Travel analysis and travel management decisions could help to reduce long-term maintenance needs by identifying roads that are not needed or could be put in storage. Travel analysis could also identify needed changes to the existing road system to meet long term access needs and minimize negative impacts to natural and cultural resources.

Incorporating best management practices into road maintenance procedures can contribute to overall natural resource sustainability. For example, incorporating drainage features can reduce surface runoff thereby reducing sediment deposits into watersheds that contribute to watershed degradation. Relocating roads away from streams or on hillsides can also contribute to watershed improvement by reducing sediments introduced into streams.

Roads do contribute to social and ecological sustainability. They provide a means of access into densely forested areas to allow for reduction of hazardous fuels, timber harvesting, and other restoration activities. Additionally, they provide access to recreation activities by national forest visitors. The forest transportation system also indirectly contributes to the social and economic sustainability of the adjacent communities. For example, roads provide access for mining activities, special use permit activities, grazing activities, and access to commodities such as fuelwood.

Road Infrastructure under Other Jurisdiction

In addition to National Forest System roads, the Lincoln NF accommodates approximately 473 miles of roads falling under the jurisdiction of other road management agencies. Management and maintenance of roads not under Forest Service jurisdiction is the responsibility of the respective road management agency. Although not under the jurisdiction of the Lincoln NF, use on these roads, road conditions, and

maintenance activities on the roads have the potential to impact resources on the Lincoln NF. Table 58 represents a breakdown by road management agency of the 473 miles of roads located on the Lincoln NF that are under the jurisdiction of others.

Table 58. Miles of roads within the Lincoln NF by Jurisdiction

Road Management Agency	Miles
Eddy County	0
Chaves County	5
Lincoln County	33
Otero County	105
State and U.S. Highways	330
Total	473

The 473 miles of road are made up of U.S. highways, State highways and County roads. These roads serve as arterials providing primary access to national forest destinations via connecting National Forest System roads. The routes serving the three ranger districts of the Lincoln are described by district in the following summaries:

- **Smokey Bear Ranger District** is situated in the northern part of the Lincoln NF. Much of the southwestern portion of the district is within the White Mountain Wilderness; therefore, there are no roads providing motorized access. The central western and northwestern portions of the district are bounded by private lands and State Trust lands and are accessed primarily by roads stemming from State Highways 349 and 462 and U.S. Highway 380. The northern and eastern sides of the district are bounded by private lands, State Trust lands, and the Bureau of Land Management and are accessed primarily by roads stemming from State Highway 246 and U.S. Highways 380 and 70. The southern area of the district is adjacent to the Mescalero Apache Indian Reservation and is accessed primarily by roads stemming from U.S. Highway 70 and Bureau of Indian Affairs Highway 4.
- **Sacramento Ranger District** is situated in the central part of the Lincoln NF. Five major routes, U.S. Highway 82, State Highway 244, State Highway 130, State Highway 24 and State Highway 6563 traverse the district and provide the majority of access to the central part of the national forest. The eastern portion of the district is bound by private lands, State Trust lands and the Bureau of Land Management. Primary access across these lands onto the district is via U.S. Highway 82 from the east and State Highway 24 from the southeast. The western side of the district is adjacent to the City of Alamogordo, private lands, State Trust lands, and the Bureau of Land Management. The primary access from the west is U.S. Highway 82. The south area of the district is bound by Fort Bliss Military Reservation, private lands, State Trust lands, and the Bureau of Land Management and is primarily accessed by roads stemming from County Road E12.
- **Guadalupe Ranger District** is situated in the southeastern part of the Lincoln NF. State Highway 137, the only major road on the district, traverses from east to west in the southern portion of the district. County Road 409 off of State Highway 137 is the primary access to the district's only developed recreation area, Sitting Bull Falls. The west, north, and east ends of the district are bound by the Bureau of Land Management, State Trust lands, and private lands. Access to these areas are primarily from county roads and State Highway 137, except for most of the west end where the topography, known as The Rim area, is severe. The south end of the district is bound

by the Carlsbad Caverns National Park and Wilderness Area, the Guadalupe Mountains National Park and Wilderness Area, the Bureau of Land Management with three Wilderness Study Areas, and private lands. On the district, this area contains the Guadalupe Mountains Escarpment Wilderness Study Area. The area in general has little to no road access.

Conditions of Other Jurisdictions' Infrastructure

On the Lincoln NF there are 14 miles of roads under Lincoln County jurisdiction and 24 miles of roads under Otero County jurisdiction that are paved. From corporate knowledge it can be generalized that the paved roadways are in good condition.

Trends and Sustainability

Public road agency transportation projects have the potential to impact the Lincoln NF and its resources. As agencies seek additional rights-of-way to increase road volume capacities or improve safety aspects, they will need resources to construct roadways (such as material sources for embankments) and may seek to use national forest land for temporary or permanent uses such as placement of excess excavation materials. In addition, transportation corridors across the Forest have the potential to be expanded due to increased population growth, expansion of freight planning, recreation and tourism opportunities, and existing and future safety concerns.

The current trend is to partner with other road management agencies to meet their goals for access and road management strategies while at the same time protecting national forest resources.

Other jurisdictional roads on the Lincoln NF have an impact both on the land and the resources. Roads of other jurisdictions are essential not only for access to the national forest but also to towns and cities adjacent to the Lincoln. Managing and maintaining these transportation routes for safety and to accommodate growing populations are a priority for State and local governments.

Road Summary

Despite the challenges faced in terms of budget limitations and resource protection, the Lincoln NF has had some successes in meeting current plan objectives for the management of the national forest transportation system. The Lincoln NF has been successful in cooperating with counties to maintain roads that are used by the general public and local communities. All road bridges on the Lincoln NF are regularly inspected and maintained and are in fair to good condition. Funding from the Federal Highways Administration has allowed the Forest to repair areas requiring major road improvements.

Even with the cooperation from counties, other agencies, and outside funding sources, maintaining the Lincoln's existing road system to objective maintenance levels is not sustainable with the current trend of relatively flat road maintenance budgets. Deferred maintenance costs, costs associated with needed maintenance that has been postponed to a future date, continue to accumulate with relatively flat and depleting budgets and increased maintenance needs. It is anticipated that demand for road use will increase with growing populations and desire for access to recreation opportunities and national forest commodities.

Trends

- Use of closed roads illegally by motorized vehicles is increasing.
- Decreasing total miles of roads through decommissioning or transferring jurisdictional status to other agencies.

- Insufficient budgets for maintaining roads and bridges will increase the deferred maintenance backlog.
- Current and future relatively flat budget levels expected for maintaining roads is insufficient to maintain all of the current road system.
- The importance of Scenic Byway designations particularly since tourism and recreational opportunities were important issues brought up in the New Mexico Transportation Plan / Recreational Trails Program planning processes.
- Maintaining, improving and adding freight corridors are key to economic development.
- Designation of New Mexico Main Street Communities, State-Authorized Arts & Cultural Districts and Frontier community projects for downtown beautification and revitalization efforts in the following communities: Alamogordo, Artesia, Carlsbad, Cloudcroft, Tularosa and Roswell.
- Future multimodal transportation options for pedestrians, bicyclists and equestrians, to help the public in the improvement of their health and provide them with recreational opportunities.

National Forest System Trails

A National Forest System trail is defined as “A forest trail other than a trail which has been authorized by a legally documented right-of-way held by a state, county, or local public road authority” (USDA Forest Service 2010). A forest trail is defined as “A route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail” (USDA Forest Service 2010). Assessment of trails includes associated features such as trail bridges.

The National Forest Trail system is comprised of a variety of different types of trails that are constructed and maintained for recreation uses such as hiking, bicycling, horseback riding and motorized use. A full discussion of trails for their recreational value is under the Recreation Chapter.

The Lincoln NF trail system consists of approximately 515 miles of trails developed to various standards and characterized by managed use and designed use (Figure 55, Figure 56, and Figure 57). Managed use refers to the modes of travel that are actively managed and appropriate on a trail based on its design and management. There can be more than one managed use per trail or trail segment (USDA Forest Service 2008b). Designed use refers to a use intended for a trail that has the most restrictive design requirements and for which the parameters employed in the design, construction and maintenance of a trail are based (USDA Forest Service 2008b). Designed uses of a trail include bicycling, hiking and pedestrian use, pack and saddle, motorcycling, and other motorized use.

In addition to characterization by designed use, trails are characterized by trail class. Trail class is the prescribed scale of development for a trail, representing its intended design and management standards (USDA Forest Service 2008b). There are five trail classes, ranging from the least developed (trail class 1) to the most developed (trail class 5):

- Trail Class 1 – minimally developed
- Trail Class 2 – moderately developed
- Trail Class 3 – developed
- Trail Class 4 – highly developed
- Trail Class 5 – fully developed

Table 59. Miles of Trail Class by Designed Use

Designed Use	Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5	Total
Hiker/Pedestrian	1	2.7	7.1	1.4	0.3	12.5
Pack and Saddle	0	95.7	174.7	8.4	0	278.8
Bicycle	0	13	28	1.2	0	42.2
Motorcycle	0.8	33.2	63.3	1	0	98.3
All-Terrain Vehicle (ATV)	0	40.2	41.5	1	0.3	83.0
Total	1.8	184.8	314.6	13.0	0.6	514.8

All trails outside of wilderness are open potentially to hiking, pack and saddle, biking, and/or motorized use. Trails inside of wilderness are only open to hiking and/or pack and saddle. Most trails on the Lincoln NF have more than one managed use allowed per trail. Specially designated trails that traverse the Lincoln NF include the Rim National Recreation Trail and the Dog Canyon National Recreation Trail. Information and assessment of these designated trails can be found under the Designated Areas chapter.

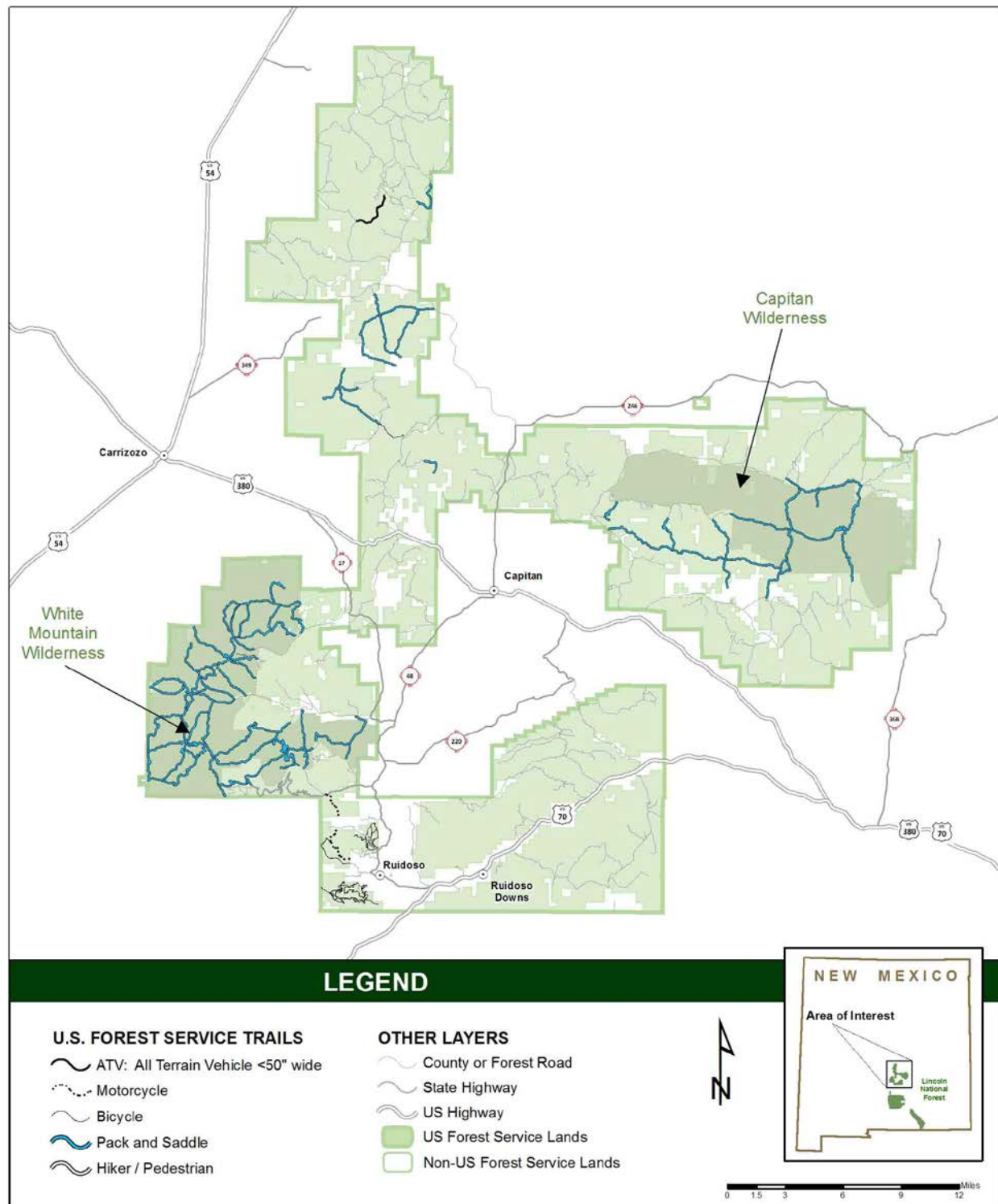


Figure 55. Trail Design Use for the Smokey Bear RD

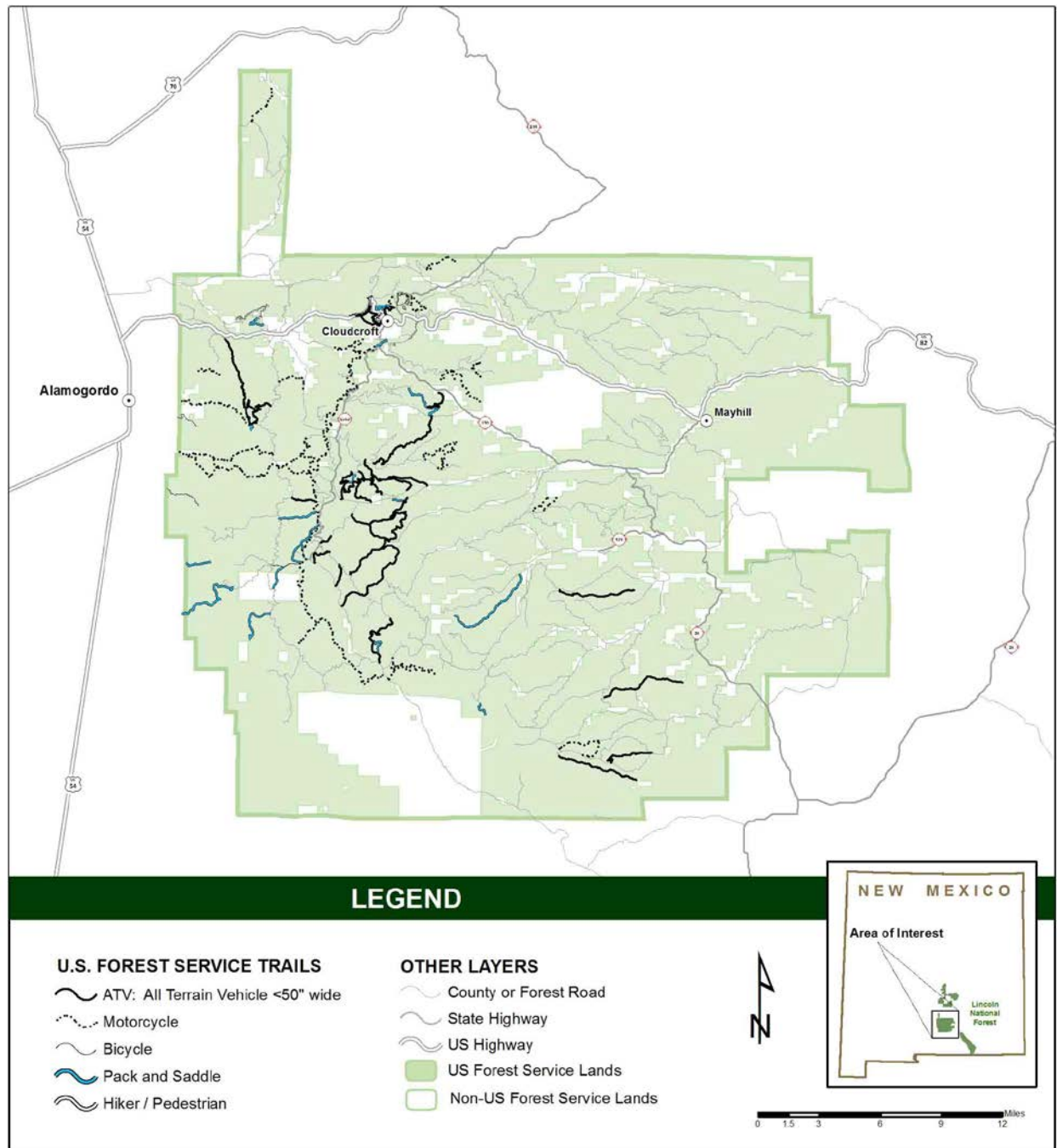


Figure 56. Trail Design Use for the Sacramento Ranger District

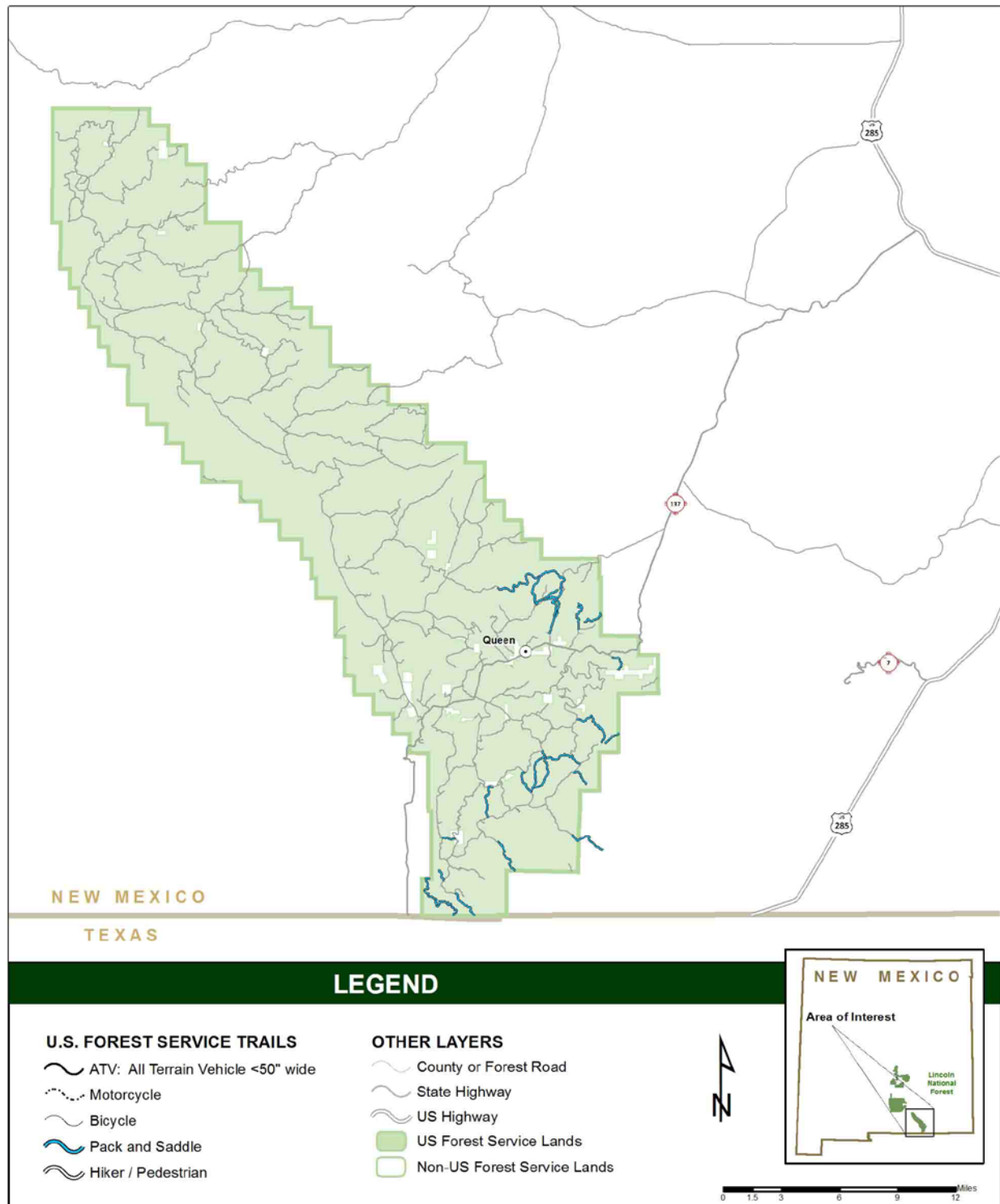


Figure 57. Trail Design Use for the Guadalupe Ranger District

There are six trail bridges on the Lincoln NF. Mills Canyon Bridge, part of Trail 22, was built in 1999 and is located on the Smokey Bear Ranger District. The remaining five trail bridges are all located on the Sacramento Ranger District. The Bluff Springs Bridge, part of Trail 112, was built in 1966 and partially rebuilt in 2014. The Mauldin Springs Bridge, part of Trail 9277, was built in 2010. The Salado Canyon

Bridge, part of Trail 128, was built in 2001 and the Bridal Veil Fall Bridge, part of Trail 129, was built in 2012. The James Canyon Bridge, part of Trail 83, was reconstructed in 2012 after it partially burned in the 2011 Mayhill Fire. The James Canyon Bridge is used only to access an isolated portion of the James Canyon Campground.

Trail Condition

Based on 2016 trail accomplishment reporting, 159.3 miles (approximately 29 percent) of trails were maintained to standard. Many of the high-use trails are maintained to standard annually. The remaining system trails seldom have maintenance performed. Lack of maintenance has led to issues including overgrown vegetation on trails, erosion issues sometimes severe in nature, missing signs, and overall poor tread and clearance.

The portion of the Lincoln NF trail system that is maintained to standard is maintained with internal and external funding and personnel. Grants and agreements along with volunteers and partners maintain an ever increasing amount of the Lincoln's trail system. These trails are reasonably maintained so they generally do not have significant deferred maintenance (costs associated with needed maintenance that has been postponed to a future date).

The five categories of trails described in Table 60 were analyzed from a standard annual maintenance cost, operation cost, deferred maintenance cost, and capital improvement cost basis. Table illustrates the estimated costs for all trails on the Lincoln NF by trail class. The location of trail classes on individual ranger districts are shown in Figure 58, Figure 59, and Figure 60.

Table 60. Costs for Trails by Trail Class

Trail Class (TC)	Operations	Annual Maintenance	Deferred Maintenance	Capital Improvements
TC 1 Minimally Developed	\$328.1	\$896.8	\$4,389.6	\$2,659.7
TC 2 Moderately Developed	\$29,710.5	\$89,746.2	\$462,459.3	\$328,659.6
TC 3 Developed	\$65,500	\$226,630	\$832,832.5	\$664,170
TC 4 Highly Developed	\$2,433.6	\$7,200	\$39,758.4	\$11,678.4
TC 5 Fully Developed	\$118.4	\$1,707.2	\$4,252.8	\$2,828.8
Total	\$98,090.6	\$326,180.2	\$1,343,692.6	\$1,009,996.5

**Source: Southwestern Regional Office data*

As indicated in Table 60, the total estimated cost for deferred maintenance of the Lincoln's trail system is approximately \$1.3 million, indicating a backlog of work and high probability of substandard trail conditions.

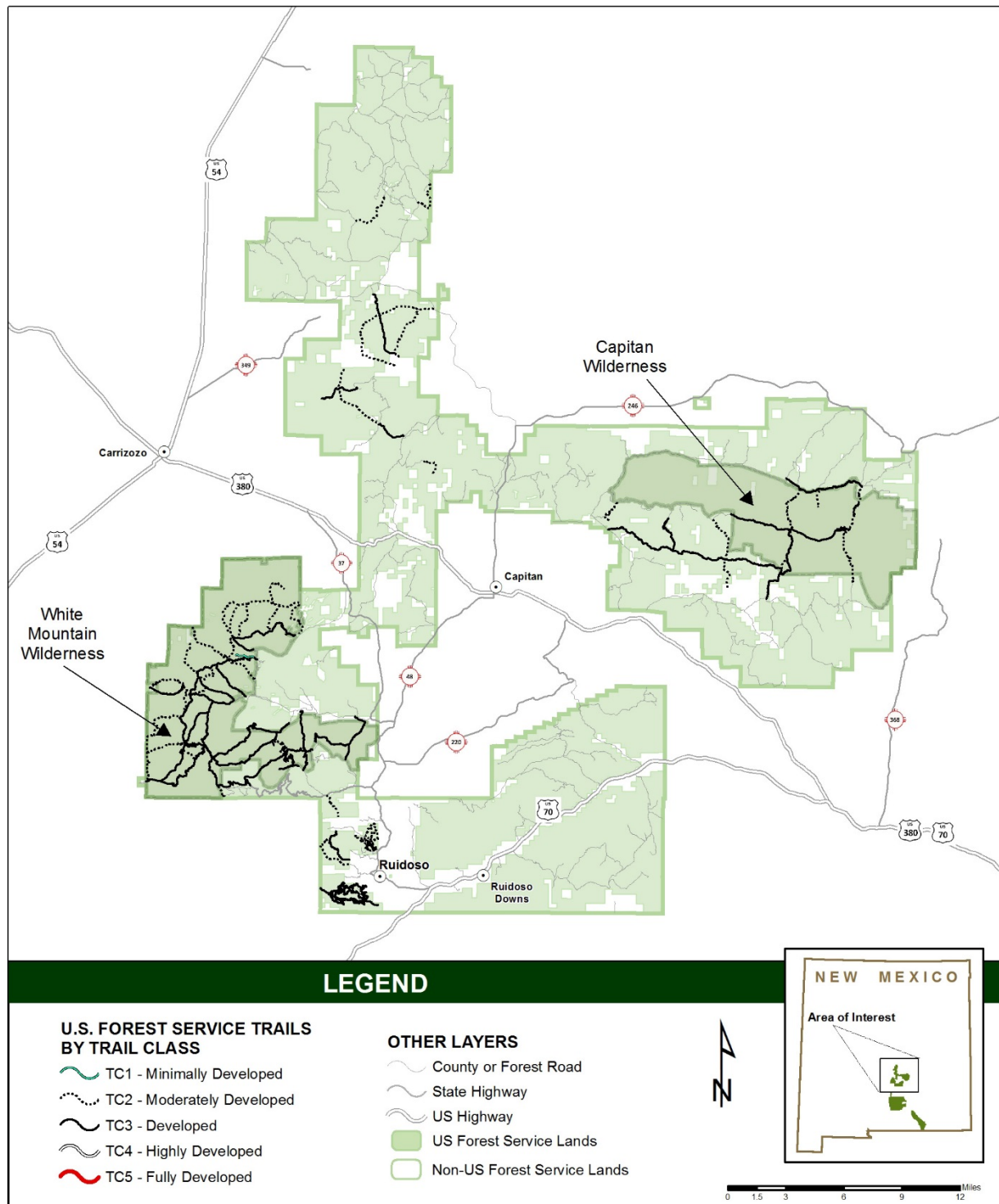


Figure 58. Trail Classes of the Smokey Bear Ranger District

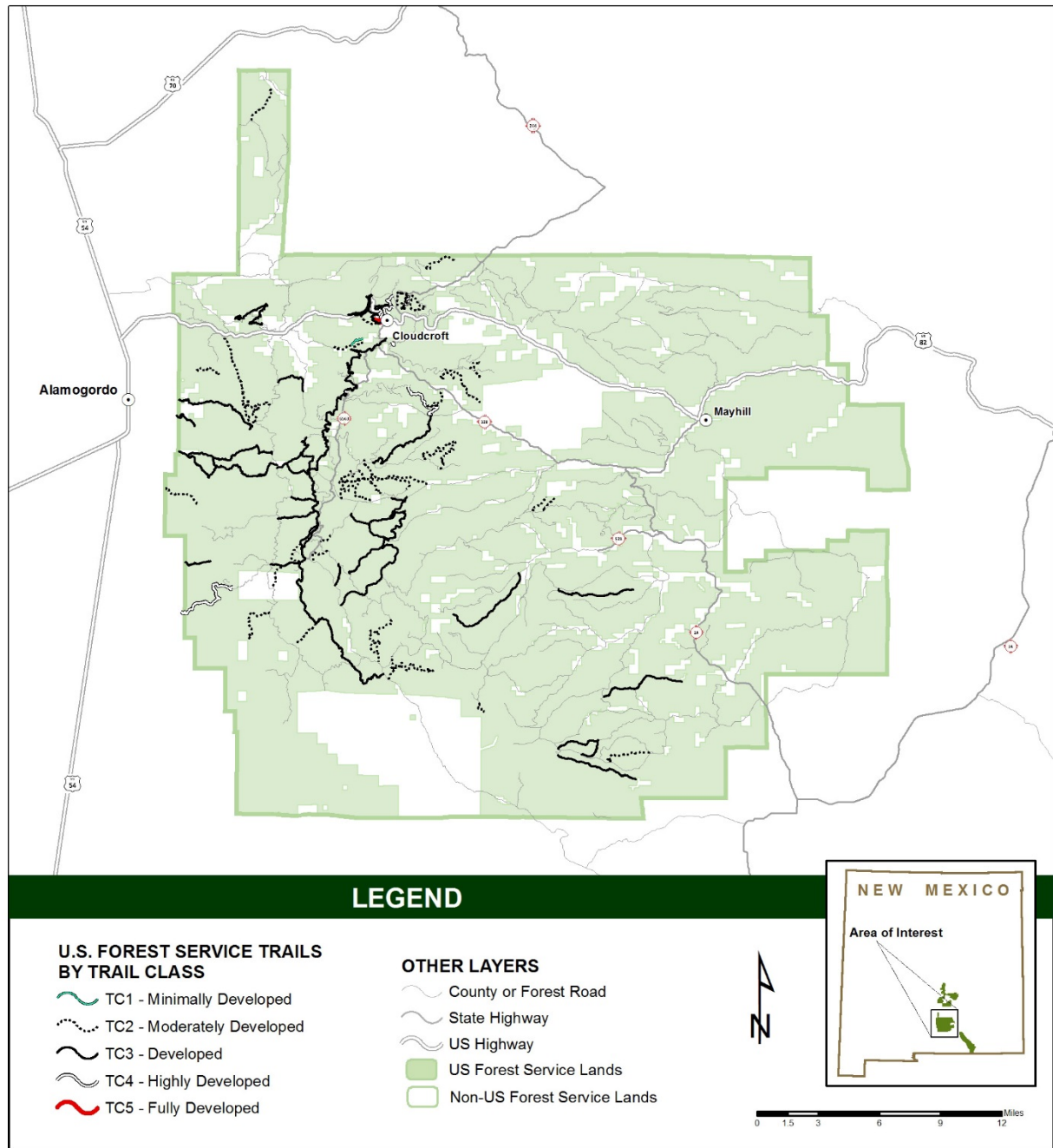


Figure 59. Trail Classes of the Sacramento Ranger District

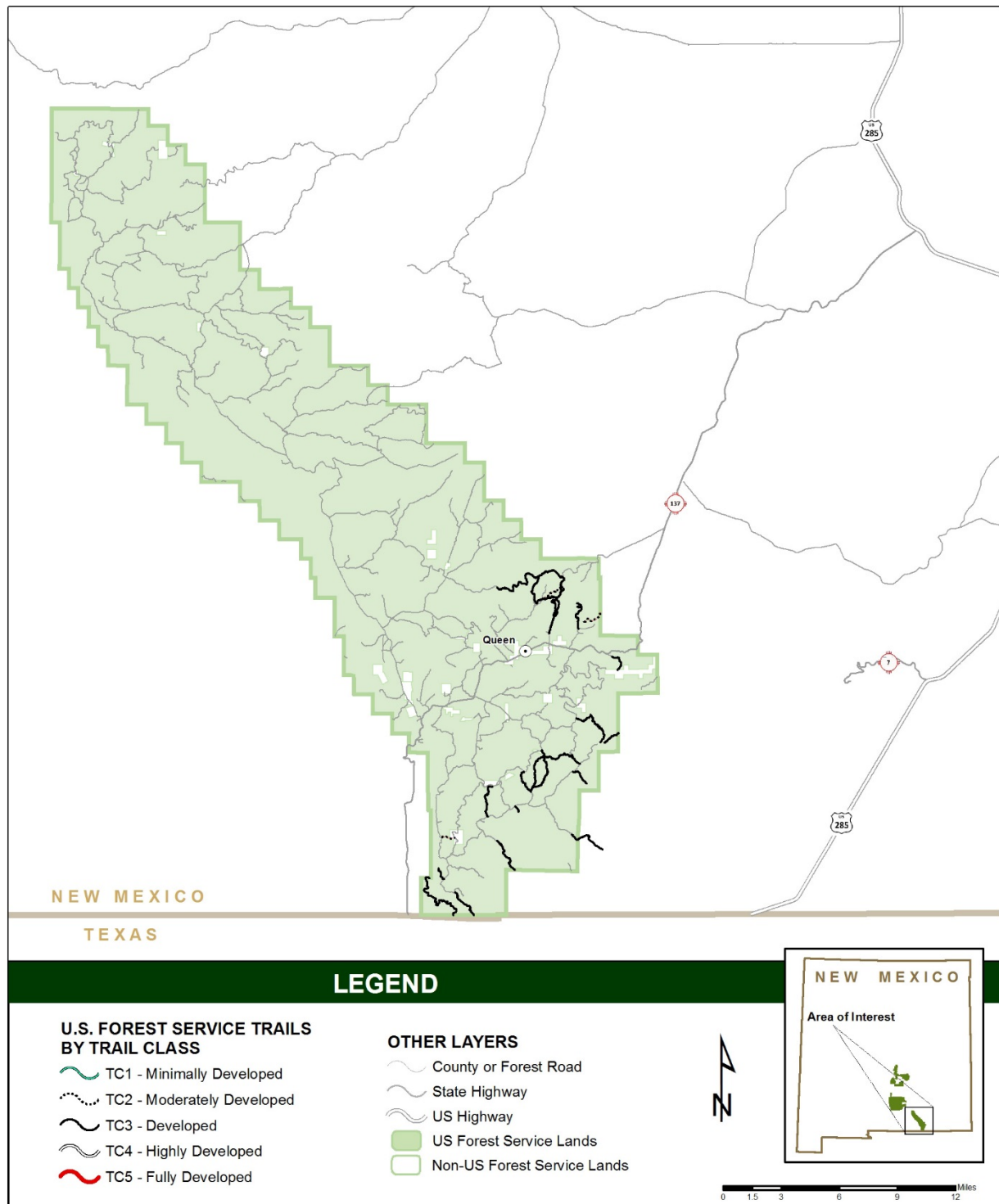


Figure 60. Trail Classes of the Guadalupe Ranger District

Trail Bridges

The six trail bridges that are part of the Lincoln NF trail system are significant structural components. Maintenance of these bridges is critical to protect the investment, and maintain a safe environment for forest visitors. As with road bridges, trail bridges are rated on the condition of several components such as substructure, superstructure, deck, and channel. A condition rating between 0 (failed condition) and 9 (excellent condition) is assigned to each of the bridge components when performing bridge inspections. The three of the six trail bridges on the Lincoln NF are currently rated with all major components listed above in fair condition (numerical rating of 5) or better. The remaining three trail bridges have never been inspected.

Data Gaps

Data gaps identified for trail system data includes the occasional non-populated data item in the NRM database, which prevents identification of a trail's class or designed use. Where indeterminate data gaps were identified mileages were not reported.

Lack of condition information for all trails is another recognized data gap. There is a lack of resources available to conduct and record condition surveys on regular intervals for all system trails thus information on condition of system trails is based on corporate knowledge. The three trail bridges that have never been inspected have been reported to the certified bridge inspectors. It is anticipated they will be inspected in fiscal year 2017.

Trail Trends and Sustainability

As populations grow and urban development expands, use of forest trails is expected to increase, as is the demand for both motorized and non-motorized recreation opportunities. At the same time, Federal budgets are expected to continue to decline, challenging manager's ability to operate and maintain trails.

Allocated dollars for operations and maintenance of the Lincoln NF's trails system over the 5-year span of 2012 to 2016 averaged approximately \$145,637. Typical annual operations cost is approximately \$98,091 while annual maintenance cost is approximately \$326,180 (see Table 60). Considering operational and annual maintenance costs in comparison to historical funding for trails, it can be assumed that deferred maintenance will continue to grow and trail conditions will continue to deteriorate under current funding trends.

Maintenance of trail bridges on the Lincoln NF have been and are expected to continue to receive priority in maintenance planning to protect the significant investment made when constructing the bridges, maintain structural integrity, and keep bridges safe for forest visitors.

Partnerships, including volunteers, are expected to continue to be essential for providing high quality recreation opportunities on the Lincoln including managing and maintaining trails. The trend to maintain only those most popular trails via grants and volunteer efforts is anticipated to continue. Further discussion of the overall trail system trends and sustainability can be found under the Recreation Chapter.

Trail Summary

The current trail system of the Lincoln NF is not sustainable without assistance from resources outside of the Forest Service. Deferred maintenance costs continue to accumulate with below cost operating

budgets. Demand for trail use will likely increase with growing populations and desires for access to recreation opportunities.

The Lincoln NF has had some success in meeting current plan objectives for the management of the national forest trail system. The Lincoln staff has been moderately successful in cooperating with volunteers and user groups to maintain trails popular with national forest visitors. Some trail bridges on the Lincoln NF are lacking inspections, but all are regularly maintained.

Trends

- Use of non-motorized and motorized trails is increasing.
- Use of OHVs greater than 50 inches is increasing.

Aviation Facilities

Aviation facilities for the Lincoln NF include airstrips, heliports, launch pads, and other developed facilities such as an air tanker base used by the Forest Service and other agencies. At this time, there are no airstrips officially part of the Lincoln NF transportation infrastructure.

Airstrips are popular destinations for backcountry pilots. There are two known historic airstrips located within the Lincoln NF. They include the Sunspot “Heliport” Airstrip and the Bluewater Airstrip on the Sacramento Ranger District. Neither of these airstrips are officially part of the Lincoln NF transportation system.

Heliports and air tanker bases are essential infrastructure for firefighting activities. The Lincoln NF has one active air tanker base (within the City of Alamogordo) that houses the Alamogordo Interagency Dispatch Center and supports Neptune Aviation’s fleet of air tankers. In addition the Lincoln NF has three active heliports (two on the Sacramento Ranger District and one on the Guadalupe Ranger District) and one inactive heliport (Sacramento Ranger District). The active heliports are concrete or native surfaces built and marked for helicopter landings. The Sacramento heliport was deactivated as part of Sacramento Mountain Checkerspot Butterfly Conservation Management Plan. The area has not been maintained for several years.

Launch pads for recreational hang-gliders and para-gliders are another form of aviation facilities on the Lincoln NF. On the Sacramento Ranger District the Horse Ridge Launch Pad is actively used by recreational pilots. There is a similar active launching area used nearby, however, there is no constructed launch pad. A new form of aviation recreation is that of flying drones. Although this type of use does not require a built facility it will continue to be a growing type of recreation use and needs to be addressed.

Aviation Facility Conditions

The Sunspot “Heliport” Airstrip was developed by the U.S. Air Force for the construction of the Sunspot Observatory in the 1955. The airstrip is no longer used or maintained and is located at an elevation of about 9,100 feet. The runway is approximately 1,700 feet long and in fair condition. The encroachment of various tree species has reduced the clearance width of the airstrip significantly. The runway has no existing markings on the ground except for an old windsock.

Information on the Bluewater airstrip could not be found at the time of this Assessment. The official name of the airstrip is also unknown, but was assigned Bluewater as a reference point only. It is unknown if the airstrip is currently being used or maintained.

The Horse Ridge Launch Pad is maintained through a special use authorization with a local recreational aviation group. The pad is build out of concrete and is in good condition.

Aviation Facility Trends and Sustainability

There is interest by backcountry pilot groups to use airstrips on the Lincoln NF, including maintaining the facilities through an agreement with the Forest Service. Comments received by backcountry pilots imply that there is interest in using airstrips, both existing and new, as a recreational use on the Forest. With increasing populations it is likely there will be an increase in national forest visitors and subsequently an increased interest in using airstrips. With no funding identified for airstrip maintenance and declining construction and maintenance budgets overall, airstrip facilities are not sustainable unless maintained by special interest groups through some form of agreement with the Lincoln NF.

Aviation Facility Summary

The aviation facilities on the Lincoln NF, specifically airstrips, are of particular interest with backcountry pilots. At this time, there are no airstrips officially part of the Lincoln NF transportation infrastructure. It is likely that interest in airstrip use will remain strong and will increase with growing populations and desires for access as a recreational opportunity. Continued use of hang-gliding and para-gliding aviation facilities is likely to remain the same with a small potential for growth.

The Lincoln NF leadership recognizes the public interest in this area. For more information see “Community Relationships” under the “Social and Economic Conditions” section.

Trends

- Drone use is increasing
- Back country aviation is under-represented

Administrative and Recreation Facilities

Administrative facilities are buildings and other infrastructure necessary to support the employees, equipment, and activities necessary for the management of the national forest. Administrative facilities include office buildings, work centers, visitor centers, fire lookouts, warehouses, communications buildings, and other utility buildings. Administrative facilities also include living quarters such as barracks and individual residences. The Lincoln NF manages and maintains 31 administrative sites, 9 of which include lookouts. Development and management of the administrative sites are guided by a Facilities Master Plan.

Recreational facilities include toilet buildings, shower buildings, storage, entry stations, shade structures and other structures maintained for public recreational use in campgrounds, camping areas, interpretive sites, and picnic or day use areas. The Lincoln NF manages and maintains 29 developed recreation sites; however, recreational facilities are not exclusive to developed sites.

This section assesses the administrative and recreation facilities on the Lincoln NF. Water and wastewater systems supporting administrative and recreation facilities are also assessed in this section as well as dams that meet engineering classification criteria to classify them as a jurisdictional dam (USDA Forest Service 2011).

The management of administrative and recreation facilities on the Lincoln NF is governed by Federal laws, U.S. Department of Agriculture, and Forest Service policy, and some State and local laws. These

laws and policies are generally not listed in this document except in specific instances. In addition to the general direction for facilities management contained in the 1986 forest plan, various other planning-type documents more specifically govern the day-to-day management of the facilities on the Lincoln NF. These include but are not limited to the facilities master plan, recreation facility analysis, water and wastewater system sanitary surveys, real property inventories, and building condition assessments. These documents cover administrative and recreation facilities at a more in-depth level than would be assessed in this report.

Indicators used in this section to assess the condition of the Lincoln NF administrative and recreation facilities include building age based on year of construction and facility condition rating.

Facility condition rating is a qualitative value applied to a facility condition index percentage. The facility condition index percentage of a building is the ratio of the deferred maintenance (or cost of repairs) of a building to its current replacement value. The facility condition index value is equated to the qualitative facility condition rating value as shown in Table 61. The facility condition rating is used as the indicator of administrative or recreation facility condition.

Table 61. Facility condition rating

Facility Condition Rating	Facility Condition Index
Good	95% or greater
Fair	Between 90% and 94% (inclusive)
Poor	89% or lower

Main Administrative Offices

The Lincoln NF Supervisor's Office is located on the outskirts of Alamogordo, New Mexico and is a leased facility shared with three other agencies. The Alamogordo Air Tanker Base which houses the Alamogordo Interagency Dispatch Center is an administrative facility that is located on City of Alamogordo land but all facilities are Forest Service-owned. The Guadalupe Ranger District's main office in Carlsbad, New Mexico, is a leased facility shared with two other agencies. All other office facilities on the three districts are both owned by the Forest Service and on National Forest System land.

Supervisor's Office and Alamogordo Air Tanker Base

The Supervisor's Office is located west of the Lincoln NF. The Supervisor's Office is located in the City of Alamogordo and was constructed in 2009. The site contains an office building as well as employee and secured Government fleet parking. The Alamogordo Air Tanker Base which houses the Alamogordo Interagency Dispatch Center is located 8 miles south of the Supervisor's Office. The site contains an office/warehouse building, an engineering shop with office, a large storage building, a radio repair shop, a flammable storage building, a slurry pump house, a tower and a building which houses communications equipment, a dispatch center, an operations building, and nine miscellaneous storage buildings.

In total, 19 administrative buildings are located at the Supervisor's Office and the Alamogordo Air Tanker Base. Nineteen, or 100 percent, are in good condition. One of the buildings is greater than 45 years old and only three are less than 20 years old.

The Supervisor's Office is served by the City of Alamogordo-owned water and wastewater systems. Alamogordo Air Tanker Base is served by the City of Alamogordo-owned water and by a Forest Service-owned wastewater system.

Smokey Bear Ranger District

The Smokey Bear Ranger District is the northernmost district on the Lincoln NF. The Smokey Bear administrative site is located in the Village of Ruidoso and was constructed in 1985. The site contains 18 structures, including the District office, Fire operations building, engine bay and warehouse, crew quarters, a residence, five RV pads and several small storage buildings. Nine additional administrative sites are located on the Smokey Bear Ranger District:

1. The Capitan Administrative Site includes a combined warehouse / engine bay / office building and a fuel and paint storage building within a fenced storage yard.
2. The Mesa Barn Site includes a wooden barn building, a corral, and is eligible for the National Register of Historic Places.
3. The Jicarilla Schoolhouse Site includes a log, one-room schoolhouse that is listed on the National Register of Historic Places.
4. The Spring Cabin Site located within the White Mountain Wilderness Area includes a cabin, a storage building, a pit toilet, and a hitching post for horses.
5. The Monjeau Lookout Site includes a stone tower with cab, stone building under the tower, a compost toilet, and is listed on the National Register of Historic Places.
6. The Ruidoso Lookout Site includes a tower with cab, a pit toilet, and is listed on the National Register of Historic Places.
7. The Buck Repeater Site includes a tower and a building which houses communications equipment.
8. The Rose Peak Repeater Site on Bureau of Land Management land includes the lease of a tower and a building.
9. The Smokey Bear Repeater Site includes a tower and a building which houses communications equipment.

Figure 61 illustrates the approximate location of sites 1-9 on the Smokey Bear Ranger District. In total, 33 administrative buildings are located on the Smokey Bear Ranger District. Twenty-six, or 79 percent, are in good condition, four are considered in poor condition, with the remaining three in fair condition. Sixteen of the buildings are greater than 45 years old and only five are less than 20 years old. Three of the four buildings in poor condition fall under the greater than 45 years building age category. Only one building is classified as inactive at this time.

The Smokey Bear Ranger District administrative site is served by a Forest Service-owned water system and a Village of Ruidoso-owned wastewater system. The Capitan administrative site is served by the Village of Capitan-owned water and wastewater systems.

The district has 39 recreational buildings located at various recreation sites. There are 13 shade structures, 5 flush toilets, 1 pump house, and 20 vault toilets. All of the recreation buildings, (39 of 39 or 100 percent) are good condition according to NRM data. One of the buildings is older than 45 years old and eighteen of thirty-nine (46 percent) are less than 20 years old.

Four Forest Service-owned water systems serve recreation sites on the Smokey Bear Ranger District. Three of the systems are inactive at this time. The active system has approximately \$2,200 worth of deferred maintenance costs and is in good condition.

Sacramento Ranger District

The Sacramento Ranger District is the central-most district on the Lincoln NF. The Sacramento administrative site is located in the Village of Cloudcroft and was constructed in 2008. The site contains 12 structures, including the District office, Fire operations building and engine bay, warehouse, recreation storage shed, hazmat storage building, paint storage building, two crew quarters, two RV pads, and two small storage buildings. Thirteen additional administrative sites are located on the Sacramento Ranger District:

10. The Mayhill Administrative Site contains 19 structures including an office, two houses, two RV pads, a shop/storage, two car ports for fire engines, five small storage buildings, outdoor storage, a large tractor shed, a horse barn with stalls and corrals, a tack building, a well house, and a repeater building. There are miscellaneous structures on site including a water storage tank, propane tanks, and a weather station. Five of the buildings are listed on the National Register of Historic Places.
11. The Sacramento Administrative Site contains 13 structures including an office, a shop/garage, two residences, a barn converted into a saw shop, a tree cooler, four storage buildings, a well house, and two fire hose sheds. There are miscellaneous structures on site including a water storage tank and propane tanks.
12. The James Ridge Lookout Site includes a tower, a communications building, a repeater, and a pit toilet within a fenced enclosure.
13. The Sacramento Lookout Site includes a tower with cab, a propane tank, and a communications building owned by the Bureau of Land Management within a fenced area. A pit toilet is also on site.
14. The Wofford Lookout Site includes a tower with a chain link fence, a cabin, a storage shed, a pit toilet, and is on the National Register of Historic Places.
15. The Carrissa Lookout Site includes a tower with cab, a cabin, a small bunkhouse, and a pit toilet. Three of the four structures are listed on the National Register of Historic Places.
16. The Bluewater Lookout Site includes a tower with cab surrounded by a fence, a cabin, a utility building, and a pit toilet. Three of the four structures are listed on the National Register of Historic Places.
17. The Weed Lookout and Repeater Site includes a tower and cab, a fenced communications building, and a pit toilet. The tower and cab are listed on the National Register of Historic Places.
18. The Wills Canyon Barn Site includes a deteriorating barn and corrals and is eligible for inclusion on the National Register of Historic Places.
19. The High Rolls Winter Horse Pasture Site includes three fenced pastures, a storage building for feed, corrals, two water storage tanks, and a water collection pad.
20. The Cathey Peak Repeater includes a tower and a building which houses communications equipment.
21. The Wofford Electronic Site includes a tower and a building which houses communications equipment.
22. The Longridge Communication Site includes a tower, a building which houses communications equipment, and a backup generator.

Figure 61 illustrates the approximate location of sites 10-22 on the Sacramento Ranger District. In total, 50 administrative buildings are located on the Sacramento Ranger District. Forty-four, or 88 percent, are in good condition, five are considered in poor condition, with the remaining one in fair condition. Twenty-nine of the buildings are greater than 45 years old and 15 are less than 20 years old. All five of

the buildings in poor condition fall under the greater than 45 years building age category. Only one building is classified as inactive at this time.

The Sacramento Ranger District administrative site is served by a Village of Cloudcroft-owned water system and a Forest Service-owned wastewater system. The Mayhill and Sacramento administrative sites are served by Forest Service-owned water and wastewater systems.

The district has 43 recreational buildings located at various recreation sites. There are nine shade structures, four viewing platforms, one shower facility, and 29 vault toilets. The majority of recreation buildings, (42 of 43 or 98 percent) are in good condition according to NRM data. Only one shade structure is identified as being in poor condition. All of the buildings are less than 45 years old and forty of forty-three (93 percent) are less than 20 years old.

One Forest Service-owned water system serves a recreation site on the Sacramento Ranger District. The system is inactive at this time.

Guadalupe Ranger District

The Guadalupe Ranger District is the southernmost district on the Lincoln NF. The Guadalupe administrative site is located in the City of Carlsbad and was constructed in 2004. The site contains a District office with an attached Sally Port, a fenced parking lot with two covered parking areas, a smaller fenced area with two portable storage buildings, and a generator. Four additional administrative sites are located on the Guadalupe Ranger District:

23. The Guadalupe Work Center Site includes three helicopter pads, a storage building, a toilet, an office / common building, a bunk house, a pump house, a Game and Fish trailer, and five RV pads with hook-ups outside the fenced area. Within the fenced area the site includes a shop / storage building, a fire cache building with a parking bay, and seven small storage structures. Miscellaneous structures on site include propane tanks and a water storage tank.
24. The Queen Corral Site includes three fenced pastures, a corral area, a storage building, and a water storage tank.
25. The Sargent Seep Ranger Station Site includes a ranch house, a school house, a bunk house, four small storage buildings, a corral, a propane tank, and a water storage tank.
26. The Dark Canyon Lookout Site includes a tower with a cabin, a storage structure, a communications building, and a pit toilet.
27. The Sitting Bull Repeater Site includes a tower with a toolbox repeater.

Figure 61 illustrates the approximate location of sites 23-27 on the Guadalupe Ranger District. In total, 27 administrative buildings are located on the Guadalupe Ranger District. Twenty-five, or 93 percent, are in good condition and two are considered in poor condition. Eight of the buildings are greater than 45 years old and ten are less than 20 years old. Both of the buildings in poor condition fall under the greater than 45 years building age category.

The Guadalupe Ranger District administrative site is served by the City of Carlsbad-owned water and wastewater systems. The Guadalupe Work Center is served by Forest Service-owned water and wastewater systems. The Queen Corral site is served by a private-owned water system.

The district has 13 recreational buildings located at one recreation site. There are 12 shade structures and 1 flush toilet. All of the recreation buildings, (13 of 13 or 100 percent) are good condition according

to NRM data. Two of the buildings are older than 45 years old and eleven of thirteen (85 percent) are less than 20 years old.

One Forest Service-owned water system serves a recreation site on the Guadalupe Ranger District. The active system is in good condition.

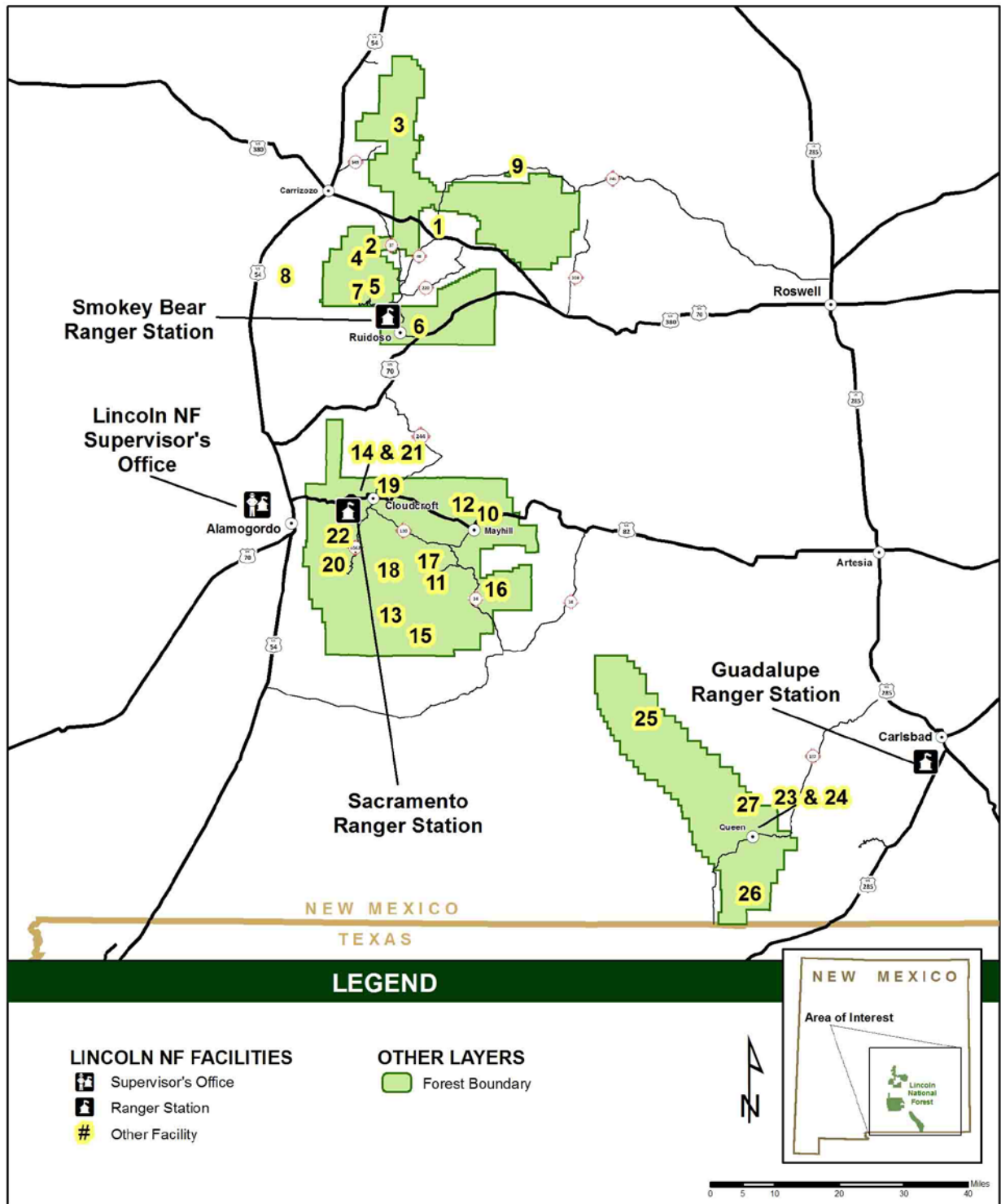


Figure 61. Lincoln NF Administrative Facilities

Other Administrative Facilities

The total number of administrative building facilities across the Lincoln NF is 129. Approximately 42 percent of the facilities are greater than 45 years old. These buildings are in various stages of repair and some need to be replaced. Existing buildings were constructed and located based on past needs. With workforce declining, some buildings are no longer needed or being used; however, since almost half of the buildings were built previous to 1971, their potential to be listed on the National Register of Historic Places complicates the decommissioning process. Also, some of these buildings contain lead-based paint or asbestos, which must be removed or mitigated. The combined effects of increased maintenance requirements as facilities become older, plus deferred maintenance and increasing costs have caused a backlog of maintenance deficiencies. The NRM database currently shows deferred maintenance of administrative buildings on the Lincoln NF at approximately \$4.2 million.

The total number of recreation buildings or related structures across the Lincoln is 95. Approximately 73 percent of the facilities are less than 20 years old. Funding is not adequate to maintain all structures to standard, resulting in increased deferred maintenance costs and more facilities failing into disrepair. The current deferred maintenance backlog for recreation buildings as reported in the NRM database is approximately \$825,000. Additionally, this figure does not include deferred maintenance of recreational water systems or wastewater systems.

Portions of two developed recreation sites (one campground and one day-use area) have been rebuilt in the last six years due to wildfire and flood damage. Another campground is in the process of being rebuilt at the time of this assessment. Funding for these projects have come from various sources including allocated budgets, Recreation Enhancement Act funds, and Burned Area Emergency Response funds.

Approximately 13 recreation and/or administrative sites are served by Forest Service-owned wastewater systems and approximately 8 sites are served by Forest Service-owned water systems. Four systems are rated with a facility condition rating of poor. Current estimate of deferred maintenance needs on the Lincoln NF is approximately \$21,000 for water systems and \$178,000 for waste water systems.

Administrative Facility Data Gaps

Facility condition ratings and building age are not available for every building on the Lincoln NF. The newest facilities on the forest have not yet been entered into the NRM database and some additional data fields have not been updated to reflect current statuses and conditions.

Deferred maintenance needs were taken from the NRM database. Again, due to declining workforce, some of the maintenance needs on the systems may have not been entered in the database; therefore, dollar amounts are only an estimate.

Administrative Facility Trends and Sustainability

Current management direction is to ensure effective management of facilities for occupancy; to provide the most cost-effective, safe, and functionally efficient use of space within available resources; and to ensure that buildings, related facilities, equipment, and subsystems function as originally designed. The Lincoln NF receives annual funding to maintain administrative and recreation facilities. The trend for annual maintenance funding appears to be declining. In addition to the yearly allocation for facility maintenance, the Lincoln competes for capital improvement funding to improve or develop facilities. Capital improvement funds are also declining and have at times been unavailable.

Recreation facility maintenance is funded from a variety of sources. Traditionally, maintenance of recreation facilities is funded by facilities construction and maintenance appropriated funds. The Lincoln NF allocations of these funds have been decreasing over the years with the Lincoln receiving \$120,000 in base allocations in fiscal year 2016 to maintain recreation facilities forest wide. Approximately 95 percent of the base allocation is generally spent on overhead costs associated with the management of recreation facilities with the remaining funding spent on actual infrastructure maintenance.

Other funding sources for recreational facilities maintenance can include recreation, heritage, and wilderness funding, other fee collections, and donations. However, these funding sources are generally used for operational expenditures and only a very small portion is spent on recreational facilities. This funding is spent on facilities only under special circumstances and is mainly used for site enhancements. Therefore funding received by these sources does not reduce the deferred maintenance backlog.

Due to the aging of buildings, increasing deferred maintenance costs and budget reductions, the trend in direction from the Forest Service Washington Office is to focus on decommissioning facilities and reducing square footage. Projects that reduce deferred maintenance or reduce square footage are most likely to be funded. New building construction is generally not funded except to replace existing facilities. Quarters generally don't receive funding for construction.

The facilities master plan for administrative facilities requires regular updates. The plan helps the Lincoln's staff prioritize buildings to retain and buildings that could be decommissioned. Structures that are 45 years old must have historic evaluations before they can be modified or demolished. Needed modifications cannot be performed due to the lack of funding for evaluations. Therefore, the trend is for these older, unused buildings to continue to collect deferred maintenance and deteriorate.

The Lincoln NF staff performs maintenance, including some preventive maintenance, on all Forest Service-owned and operated water and wastewater systems. However, the levels of preventive maintenance are minimal as most of the funding is used for operational maintenance. As these systems age, they become more expensive to maintain. The future trend may be to decommission water systems resulting in reduced services at campgrounds.

Sanitary surveys are completed for each water system with a Forest Service-owned source. While the mandatory testing of water and wastewater systems indicate that the systems are meeting all operational safety requirements, some systems need to be physically repaired or reconfigured to meet current standards.

Due to the disparity between the amount of funding needed to adequately maintain recreation facilities and the amount of funding received, there is an increased trend in collaborating with partners to meet recreation facility demands.

There is an increased focus on the sustainable operations of administrative facilities. Chapter 70 of the Forest Service Handbook is "Sustainable Buildings." Section 7309.11 "Buildings and Related Facilities" provides direction with respect to agency-owned facilities to reduce energy consumption, increase use of renewable energy, and incorporate sustainable concepts (such as Leadership in Energy and Environmental Design) into the design of buildings. There is minimal additional funding available to implement sustainable operations strategies, although it is often a criterion for competitive project funding.

Administrative Facility Summary

Despite the challenges faced in terms of budget limitations and resource protection concerns, the Lincoln NF has generally been able to meet the current plan objectives in the management of administrative facilities and has been successful in providing safe recreational experiences for its visitors. Facilities are provided for employees to work in that are safe and functional. Water and wastewater systems are provided that are meeting all operational safety requirements. Although the trend for funding is declining, there is no known resource damage occurring as a result of the management of administrative and recreational facilities on the Lincoln NF.

Other Facilities and Infrastructure

Dams

Four inventoried dams are located within the boundaries of the Sacramento Ranger District. Three permitted dams, Curtis Canyon Dam, constructed in 1959, Graveyard Canyon Dam, constructed in 1960, and Bear Canyon Dam, constructed in 1960 are owned and managed by Otero County Soil and Water Conservation District. The fourth dam, Parker Canyon Dam was constructed in 1966, and is owned and managed by the Forest Service.

The Bear Canyon and Graveyard Dams have been determined to meet low hazard jurisdictional dam definitions and therefore are inspected every 10 years or more frequently if increased downstream development is observed. Operation and maintenance plans are revised following inspections. In 2007, an inspection found the Bear Canyon Dam to be in good condition with only minor maintenance needed. The Graveyard Dam was found to be in fair condition with major work needed to remove sediment buildup in the reservoir. Deferred maintenance needs were projected to cost \$95,000. The dams and reservoirs were built to store water for flood control purposes.

The Curtis Canyon Dam has been determined to meet high hazard jurisdictional dam definitions requiring annual inspections and operation and maintenance plans. Annual operation and maintenance plans are reviewed and approved by a certified engineer. In addition, safety inspections are performed every 5 years. The 2007 inspection found the dam to be in good condition. The dam and reservoir were built to control flooding after a large wildfire.

The Park Canyon Dam had been determined to meet low hazard jurisdictional dam definitions. The 2007 inspection found this dam and reservoir to be in poor condition. Several items were highlighted as priority work including vegetation removal, repair to the outlet, renovation of the spillway, and sediment removal. Deferred maintenance costs were projected to be about \$56,000. After review of the site, engineers determined it best to breach the dam and to redesign the area to control flooding without the dam. In 2013, the dam was breached and in 2016 the hydrologic redesign was completed. The dam and reservoir were originally built for livestock water supply purposes.

The hazard rating on a 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 due to financing and environmental analysis requirements. Dams on the forest will continue to operate and be maintained until they are no longer needed.

Public Utilities

Public utilities include public services such as water, power, waste treatment, and telecommunications to the general public provided by agencies and cooperatives. Infrastructure associated with these services include dams, municipal water systems, transmission and distribution powerlines, fiber optic and phone lines, and communication facilities such as cell towers. These utilities either produce the services on National Forest System lands (such as water supply) or transport the service across National Forest System lands (such as optical fiber and electrical distribution networks).

In recent years, due in part to historically large fires and flooding, a great deal of work is being done in partnering with local agencies to maintain or improve watershed condition to ensure a constant source of water from key watersheds. Some examples include developing erosion control measures in the Alamo Canyon and Bonito watersheds. Improving fire safety by widening power line corridors to lessen the chance of fire starts through a downed electric line.

Public utilities are authorized through special use authorizations. A full discussion of public utilities is under the Land Status and Ownership, Use, and Access Patterns Chapter.

Private Infrastructure

Private infrastructure refers to facilities developed in private ownership that are used in conjunction with special use authorizations. Such facilities include buildings and other structures and improvements representing a broad range of permitted recreation and land use activities. These activities can serve single purpose use by individuals or single-families as well as offer services that provide a benefit to the public.

Categories of private infrastructure include recreation residences, private water and wastewater permits, ski areas, camps, observatories, and shelters. A full discussion of privately owned infrastructure is under the Land Status and Ownership, Use, and Access Patterns and Recreation chapters.

Stakeholder Input

This section summarizes input, perspectives, and feedback relevant to this assessment topic and received from the public between March 2015 and January 2016. Input was gathered from multiple public and group meetings, from online submissions, and from emails.

Infrastructure was an important topic of discussion at many of the meetings, and most of this conversation focused on roads, trails, and recreation areas. In the Issues/Concerns and Recommendations sections, you will find the compiled Issues and Recommendations put forth from the public.

Issues/Concerns

Communications and ROWs

- Too many communications towers and infrastructure

Camping and Facilities

- Campgrounds are too large
- Lack of facilities for fishing opportunities
- Lease Lincoln NF lands for commercial development and use including campground facilities

- Campgrounds closed due to past fires and delay in their reopening (e.g., South Fork Campground)
- Poor conditions and limited recreation opportunities at fire- impacted areas (e.g., Bonito Lake)
- Limited parking and turnarounds at trailheads, especially for trailers
- Limited toilet/restroom and campground facilities, particularly in popular areas (e.g., Smokey Bear Ranger District) and during the holidays
- Human waste associated with dispersed camping and RV campers

Roads and Trails

- Reduced road and Forest access due to road closures and locked gates
- Poor condition of existing roads
- Fallen trees along and across roads due to overgrown forest
- Limited roads for fire incident response
- Degraded/eroded trails
- Trails are too narrow—ample routes/access for OHVs less than 50 in., very limited for “side-by-side” (58-68 in.) UTV and jeep access
- A lot more trail signs and numbering than before
- Closure of roads/routes due to ATV/OHV concerns, impacting other users
- Limited ATV/OHV trails in parts of the Forest (e.g., Smokey Bear RD) compared to the rest
- Excellent public access for hunters
- Ineffective closure and signage of routes to OHV use, and lack of enforcement, inconsistent with MVUM
- Problems/delays removing deadfall from trails
- Limited parking and turnarounds at trailheads, especially for trailers
- Few shorter loop trails which limits recreation opportunity and experience
- No travel management plan or strategy
- Most trails are well-maintained
- Incompliance with National Environmental Policy Act (NEPA) decisions to close timber roads

Military Uses

- Limited high altitude landing zones and helispots for military use
- Disrepair and neglect of military sites and facilities on the Lincoln NF, with risks to human safety

Backcountry Aviation

- Lack of backcountry aviation airstrips and recreational access by private aircraft

Safety

- Eroded routes, reduced egress/escape and high risk to human safety in the event of fire

Management Recommendations

Communications and ROWs

- Improve and ensure access to radio repeater stations to help maintain and improve communications infrastructure
- Manage power line and other rights-of-way with vegetation treatments/thinning
- Provide for and implement photovoltaic solar energy technologies across the forest where electricity is needed

Camping and Facilities

- Add more toilets/facilities and campgrounds in popular areas to improve recreation experience and address human waste issues
- Do not use generators

Roads and Trails

- Increase roads to improve access fire response
- Institute an OHV route volunteer program, actively promote volunteerism, foster partnerships and other incentives (e.g., permits)
- Build and maintain more roads to improve access and forest management
- Improve signage to indicate trail locations
- Improve and ensure access to radio repeater stations to help maintain and improve communications infrastructure
- Provide more opportunities (roads and trails) to those with disabilities
- Close routes only to ATVs/OHVs, keep open to other users
- Use effective closure (barricade, decommissioning) and signing of route closures
- Keep logging roads open to the public and for future maintenance
- Accurately identify roads versus trails versus other routes, by signage and maps
- Allocate more funds and effort toward trail maintenance
- Enlarge parking areas and provide turnaround areas for trailers
- Add more loop and/or connector trails
- Implement/refine the travel management plan

Military Uses

- Seek out mutual support missions with military and identification of high altitude landing zones and helispots
- Address long-term disposition of military sites on NFS lands
- Work with Department of Defense to address radio frequency conflicts in and around the Lincoln NF

Backcountry Aviation

- Maintain and improve existing, develop new, and reopen old backcountry airstrips for public use/access and recreational aviation, plus other benefits (safety, emergency response)

Safety

- Keep logging roads open to the public and for future maintenance and fire response
Build retention ponds and similar flood control structures to protect downstream communities

Conditions/Trends

Beginning in November of 2015 and concluding in January 2016 the Lincoln NF provided survey forms to assess the stakeholder's opinions on the 15 Areas of Interest. Infrastructure comments and ratings totaled 48 with a majority of 22 addressing travel management issues of illegal use of roads. Overall past conditions for infrastructure as a whole show conditions to be fair or good. Existing conditions were evaluated to be poor and finally a future trend is shown to be predominantly Getting Worse throughout all categories except for trail condition, general recreation and partnerships which are trending level. The overarching set of concerns involve travel management (illegal use of roads/trails) having 22

comments with the vast majority showing a worsening trend. Also, and directly associated with the previous issue, is a trend of worsening watershed condition.

Summary of Findings for Infrastructure

Conditions and trends are key to move into the next phase of our plan revision process because it tells us what may need to change and what may be working fine under current management direction. Conditions and trends have been discussed in detail within this chapter along with any trends that follow. In the overall trends section following are bulleted quick references to these trends. For further detail, please refer to the chapter sections for these subjects.

Overall Trends

- As populations in the four-county area and public visitation continues to grow, demand for infrastructure and facilities on the Lincoln NF will increase.
- Use of closed roads illegally by motorized vehicles is increasing.
- Use of non-motorized and motorized trails is increasing.
- Decreasing total miles of roads through decommissioning or transferring jurisdictional status to other agencies.
- Insufficient budgets for maintaining roads and bridges will increase the deferred maintenance backlog.
- Drone use is increasing
- Use of OHVs greater than 50 inches is increasing.
- Current and future relatively flat budget levels expected for maintaining roads is insufficient to maintain all of the current road system.

CHAPTER 9 - Land Ownership, Status, Use, and Access

Introduction

This chapter discusses existing patterns and trends of land ownership, status, and use both within, and near, the Lincoln National Forest (Lincoln NF). It also explains how land status, ownership, use, and access patterns influence management of the Forest and vice versa. This chapter will discuss all four of these main concepts and conditions, trends and status of each of these topics and discuss adjacent management plans for other agencies.

The scale of analysis for this chapter will be the four counties which touch the Lincoln NF: Otero, Lincoln, Eddy and Chavez Counties. Numbers presented within the chapter will be for these four areas unless otherwise noted and will be derived from the Natural Resources Management corporate database for the U.S. Forest Service and/or Lincoln NF Geographic Information Systems (GIS) datasets.

Key Concepts and Definitions

Land ownership is the basic pattern of public and private ownership of both surface and subsurface estates and legal restrictions and permissions on the use of the land. It refers to the ownership of land and interests in land.

Land status is defined as the ownership record of title to lands, including withdrawals, rights, and privileges affecting or influencing the use and management of National Forest System (NFS) lands.

Land use describes the activities to which the land is devoted, such as residential, commercial, industrial or agricultural uses usually described for private lands, and current land allocations and the uses permitted for NFS lands, such as grazing, mining, recreation, administration, etc.

Access can best be described as the ability to get to a particular piece of land or route, literally, the ability to access an area or destination.

Social and Economic Contributions of Land Ownership, Status, Use and Access

Land ownership patterns are important because decisions made by public land managers may influence the local economy, 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 much of the land is managed by public agencies.

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, and this can lead to 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 and revenue sharing payments (Forest Service Secure Rural Schools and Community Self-Determination Act or BLM Taylor Grazing Act payments; Headwaters Economics 2016). There are no counties in the four-county area of assessment that contain National Forest System or Bureau of Land Management lands totaling less than 900,000 acres.

Land Status and Ownership

Land ownership status is defined as the condition of title of land or interest in land under the jurisdiction of the Forest Service. The following conditions are also included under this definition: the manner in which these lands came into Federal ownership; encumbrances and restrictions that affect the administration of the land; interest owned by the Government in private lands; and the interest in Government lands held by others.

There are just under 14 million acres of land in the four counties (Otero, Lincoln, Eddy, and Chaves) that encompass the Lincoln NF. Within this expanse, there are distinct patterns of land ownership and use, each of which carries important implications for current and future forest management. The total forest acreage of the Lincoln NF, the plan area, is 1,095,470 National Forest System acres (USDA Forest Service 2015), with 166,425 acres in other ownership within the boundaries.

The planning area consists primarily of large tracts of National Forest System land inter-dispersed with private land, State land, and Bureau of Land Management (BLM) land. The Lincoln's three ranger districts are not contiguous with each other, with more than 30 miles separating the districts. The Smokey Bear Ranger District is bound to the north, west, and east primarily by private land with some State and BLM lands. To the south the district is bound by the Mescalero Apache Indian Reservation and the Village of Ruidoso. The Sacramento Ranger District is bound to the north by the Mescalero Apache Indian Reservation, to the south by the Fort Bliss Military Reservation, and to the west by the City of Alamogordo. In addition, the district is bound to the west, south and east by private land, State land, and BLM land. The Guadalupe Ranger District is bound predominately by BLM land on all sides with some State and private land inter-dispersed. To the south, the district is additionally bound by National Park Service land.

In addition, private inholdings of various sizes are scattered throughout the planning area. For the most part, these private inholdings were created when homestead entries were patented to private individuals. These scattered private inholdings create additional miles of irregular property boundary.

Collected ownership data reveals that the area of assessment for the Lincoln NF contains a relatively high percentage of federal land (49.6 percent), half of which is BLM land. The second highest percentage of land ownership is private land (33.8 percent). State Trust land, in comparison, is relatively small at 13.0 percent. (Headwaters Economics 2016) Private land and State Trust land, however, are likely to have a considerable impact on future development patterns throughout the region. Both private land and State Trust land have potential for housing and commercial development.

Existing Patterns of Ownership

Information on land ownership for the entire area of assessment is provided in Table 62 and Table 63. Data in these tables suggest that, as a whole, the four-county area (Otero, Lincoln, Eddy, and Chaves) differs from overall ownership patterns for the state of New Mexico. For example, the four-county area contains a relatively large amount of federal land compared to the state (50 percent versus 34 percent, respectively), but limited private land compared to the state (34 percent versus 44 percent, respectively). (Headwaters Economics 2016).

The more detailed data provided in Table 62 and Table 63 indicate important differences in ownership among the four individual counties. Lincoln and Chaves Counties are notable for their relatively substantial amounts of private land (54.7 and 49.5 percent). In comparison, Otero and Eddy Counties

are notable for their relatively substantial amounts of federal land (70.1 and 58.3 percent). Otero County contains the only percentage of tribal land (10.8 percent) and the greatest percentage of land held by the Military (32.9 percent). Eddy County contains the highest percentage of BLM land (51.1 percent) and Chaves County has the highest amount of State Trust land (18.2 percent) (Figure 62 and Figure 63) (Headwaters Economics 2016).

Table 62. Land Ownership by County by Acres

Ownership	Otero County	Lincoln County	Chaves County	Eddy County	Four County Region	New Mexico	U.S.
Total Area	4,241,604	3,092,044	3,888,080	2,686,413	13,908,141	77,814,169	2,301,106,907
Private Lands	469,892	1,691,387	1,944,208	617,510	4,702,997	33,972,877	1,364,048,727
Federal Lands	2,975,147	1,101,828	1,256,509	1,566,004	6,899,488	26,322,826	649,455,740
National Forest Service	559,906	397,399	40,249	133,069	1,130,623	9,238,826	192,507,338
Bureau of Land Management	927,612	523,292	1,191,377	1,373,231	4,015,512	12,963,882	242,951,818
National Park Service	93,340	0	0	47,336	140,676	388,758	78,773,678
Military	1,394,289	181,137	0	0	1,575,426	3,114,318	22,945,136
Other Federal Lands	0	0	24,883	12,368	37,251	617,042	112,277,770
State Lands	336,640	298,009	707,362	502,899	1,844,910	9,125,341	194,258,469
State Trust Lands*	335,921	298,009	705,876	467,808	1,807,614	8,875,245	46,116,200
Other State	719	0	1,486	35,091	37,296	250,096	148,142,269
Tribal Lands	459,924	653	0	0	460,578	8,037,660	66,666,114
City, County, Other	0	167	0	0	167	66,415	7,650,993

* 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.

Table 63. Land Ownership by County by Percent of Total for 2016

Ownership	Otero County	Lincoln County	Chaves County	Eddy County	Four County Region	New Mexico	U.S.
Private Lands	11.1%	54.7%	49.5%	23.0%	33.8%	43.7%	59.3%
Federal Lands	70.1%	35.6%	32.3%	58.3%	49.6%	33.8%	28.2%
National Forest Service	13.2%	12.9%	1.0%	5.0%	8.1%	11.9%	8.4%

Ownership	Otero County	Lincoln County	Chaves County	Eddy County	Four County Region	New Mexico	U.S.
Bureau of Land Management	21.9%	16.9%	30.6%	51.1%	28.9%	16.7%	10.6%
National Park Service	2.2%	0.0%	0.0%	1.8%	1.0%	0.5%	3.4%
Military	32.9%	5.9%	0.0%	0.0%	11.3%	4.0%	1.0%
Other Federal	0.0%	0.0%	0.6%	0.5%	0.3%	0.8%	4.9%
State Lands	7.9%	9.6%	18.2%	18.7%	13.3%	11.7%	8.4%
State Trust Lands*	7.9%	9.6%	18.2%	17.4%	13.0%	11.4%	2.0%
Other State	0.0%	0.0%	0.0%	1.3%	0.3%	0.3%	6.4%
Tribal Lands	10.8%	0.0%	0.0%	0.0%	3.3%	10.3%	2.9%
City, County, Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.3%

* 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.

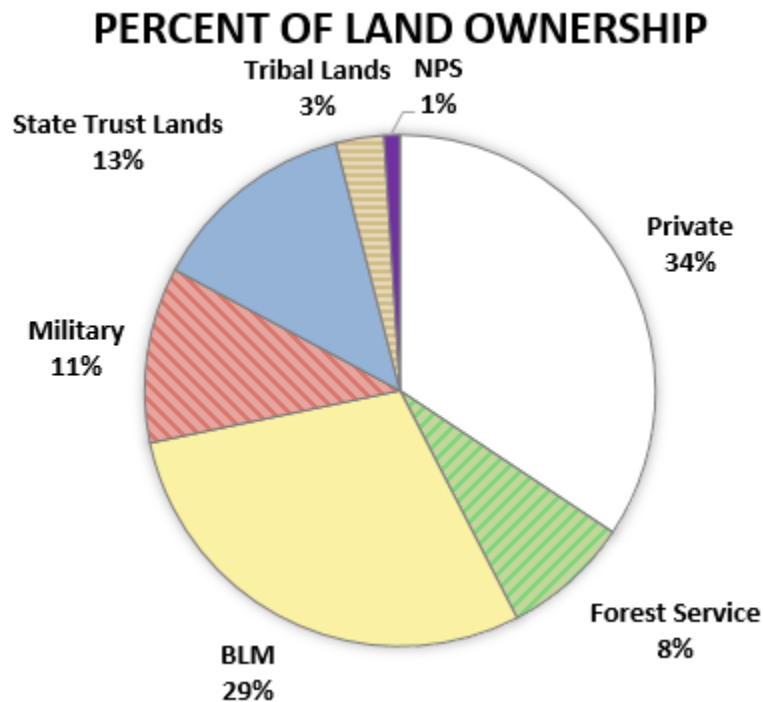


Figure 62. Percent of land ownership by major land owners in four-county area. Note: If percentage is less than 0.5, it is not represented in this figure.

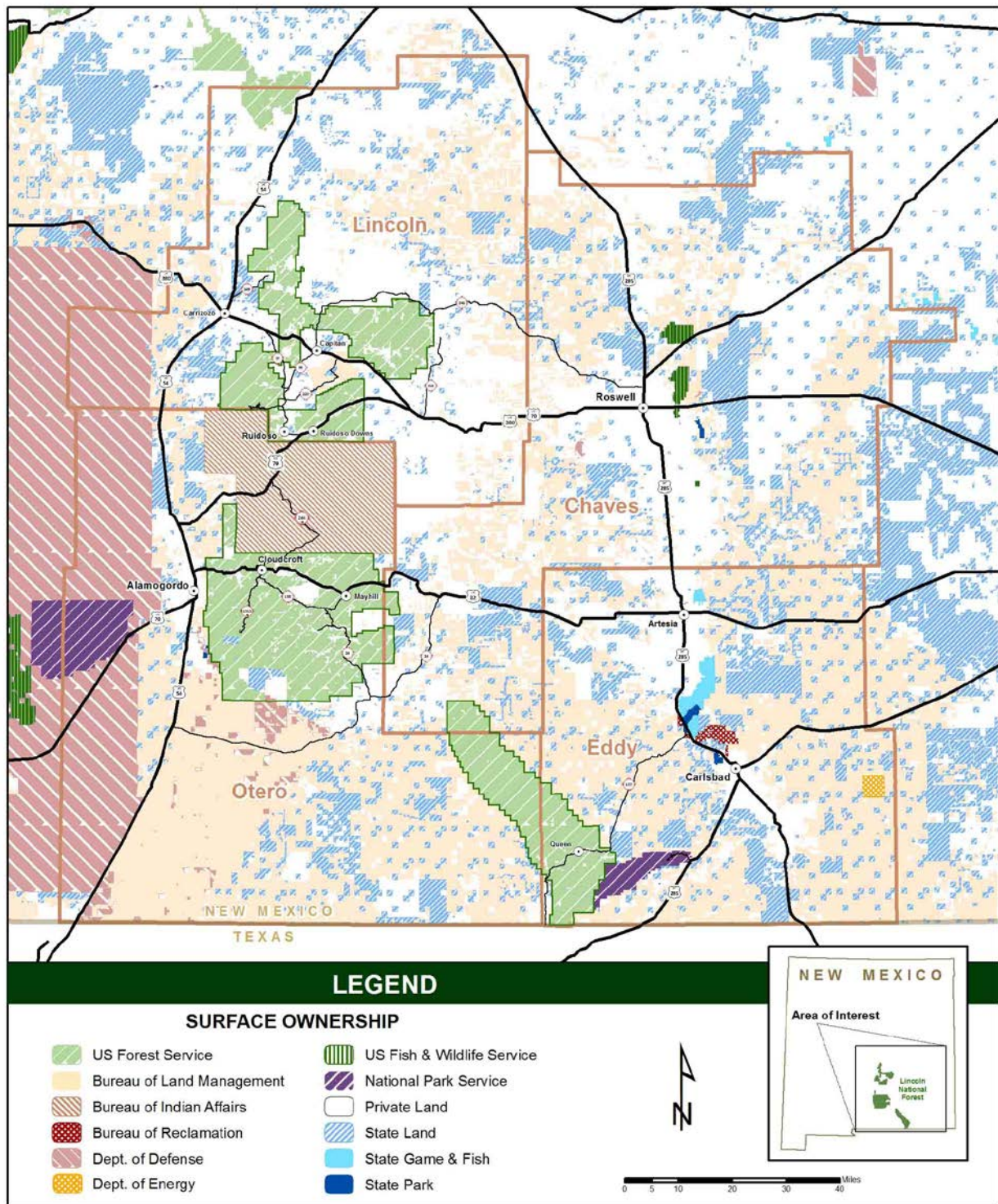


Figure 63. Surface Ownership for the Four County Area

Changes in Ownership

Land ownership status on National Forest System lands can change over time through land adjustments. Land adjustments involve transfer of fee title, resulting in a change in legal land ownership. Land adjustments can result from land exchange, purchase, donation, sale, transfer, condemnation, and interchange.

Ownership of National Forest Service lands within the planning area has changed in the last planning cycle. Since 1986, there was a decrease in National Forest System ownership of 7,967 acres on the Lincoln NF (USDA Forest Service 2015).

A number of land adjustments completed in recent years have either directly or indirectly involved lands managed by the Lincoln NF. These land adjustments include land exchanges, purchases, Small Tract Act sales, Sisk Act sales, Forest Service Facility Realignment and Enhancement Act sales, and Education Land Grant Act sales.

Land adjustments within the Lincoln NF have been an important tool to acquire high quality inholdings and resources within the national forest. In addition there are certain criteria when selecting desirable adjustments to the Lincoln's internal landownership pattern and use.

Criteria for acquisition include:

- Inholding tracts reside within a wilderness;
- Land has water related desirability;
- Land has high recreation potential;
- Lands contain unique natural or cultural values;
- There is a need to stabilize or protect threatened or endangered species;
- There is a need to improve ownership and management pattern or meet research needs;
- There is a need to provide access or protect public land from fire or trespass or prevent damage to public land resources;
- There is a need to rehabilitate or stabilize non-federal land in order to restore productivity of lands administered by the Lincoln N
- There is a need to implement direction prescribed by Congress or U.S. Department of Agriculture; or
- There is a need to improve management or meet specific administrative needs or to benefit other Lincoln NF programs or priorities.

Criteria for disposing of National Forest System lands include:

- Isolated tracts;
- Inability to manage;
- Areas needed by a local community; or
- Lands are not suitable for national forest purposes or for meeting an overriding public need.

Land Use

Many land uses are covered by special use authorizations, which include permits, leases and easements that allow occupancy, or use, on National Forest System lands. Special use authorizations are legal instruments whose terms and conditions are fully enforceable when reasonable and consistent with law, regulations, and policy.

Currently there are over 74,000 authorizations on National Forest System lands for over 180 types of uses (USDA Forest Service Special Uses Website). The Forest Service divides management of special uses

into two categories, lands and recreation. There are approximately 380 special use authorizations issued on the Lincoln NF, of which 30 percent are for recreation uses. Table 64 represents a snapshot of the authorization on the Lincoln NF. Special uses can be short-term or long-term depending on their use. The Lincoln NF will have 350 to 400 special use authorizations at any one time. Recreation event authorizations, generally short-term in nature, have the greatest fluctuation in numbers on the Forest.

Table 64. A snapshot of special use authorizations issued by the Lincoln NF

Category of Use	Type of Use	Number of Authorizations
Recreation	Outfitter and Guides	62
	Recreation Residences	28
	Ski Areas and Related Facilities	2
	Concession Campground	1
	Organization Camp	3
	Recreation Events	6
	Structures, Target Ranges, Vendor, Non-commercial Group	7
Lands	Agricultural Facilities	5
	Community And Public Information, Religious and Service Facilities, Storage	9
	Sanitary Systems	6
	Feasibility, Research, Training, Cultural Resources, and Historical Feasibility	30
	Power, Telephone, and Gas Utilities	23
	Transportation	68
	Communication Uses	70
	Water Facilities	58
Total		378

Lands Special Use Permits

Lands special uses include special permitted Right-of-Way corridors such as water transmission lines, communications, filming, research, and granting road and utility rights-of-ways. The most frequently permitted category under lands is for communication-related uses. Out of the 70 authorizations currently issued, 65 are for communication facilities such as cellular, internet, television, AM and FM radio, and private and commercial mobile radio. These facilities are commonly associated with high mountain tops where better coverage can be achieved.

The second most frequently permitted category under lands is for transportation-related facilities. Out of the 68 existing transportation authorizations, 27 are access easements granted under the Forest Road and Trail Act and the Federal Land Policy and Management Act.

The third most frequently permitted category under lands is for water-related facilities. Out of the 58 authorizations currently issued, 46 are for water lines (10 for irrigation and 36 for domestic water). The majority of these are issued to water associations and communities for a water supply to their land.

There are eight utility companies currently permitted on the Lincoln NF authorizing hundreds of miles of power and telephone line right-of-ways. These facilities are primarily owned by Otero County Electric Cooperative, Inc., Peñasco Valley Telecommunications, Tularosa Basin Telephone Company, Inc. / Tularosa Communications, Inc., and the Central New Mexico Electric Cooperative, Inc.

Recreation Special Use Permits

Recreation special use permittees serve as Forest Service partners to offer guided recreation activities and services to the public. Special use permit representatives assist the Forest Service in conveying important stewardship messages to their clients. Special use authorizations provide commercial use of National Forest System lands for a wide variety of activities include riding/packing stock, hiking, hunting, hang-gliding, off-highway vehicle riding and jeep tours, mountain biking, snowmobiling, and running.

The most frequently permitted category under recreation is for outfitter and guide-related uses. There are 62 existing outfitter and guide authorizations on the Lincoln NF, of which 60 are for hunting services and 2 for horseback riding services. Outfitters and guides play an important role by providing services to people that don't have the skills, equipment, or expertise to participate on their own. They can teach and promote "Leave no Trace" ethics and other light-on-the-land techniques, helping to reduce visitor impacts while providing enjoyable experiences for the visitor. Impacts to local communities are both social and economic. They are social in the sense that these guides expose non local visitors to the local cultural and tradition of the area and economic impacts are large for both the communities and for the outfitter guide.

The second most frequently permitted category under recreation is for recreation residences-related facilities. All 28 existing authorizations are permitted on the Smokey Bear Ranger District. Recreation residences originated in the early 1900s as a way to promote the public to recreate in the forest. These seasonal, privately-owned facilities are generally passed down within the same families for generations.

There are 2 ski areas/lifts permitted on the Lincoln NF. Ski Apache is partly located on the Mescalero Apache Indian Reservation and partly on the Forest. Ski Cloudcroft is mostly on the Village of Cloudcroft land. Ski Cloudcroft is the second most southern ski area in the United States, the most southern one being Mount Lemmon Ski Valley in southern Arizona. Both bring substantial economic impacts to the communities of Ruidoso and Cloudcroft during the winter months, an important influx of money during normally low visitor use months.

Trends

- Special use demand on the Lincoln NF is expected to increase.
- Infrastructure (power, communication, water, and transportation) needs will require additional facilities on national forest land.
- Staffing levels of both qualified special use personnel and specialists required to review environmental analysis documents are in decline and not expected to recover.
- Budgets for both lands and special uses are also in decline and not expected to rise.

Other Land and Resource Plans

All four counties in the Lincoln NF area of influence, and most of the neighboring cities and villages, have comprehensive, long-range general plans. Comprehensive plans identify areas as to their suitable status for future residential, commercial, industrial and agricultural development or activities, and in some cases, expectations for coordination of uses between private landowners and Federal agencies administering land in the respective counties. They also contain information on patterns of development, desired conditions, and current land use and growth policies. Information gleaned from these plans is discussed in terms of its potential for influencing land use patterns adjacent to the national forest.

City, Village, and Town Plans

City of Alamogordo Comprehensive Plan 2000

The City of Alamogordo revised its 1971 Comprehensive Master Plan in 2003. The Alamogordo Comprehensive Plan 2000 update provides direction for the future growth of the city. The goals and objectives in the Comprehensive Plan are structured around the following themes: development controls, public infrastructure, and community needs. Comprehensive Plan elements based of these three themes include: growth management, zoning, extraterritorial intergovernmental coordination, annexation, infill, economic development, industrial development, housing, community character, transportation system, water and sewer service, drainage, trails and recreational facilities, historical preservation, public services and facilities and environmental protection (City of Alamogordo 2003).

Land Use: The city shares its border with the Lincoln NF along its eastern boundary, a distance of approximately 5 miles. For the area abutting the national forest, the town's future land use map calls for low density and medium density residential uses (City of Alamogordo 2003).

Growth Areas: Alamogordo's future growth is likely to occur in the following areas:

Single-Family Residential - The greatest opportunity for single-family residential growth is in the area east of U.S. 54 and south of Ocotillo Drive, within the vacant private lands that have access to city water and sewer service. The highest concentration of growth is expected directly south of Ocotillo Road and east of South Florida Avenue and between U.S. 54 and South Florida due to the availability of services and easy access to commercial and school areas (City of Alamogordo 2003).

Multi-Family/Trailer Park Residential - The area with the greatest potential for multi-family growth (including mobile homes) is bordered by U.S. 70/82 on the north, Airport Road on the west, U.S. 54 on the east, and the Alamogordo airport on the south. This region is expected to develop significantly by the year 2020 due to its proximity to Holloman Air Force Base (City of Alamogordo 2003).

Commercial Development - Future retail growth will most likely concentrate in the southwest area of the city along U.S. 70/82 and U.S. 54. There has already been commercial growth at the interchange of these two highways, and the area is projected to undergo considerable future commercial development (City of Alamogordo 2003).

Industrial Development - The long narrow area west of White Sands Boulevard is zoned for industrial use, appropriate for low impact industrial and manufacturing uses (City of Alamogordo 2003).

Extraterritorial Intergovernmental Coordination: A goal of the plan is to work with the Lincoln NF, the Bureau of Land Management, the New Mexico State Highway and Transportation Department, and the

State Land Office to assure continued access to public lands from Alamogordo and enhance the region's trails system. A policy recommendation is to maintain relations with other governmental agencies (U.S. Forest Service, BLM, National Solar Observatory, and Apache Point Observatory) and ensure that their interests in the community are recognized (City of Alamogordo 2003).

Community Character: The Comprehensive Plan recognizes the importance the community places on the quality of life and amenities that characterize Alamogordo and the many reasons that make it a desirable place to live. To this end, the plan illustrates the need to identify, acquire, and develop choice park lands as growth occurs; to provide linkages from the city into adjacent public lands and natural open spaces and to proposed regional trails system; and to provide recreational activities for youth. Recommended policies include preserving scenic views enjoyed by citizens and visitors and maintaining the dark skies policy by enforcing the city's outdoor lighting ordinance benefiting the astronomical research in the Sacramento Mountains (City of Alamogordo 2003).

Transportation: The Comprehensive Plan acknowledges the current transportation system is lacking in bicycle and pedestrian facilities and there is a need for amenities to accommodate non-motorized, alternative modes of travel. The Plan also acknowledges a community need to define and acquire public access-ways for open space that connects existing and proposed trail systems. Policy recommendations to resolve these issues include (City of Alamogordo 2003):

- Designating bicycle routes and trails throughout the city and improving the quality of walking in Alamogordo by creating an off-road multi-use trail system using existing public right-of-ways.
- Supporting the development of the regional trails system by cooperating with the other participating agencies, providing connections to city trails, and allowing joint use of city-owned property. Specifically, New Mexico's Rails-to-Trails proposal of an extensive trail system that creates a loop through Alamogordo, extending south to Oliver Lee State Park, east to Sunspot, north to Cloudcroft, west to La Luz, and then south back to Alamogordo.
- Providing dedicated easements to access Lincoln NF trails, particularly at Marble Canyon and allowing joint use of city water tank areas for parking and staging to access Forest Service trails.

Village of Cloudcroft Comprehensive Plan

The Village of Cloudcroft Comprehensive Plan is a general, long-range, comprehensive expression of the future vision of the Village. The plan provides specific focus through the creation of an overall vision, and the identification of goals, objectives, and policies to guide public and private decisions related to growth and development of the Village of Cloudcroft. The Comprehensive Plan was developed in 1974, and revised in 2005 and 2014. (Village of Cloudcroft 2014)

Land Use: The village of Cloudcroft's land area consists of 1.6 square miles (1,034 acres) of incorporated property and abuts the Lincoln NF on all sides. For the areas abutting the National Forest, the town's future land use map calls mostly for single family residential use. (Village of Cloudcroft 2014)

Growth: The mid-range population projections in this plan do not show a need for expansion of the land area. The plan assumes the village boundary with the National Forest is generally static for the future. Cloudcroft's residential neighborhoods have varying mixes of single family residences, townhomes, apartments, and lodging. Future development should retain this fabric of compatible uses including having a mix of seasonal homes and affordable permanent homes. (Village of Cloudcroft 2014)

The commercial core area contains a mix of pedestrian-oriented retail commercial, heavy commercial, lodging, public and office uses. Higher density residential uses, including apartments, townhouses and small lot single family residences are appropriate future development uses within this area. The Burro Avenue area should have a strong orientation to pedestrian traffic while accommodating emergency and service vehicles, and additional convenient customer parking. (Village of Cloudcroft 2014)

The east commercial area at the east end of town presents a major opportunity to add retail, office, and lodging uses expanding the community's current offerings, bringing in additional tourists, and increasing the Village's tax base. (Village of Cloudcroft 2014)

Retaining Sense of Place: The Village of Cloudcroft has a strong sense of place valuing its small-town atmosphere, western appearance, and pedestrian-friendly community. The Comprehensive Plan supports continuing efforts to protect historic assets of the railroad and logging-era in the Village and the surrounding Lincoln NF. The Plan also supports developing a wildland/urban interface fire prevention and protection plan and potential accompanying regulations. (Village of Cloudcroft 2014)

Cooperative Planning: For many visitors and residents, the National Forest surrounding Cloudcroft is the most significant attraction of the community. The Village recognizes the importance of good land-use practices that support visitor activities, resource use, and the health of the forest. The Plan emphasizes pursuing cooperative planning with other governmental agencies in the vicinity, highlighting three specific goals. First, coordinating with the Lincoln NF on a trails and trailhead planning effort by expanding trails and better connecting trails directly from the Village. Second, developing a master plan with a feasibility study for ski area development by cooperatively working with all parties involved. Lastly, discouraging any development outside the Village in the 3-mile extraterritorial zoning area that would detract from the Village's natural setting. (Village of Cloudcroft 2014)

Economic Development: The community vision's for the future economic development of the Village is to retain and promote the physical beauty and historic character of the area while creating a fresh approach to meeting visitor's interests and preserving quality of life for residents. The Village's Comprehensive Plan identifies preserving the natural qualities of the community including retaining surrounding vistas and enhancing the public landscape for long-range viability of tourism and second home residences. It also illustrates the need to continue working with the Lincoln NF in joint planning efforts to support tourism and economic growth in areas of recreation, retail services, and lodging. The Plan supports economic diversification in the community by promoting astronomy as a special niche and the use of small-diameter forest products for manufacturing and marketing of local goods. (Village of Cloudcroft 2014)

Village of Ruidoso 2010 Comprehensive Plan

The Village of Ruidoso Comprehensive Plan was adopted in 2010. The foundation for Ruidoso's Comprehensive Plan is based upon the village's previous plan, which was adopted in 2006. This newest version is different from the previous plan and other plans in neighboring communities. This plan focuses on action items with a more restricted number of goals and objectives as it only attempts to address and guide changes over a 10 year period (Village of Ruidoso 2010).

Land Use: The village shares its borders with the Lincoln NF along its western, eastern, southwestern and southeastern boundaries, a distance of approximately 10 miles. Due to terrain and historic patterns of subdivision and development, there is little land available for new development. The focus will be on

redevelopment of outdated structures and infill within established subdivisions. (Village of Ruidoso 2010)

Recreation Facilities: The Comprehensive Plan recognizes there is an ever-increasing demand for parks, recreational facilities, and open space necessary to serve new development and to maintain the quality of life enjoyed by existing residents. The Village's Parks and Recreation Department has been tasked with continuing to identify opportunities for share facilities with the Lincoln NF(Village of Ruidoso 2010).

Regional Cooperation: The Village of Ruidoso acknowledges improved cooperation with other governments and agencies within the region is essential for effectively being able to meet the needs of the Village's residents. The Village will continuously work to establish better lines of communication between the various jurisdictions, including the City of Ruidoso Downs, the Mescalero Apache Tribe, Lincoln County, and the Lincoln NF(Village of Ruidoso 2010).

County Plans

Chaves County Comprehensive Plan

Chaves County's 2015 Comprehensive Plan establishes goals, objectives, and implementation actions to guide decision makers regarding the future of the County, particularly in regard to land use, preparation of capital improvement plans, enforcement of zoning and other regulations, and related growth management issues. Chaves County is located in the southeastern portion of New Mexico and is approximately 6,065 square miles in area. Roswell is the county seat and contains the highest concentration of people in the county (48,366 people or 73.7 percent). In addition to Roswell, other incorporated communities in Chaves County are Dexter, Hagerman, and Lake Arthur. (Chaves County 2015)

Land Use: Land ownership within the County falls into three categories: federal, state trust, and private. Federal land makes up approximately 34 percent of the total land area (1,303,439 acres) and is managed by a number of agencies including the Bureau of Land Management, the US Forest Service, the US Fish and Wildlife Service, the Bureau of Reclamation, and the Department of Defense. State trust land comprise approximately 26 percent (1,019,653 acres) and is managed by the New Mexico State Land Office. The remaining land, approximately 40 percent (1,756,952 acres), is in private ownership. (Chaves County 2015)

The Plan's intent for land use management is to protect the local custom and culture, promote economic stability, protect property rights, and establish a framework to ensure harmonious and orderly growth for the future. The largest land uses in Chaves County are agriculture and rural residential. (Chaves County 2015)

Public Land: The Chaves County Land Council (CCLC) is made up of nine appointed members, of which three members represent agricultural interests, three members represent extraction interests, and three members represent recreational interests. The CLCC members review issues dealing with federal and state trust lands in Chaves County and advise the Commissioners regarding public land matters. The reason for addressing federal and state trust lands in the 2015 Comprehensive Plan stems from the County's desire to guide decisions about the use of land and public resources in Chaves County. This involves the protection of the rights of private landowners in relation to public lands, and to promote the coordination and cooperation of land use decisions affecting the use of public land between the County and governmental agencies charged with management of those lands. Chaves County's local

economy is to a great extent dependent on the business activities occurring on public lands within the County. Chaves County supports the continued multiple use of federal lands and maximizing the income from the assets and resources of state lands in Chaves County. Chaves County believes that it is imperative that federal and state agencies inform local governments of those pending actions affecting local communities and citizens and coordinate with them in the planning and implementation of these actions. (Chaves County 2015)

Eddy County Comprehensive Plan

Eddy County holds comprehensive planning and zoning authority for over 4,180 square miles of land. The Eddy County Comprehensive Plan seeks to promote a more efficient land use pattern in order to attract retirees and young families while preserving farmland, to provide for projected growth needs, to ensure a sufficient water supply, and to maintain the county's quality of life. Eddy County is located in southeastern New Mexico, bordering Texas to the south. Carlsbad is the County seat, as well as the largest town in Eddy County. Other incorporated places include Artesia, Loving, and Hope. (Eddy County 2008)

Land Use: Some 80 percent of the land in Eddy County is public land, administered by the federal or state government, while 20 percent is privately owned. Of the federal land owners, the Bureau of Land Management administers approximately 1.4 million acres, while the US Forest Service administers some 135,000 acres. The state owns nearly 18 percent of the land (478,000 acres) and inland water covers another 0.3 percent or 8,100 acres. The Comprehensive Plan recommends sponsoring public education and discussion about land use regulations to try to reach a consensus on what approaches would be acceptable to residents. It also recommends mapping existing land use in the County unincorporated areas; identifying areas for future growth, based on proximity to infrastructure and other criteria; ensuring infrastructure needs are met before development occurs; and revising the County subdivision ordinance. The plan seeks to limit the risks of development in hazard areas, such as floodplains or next to underground gas lines. Other recommendations address ways to incorporate green spaces into new developments, preserve gateways into the County and municipalities, preserve the small-town feeling of communities, strengthen agriculture, and improve property appearance, quality and maintenance. (Eddy County 2008)

Lincoln County Comprehensive Plan

The Lincoln County Comprehensive Plan is envisioned to be a unifying force that cultivates cooperation between the County and the municipalities within. Lincoln County is located in south central New Mexico and comprises 4,858 square miles which range from sprawling ranch lands to mountain settings. Carrizozo is the Lincoln County seat, although Ruidoso is the largest town in the County. Other incorporated places include Ruidoso Downs, Capitan, and Corona. (Lincoln County 2007)

Land Use: Of the 3,109,120 acres that comprise Lincoln County, about 43 percent are publicly-owned lands which are managed and administered by a variety of agencies. These include the US Forest Service, the Bureau of Land Management, State Trust Lands, and the Department of Defense (White Sands Missile Range). These agencies are required to work with local counties in a way that promotes and respects the local custom and culture of the area. Some of these state and federal lands are used for public recreation, hunting, mining, and grazing, and they also contribute to the County's reservoir of open space and its rural character. Because of the large amount of publicly-owned land in the County, treatment of this resource is very important. (Lincoln County 2007)

The Lincoln County Comprehensive Plan highlights eight Natural Resources/Public Land Use Vision and Goals. They are (Lincoln County 2007):

- Ensure that the County's custom and culture, needs and interests are taken into consideration and prioritized by state and federal agencies operating in the County.
- Promote the sustainable extraction of slash, timber, and wood products on federal and state trust lands within the County as a fire protection measure, to promote watershed health, and as a small-scale economic development strategy.
- Expand and improve public recreation opportunities on federal and state trust lands in Lincoln County, ensuring that there are sufficient facilities and measures in place to handle increased volume.
- Ensure the continued use of federal and state trust rangelands for grazing, mining, recreation, and other public uses and activities.
- Continue to improve the quality of rangelands on federal and state trust lands.
- Limit predation on livestock using wildlife management techniques that still maintain wildlife as an important natural resource.
- Work to effectively manage large game herds in Lincoln County.
- Eliminate detrimental invasive species in the County.

County of Lincoln Public Land Use and Rural Affairs Advisory Committee

The primary objectives of Committee are to engage in fact-finding about Lincoln County's natural resources; coordinate the development and monitoring of proposed uses of public lands and natural resources with special attention to recreation, hunting, fishing, water, fuel wood harvesting, timber harvesting, mining and grazing; to monitor plans and activities of federal and state agencies that are active in the County; and to work to protect private property rights, among other tasks. (Lincoln County 2007)

Lincoln County Comprehensive Land Use Plan

The Plan details Lincoln County customs and culture related to the area's rural lifestyle, and specifically addresses how state and federal agencies should interact with County functions in a way that is respectful of this local character. The plan describes general conditions of forest health, air and water quality, range conditions, wildlife management, mineral resources, environmental health and waste, and then lays out recommended goals, policies, and action plans for these topics. One of the overarching goals of the Lincoln County Comprehensive Land Use Plan is to provide guidance to the County in long-range planning relating to natural resources and land use. The most recent version of the Plan was adopted in 1998. (Lincoln County 2007)

Otero County Comprehensive Plan

The nature and intent of Otero County's land use planning is to protect the custom and culture of County citizens by protecting private property rights, facilitating a free market economy, and establishing a process to ensure self-determination at the County level by local communities and individuals. Otero County is located midway along New Mexico's southern border with Texas. The County comprises three incorporated municipalities; Alamogordo, Tularosa, and Cloudcroft. Alamogordo is both the largest community in the County and the County seat. (Otero County 2005)

Land Use: Otero County encompasses nearly 4.3 million acres, of which 11 percent are privately owned. A majority of the land (89 percent) is owned by the Department of Defense, the Bureau of Land Management, the US Forest Service, the Mescalero Apache Indian Tribe, and the State of New Mexico.

The interface between the County and Federal and State land managers is so important the County appointed a special committee (Public Land Use Advisory Committee) to deal with these issues. The County desires to guide decisions regarding the use of public lands and public resources in Otero County and to protect the rights of private landowners and the rights of all citizens with respect to the multiple uses of public lands. Based on its custom and culture, Otero County and its citizens support the continuous multiple use of Federal lands and all resources in Otero County. The County expects Federal agencies and any State agency, subject to the National Environmental Policy Act, will inform local governments of those pending actions affecting local communities and citizens economically, and coordinate and consult with them in the planning and implementation of these actions. (Otero County 2005)

Natural Resources: Otero County seeks to balance the sustainable use of its natural resources, both for products and recreation, while also conserving them for future generations. The County established the following three goals within its Comprehensive Plan in support of this vision. (Otero County 2005)

Goal One: Conserve and utilize our natural resources in a manner that will sustain them for use by future generations.

Goal Two: Protect the quality of the environment through good stewardship practices and through a balanced management approach to using natural resources.

Goal Three: Pursue policies to protect Otero County's natural resources.

County Soil and Water Conservation Plans

Otero Soil and Water Conservation District Land Use Plan

Upper Hondo Soil and Water Conservation District Land Use Policy Plan

The purpose of these Plans is to guide with respect to soil and water natural resource conservation and enhancement as needed and is intended to provide a framework for local, county, state, and federal agencies in land use planning that affect the resource universe in these Districts. Additionally, the Plans are meant to safeguard the historic, traditional, conceptual, and future conservation measures of these resources against all encroachments that may jeopardize their sanctity and beneficial use. These plans are designed to protect the production and safeguarding of agricultural products, to ensure sanctity of private rights, to allow and encourage expansion of resources supplies, and to defend the active engagement of public safety for District citizenry created by presence and absences of water supplies. (Upper Hondo 2015)

Other Federal Plans

McGregor Range Resource Management Plan Amendment

The Bureau of Land Management manages 606,233 acres of public land withdrawn from the public domain for military use on McGregor Range. McGregor Range encompasses a total of 694,981 acres of Federal land, which also includes 70,884 acres owned by the U.S. Department of Defense and 17,864 acres administered by the Forest Service. Military use on McGregor Range by the U.S. Department of the Army first occurred in 1948. McGregor Range is the principal training facility for air defense systems, a critical part of military operational readiness for national defense. It is bordered by the New Mexico-Texas state line along the southern boundary, Lincoln NF along the northern boundary, and U.S. Highway 54 along the western boundary. (USDI Bureau of Land Management 2006)

Key approved decisions include the following:

- Livestock grazing will continue on the 14 existing grazing units.
- Public access will be allowed on McGregor Range through issuance of permits. Public vehicular travel will be limited to designated roads and trails except for 3,718 acres that will be closed to motorized vehicle use.
- Watershed management plans will be developed for six areas warranting priority consideration for management. Two habitat management plans will be developed for a total of 205,109 acres in the Sacramento Mountains foothills adjacent to the Lincoln NF and on grasslands on Otero Mesa adjacent.
- Two linear corridors will be designated to accommodate future utilities and 171,948 acres will be identified as areas to be excluded from consideration for any type of right-of-way unless otherwise mandated by law.
- The 3,718-acre Black Granma Grassland ACEC will continue to be maintained, and 220 acres will be designated as the Escondido Site ACEC to protect cultural resources near the Lincoln NF.

White Sands Resource Area Resource Management Plan

The White Sands Resource Area encompasses nearly 7 million acres of south-central New Mexico and includes Otero and Sierra Counties. Population centers in or next to the planning area include the city of Alamogordo and the community of Truth and Consequences. (USDI Bureau of Land Management 1986)

The White Sands Resource Area Resource Plan was approved in September 1986. Land use plan decisions contained within the plan are expressed as goals and objectives (desired outcomes), allowable uses, and management actions anticipated to achieve desired outcomes. The decisions in the approved plan apply only to Bureau of Land Management-administered lands and subsurface (mineral) estate in the White Sands Resource Area. The Bureau of Land Management administers approximately 1.8 million surface acres and 3.6 million sub-surface acres in the Resource Area (USDI Bureau of Land Management 1986).

The Bureau of Land Management is currently in the process of revising the White Sands Resource Area Resource Management Plan (Tri-County Resource Area). The Resource Area bumps up to the Lincoln NF in multiple areas. Several activities fall within these adjoining areas including the protection of cultural sites, road improvements, areas of critical environmental concern, wildlife management areas, and vegetation treatments.

Fort Stanton-Snowy River Cave National Conservation Area

The 1997 Roswell Approved Resource Management Plan established the Fort Stanton Area of Critical Environmental Concern (ACEC), encompassing 24,630 acres of Bureau of Land Management public surface and 27,622 acres of federal mineral estate. One of the prominent features of the ACEC is Fort Stanton Cave, designated as a National Natural Landmark in 1975. The cave has been the site of numerous scientific explorations and in 2001 one such exploration resulted in the discovery of a new, undisturbed passageway. This passageway led to a floor formation of continuous snow-white calcite – the Snowy River Passage. A truly unique formation, the Snowy River Passage was the catalyst that brought about the designation of Fort Stanton-Snowy River Cave National Conservation Area through the Omnibus Public Land Management Act of Congress in 2009. This designation effectively transformed the Fort Stanton Area of Critical Environmental Concern, along with an additional 246 acres, into the National Conservation Area (USDI Bureau of Land Management 2011).

The National Conservation Area is surrounded by Forest Service-managed public lands, State lands and private property. The termination of Snowy River has yet to be discovered and several side passages remain unexplored. The indications are Snowy River will continue in a southwesterly direction; as of May, 2013 two passages have been mapped under lands managed by the Lincoln NF.

Roswell Resource Area Resource Management Plan

This Resource Management Plan addresses the management all uses of the public lands on about 1,490,000 acres in the Roswell Resource Area where both the surface and subsurface estates are in federal ownership and are administered by the Bureau of Land Management. This Plan also presents management for an additional 8.4 million acres of federal mineral estate where the surface is managed by other surface management agencies of the federal or New Mexico State governments, or is in private ownership. The Plan Area covers 364,579 acres of the Lincoln NF's mineral estate, of which, 265,408 acres are open to mineral leasing (USDI Bureau of Land Management 1997a).

Carlsbad Resource Area Resource Management Plan and Amendment

The Carlsbad Resource Management Plan contains the land use decisions for allocating resources and for guiding future management actions on public land administered by the Bureau of Land Management. The Carlsbad Resource Area comprises Eddy and Lea Counties, and part of Chaves County in southeastern New Mexico. The Guadalupe Escarpment Scenic Area, a 49,570 acre area, parallels the Guadalupe Escarpment on the Lincoln NF. It is a highly sensitive visual area because it is the immediate visual foreground as viewed from several key observation points along U.S. Highway 62/180. It is also a primary view shed from the designated wilderness of Carlsbad Caverns National Park and some Forest Service scenic areas. In addition, three Bureau of Land Management Wilderness Study Areas adjoin the Lincoln NF's Guadalupe Escarpment Wilderness Study Area in the southwest portion of the Resource Area (USDI Bureau of Land Management 1988).

The amendment replaces those decisions made in the Carlsbad Resource Management Plan relating to the management of oil and gas resources. The Bureau of Land Management's Carlsbad Resource Area includes management of oil and gas resources on approximately 2.197 million surface acres of public land and approximately 1.898 million acres of federal mineral estate. The Plan Area covers 175,345 acres of the Lincoln NF's mineral estate, of which, 149,063 acres are open to mineral leasing (USDI Bureau of Land Management 1997b).

Guadalupe Mountains General Management Plan

Guadalupe Mountains National Park, located in west Texas, contains 86,416 acres. Most of the surrounding land is privately owned, although some land to the northwest, north, and northeast is owned by the Forest Service and the Bureau of Land Management. The Lincoln NF in New Mexico shares more than 4 miles of boundary with the park. A designated Wilderness Study Area on the Lincoln NF is adjacent to the park boundary. Jurisdiction over the significant riparian and canyon resource of North McKittrick Canyon is shared by the Lincoln and the National Park Service. (USDI National Park Service 2012)

Other Land and Resource Plans Key Trends

As urban and rural populations continue to grow, the special use demand on the Lincoln NF is expected to increase. Additional need for infrastructure (power, communication, water, and transportation) needs will require additional facilities on national forest land.

Although some of the recommendations the Office of Inspector General report made were addressed by improving the ability of the special uses database to control integrity and accuracy, the remaining recommendations have not. Staffing levels of both qualified special use personnel and specialists required to review environmental analysis documents are in decline and not expected to recover. Budgets for both lands and special uses are also in decline and not expected to recover. There has been very little progress made in the retention of additional special use fees collected to cover costs of administration of the authorizations.

Because of the above issues, work backlogs are expected to increase and turnaround time on proposals will increase. In general, customer service will suffer.

Development on private lands continues to threaten public lands and resources through unauthorized and illegal occupation and use of the adjoining public lands. This may be the result of willful and knowing action, erroneous land survey, title flaws, deed and abstract errors, unrecorded deeds, adverse possession, reliance on estimate boundaries, erroneous fences, and failure to have a proper land survey made before improvements are made on adjoining lands.

When estimating the number of National Forest System acres encroached upon, one encroachment per mile has been consistent when surveying along developed private lands adjoining national forest land.

At present, there are over 26 known title claim, encroachment, and trespass cases on the Lincoln NF that are either active, inactive, or suspected. Very few cases are resolved every year, due to existing work load and reduced staffing. Cases range from quick resolution to more lengthy cases that can take years to reach conclusion through court proceedings. For every case resolved, new cases emerge. The current backlog may be estimated at 5 - 10 years.

One of the greatest trends currently affecting management of land ownership status and land uses and access patterns is the escalating housing development on private rural lands along national forest boundaries. As more people choose to live at the urban fringe and in scenic, rural areas, open space lands such as farms and ranches, including those adjacent to National Forest System lands, are being lost to development.

With the increase of development on adjacent private lands and inholdings, national forests face management challenges associated with control of property lines. Adjacent resources can and frequently are affected and include illegal garbage dumping, illegal access from private land to NFS trails, increased fire danger due to piling of material and more. Limited funding, resources, and workforce have not kept pace with increased development on adjacent private lands and the Forest Service estimates that control of property boundary lines for approximately 1 million acres of public land has been heavily compromised because of encroachment and trespass by adjoining landowners (Stein et al. 2007).

Developments occurring on inholdings can increase encroachment cases, which is not legal, but could transform publicly owned land into privately claimed land for uses such as pastures, garbage dumps, and personal storage sites. This increases the workload on lands staff to identify and report, and can limit management options on the adjacent Federal lands. To reduce the impacts to National Forest System land management caused by this development, there can be an increased desire to complete land adjustments. An active land adjustment program can reduce the complications of managing National Forest System land where it is co-mingled with private lands.

Summary of Other Resource Plans

It is clear that the Lincoln NF will need to both be involved with our partnering and adjacent communities and agencies as well as having them be part of our plans. Improved communication, sharing and partnering is the future trend to ensure both the best possible experience is provided to the public as well as managing the resources on the Lincoln NF. Adjacent uses should tier into Lincoln NF uses and avoid instances of motorized use being directly adjacent to non-motorized use as an example.

One such example was in the development of the Grindstone Lake mountain bike trail system which was a partnership between the Village of Ruidoso, local groups and the Lincoln NF. The result of addressing a recreational need of mountain bikes near Ruidoso was to create seamless network of trails that moved from non-USFS trails into and out of Lincoln NF trails.

Another example is that of the BLM's Areas of Critical Environmental Concern (ACEC) the lie adjacent to the west side of the Sacramento RD. Their ACECs do not meet minimal acreage criteria without considering the adjacent roadless areas directly east of them. If we were to change the status of these roadless areas, it would be problematic for the BLM. Coordination and communication is the key to providing the appropriate type of use throughout the area of influence.

Trends

- The need to partner, share and cooperate with adjacent communities and agencies is increasing
- Development on private lands continues to affect public lands and resources through unauthorized and illegal occupation and use of the adjoining public lands.
- Title claims, encroachments and trespasses cases continue to grow.
- Housing developments on private and rural lands are increasing
 - Management challenges associated with control of property lines.
 - Limited funding, resources, and workforce have not kept pace with increased development on adjacent private lands.

Access, Rights-of-Ways and Travel Patterns

This section describes transportation access to or through the plan area, including pedestrian access from properties next to the plan area.

There are 68,452 centerline miles of roadway across the State, of which 12,075 centerline miles are operated and maintained by the New Mexico Department of Transportation and comprise the State Highway System. Some of the New Mexico state highway system passes through lands managed by Federal agencies or owned by federally recognized tribes. These lands account for 16 percent of the land in New Mexico. Federal land agencies, including the Forest Service, the Bureau of Land Management, and others manage 34 percent of the land in New Mexico with over 10,810 miles of state roadway passing through these lands. Of that 10,810 miles, 330 travel lane miles of state roadway pass through the Lincoln NF. (USDOT Federal Highway Administration 2016)

Transportation Modes and Flow Patterns

The Lincoln NF is accessed primarily by roads stemming from U.S. Highways (U.S. 380, U.S. 70, U.S. 82), State Highways (Route 246, State Route 349, State Route 462, State Route 244, State Route 130, State Route 24, State Route 6563, State Route 134), County Roads, local City Roads, and arterial Forest Roads. Many popular recreation areas are accessed by National Forest System Roads and county roads. Non-

developed and dispersed recreation activities are accessed by either National Forest System roads or county roads. These roads are not only used by the public to access the Lincoln NF for recreational uses, but also for non-recreational uses, commercial uses, and Forest Service management activities. Peak travel times for most of the area of assessment occur between the months of May and September, though areas in the high country also experience significant winter traffic.

Regional Plans and Improvements

Access areas to the national forest that are controlled by States and counties are not expected to change over the next couple decades. For access controlled by the Forest Service, the Lincoln NF has implemented its Motorized Travel Management Decision. This entails completing mitigations, blocking unauthorized routes, monitoring the effectiveness of closures, and patrolling. As discussed in the “Infrastructure” chapter of this assessment, the Lincoln NF currently has a designated system of National Forest System roads, National Forest System trails and areas on National Forest System lands for motor vehicle use.

Access

Access to the Lincoln NF is primarily through US, State and County roads with Forest roads, along with county providing the majority of access to more rural areas within the Lincoln’s boundaries. A large portion of the Lincoln NF can be accessed directly from the open NFS roads and open closed roads, state and US highways were not considered since they usually have fenced easements and access to forest lands adjacent to these roads is difficult. Table 65 displays the results. By using these roads, anyone can access 30 percent of US Forest System lands within ¼ mile, 52 percent within ½ mile and finally 77 percent within one mile of these routes.

Table 65. Percentage of USFS Lands accessible by 1/4, 1/2 and 1 mile from open roads

	Total USFS	¼ Mile Acreage	¼ Mile %	½ Mile Acreage	½ Mile %	1 Mile Acreage	1 Mile %
Smokey Bear RD	360,911	98,684	27%	172,244	48%	259,590	72%
Sacramento RD	450,501	117,011	26%	211,877	47%	325,294	72%
Guadalupe RD	283,227	110,072	39%	188,911	67%	259,726	92%
Forest	1,094,639	325,731	30%	573,032	52%	844,610	77%

Reasonable access to private land is a right granted by the Alaska National Interest Lands Conservation Act (ANILCA 1980), which applies to other states besides Alaska. However, this right only applies to a private inholding (i.e. a parcel of private land completely surrounded by NFS land). It is incumbent upon the owner of the original patented tract of land (prior to its subdivision or parceling off) to provide access to the pieces of property which is or was originally broken off from it.

In essence, while the Forest Service may be required to allow access, this requirement is not unqualified. Within NFS boundaries, the Lincoln NF is legally obligated to allow physical access to private property that is identified as an inholding where other reasonable access does not exist. The Forest Service is not

required to physically construct an identified access route or to absorb the construction cost. The manner in which access is provided to a private inholding is a discretionary management decision, and is based upon the individual case circumstances. The Lincoln NF is not required to 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 is causing resource damage, an alternative means of access and location may be substituted and allowed instead. The Lincoln NF can also dictate the location of a new access route across its land. If a tract of land is already accessed, substituting the existing route for another route across NFS land is subjective and the decision to permit the new route is entirely up to the Forest Officers.

It is the responsibility of the owner of a particular property to obtain access from adjacent private lands. Once a private patented inholding property is accessed by a road, the entity subdividing a parent parcel is obligated to provide access to the new parcel, which is broken off from the original patent. It is not incumbent on the Forest Service to provide access to every ownership parcel because of convenience, or because an owner of a parcel does not desire to share his property for access to another adjacent parcel, or to avoid an environmentally difficult access route within the property. The Lincoln NF will work with owners of inholdings desiring access across NFS land where no access exists. Construction and maintenance of this access will be the responsibility of the owner. The route used and mode of travel will be determined by the Lincoln NF and will be in compliance with the laws of the designated land. This means that a constructed road may not be permitted where motor vehicle use is prohibited, but only trail access may be considered reasonable access.

Right-of-Way

The Lincoln NF currently has 206 access road and trail easements across private land. Access to the Lincoln NF from adjoining lands is generally good. The Lincoln NF has a 'checker board' style of non-US Forest Service lands within its boundaries and as such has a significant access need. There are a number of acquired Rights-of-Way (ROW) in place but a number more that could be acquired. Some roads may need a ROW on a permanent basis, some on a temporary basis and some perhaps not at all.

Table 66 shows the mileage and percentage of roads without ROW easements and is based upon the total mileage of the roads. It must be noted that for many of the roads in the table, only portions may require ROW easements. Other roads, such as closed roads, may not be desirable to acquire easements. More study and prioritization is needed to develop a strategy for the Lincoln NF to move forward with this, as it stands it is currently dealt with on a project or case need.

Of key concern are Operational Maintenance Level (OML) 3 roads (see infrastructure chapter for definitions) provide significant access in and out of the forest. As seen in Table 66, 66 percent of all OML 3 roads require a ROW easement. Historically, easements were granted with a simple hand shake agreement. When combined with increased housing developments potentially cutting off access to all or portions of these roads, this could be problematic and cause the loss of access to areas of the Lincoln NF.

Table 66. Mileage and Percentage of USFS Jurisdiction Roads Needing ROW Easement. Note: Percentages are based upon the mileage for each Operational Maintenance Level.

Operational Maintenance Level	Miles Of ROW Needed	Total Miles Of Roads	Percentage Without ROW
1 – Basic Custodial Care (Closed)	62	1,095	6%
2 – High Clearance Vehicles	219	925	24%
3 – Suitable for Passenger Cars	203	306	66%
4 – Moderate Degree of User Comfort	7	18	39%

In the areas where National Forest System lands are fragmented, legal access can be more difficult to obtain due to multiple land ownerships. Determining the need of access, and completing these acquisitions, requires substantial time and funding for a qualified lands specialist to complete. There is also a continuing need to acquire permanent or temporary access on a project-by-project basis. The time and process required to acquire sufficient legal and physical access is often times a challenge to meet project timelines. Figure 64 through Figure 66 show the distribution of the ROW needs for each Ranger District.

Due to the high number of inholdings within the Lincoln NF boundary and the amount of private land abutting the Lincoln, unauthorized use, trespass, and encroachment occurs along the boundaries. Trespass cases include equipment being stored, roads being created, and entire homes and other structures being built on National Forest System lands.

The Lincoln NF maintains two designated wilderness areas. Access to these areas is regulated to prevent damage to sensitive areas; however, due to the proximity to a highly populated tourist town environment, one of these areas is highly used seasonally making management of access challenging.

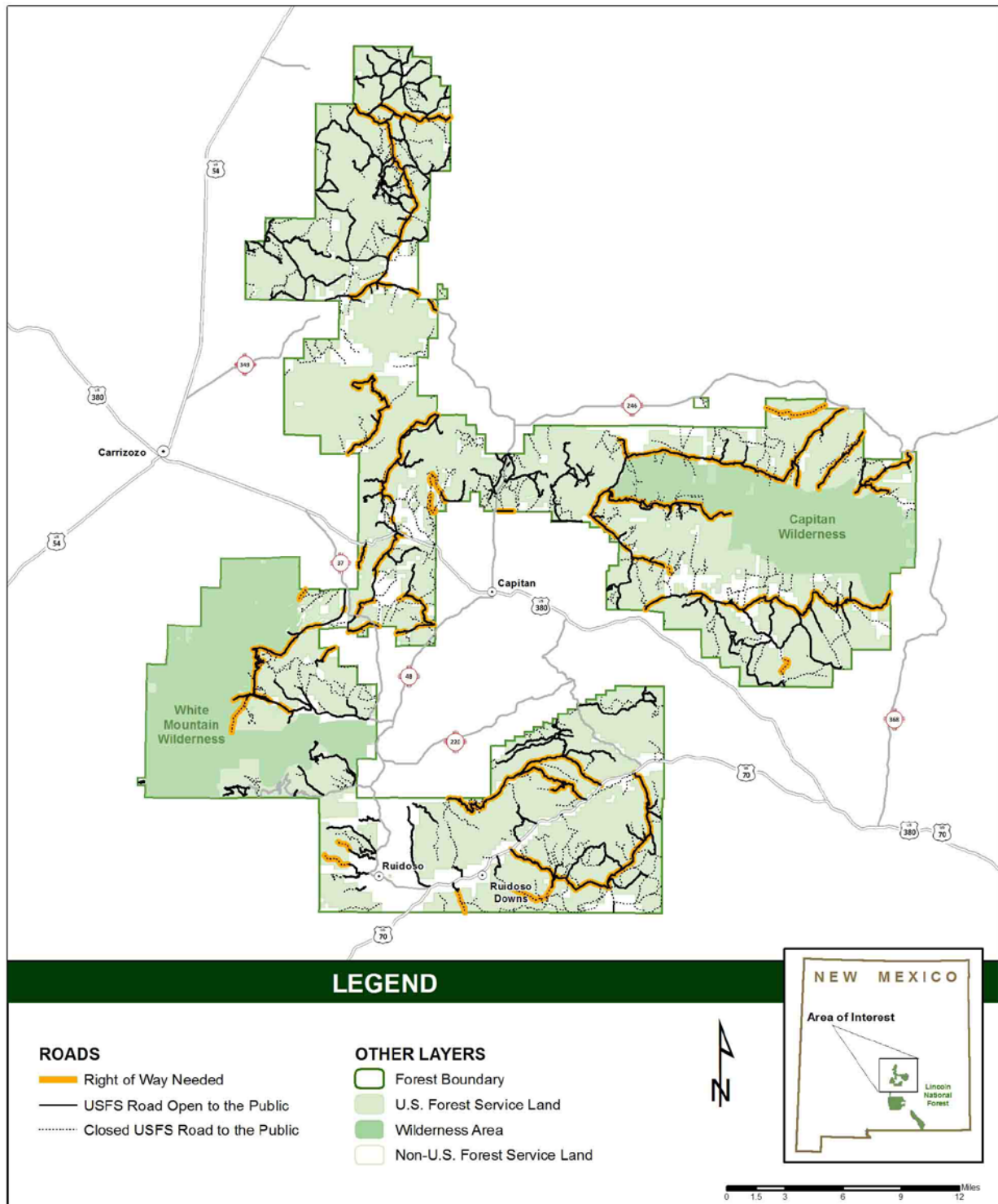


Figure 64. Roads without Right-of-Way Easements for the Smokey Bear RD

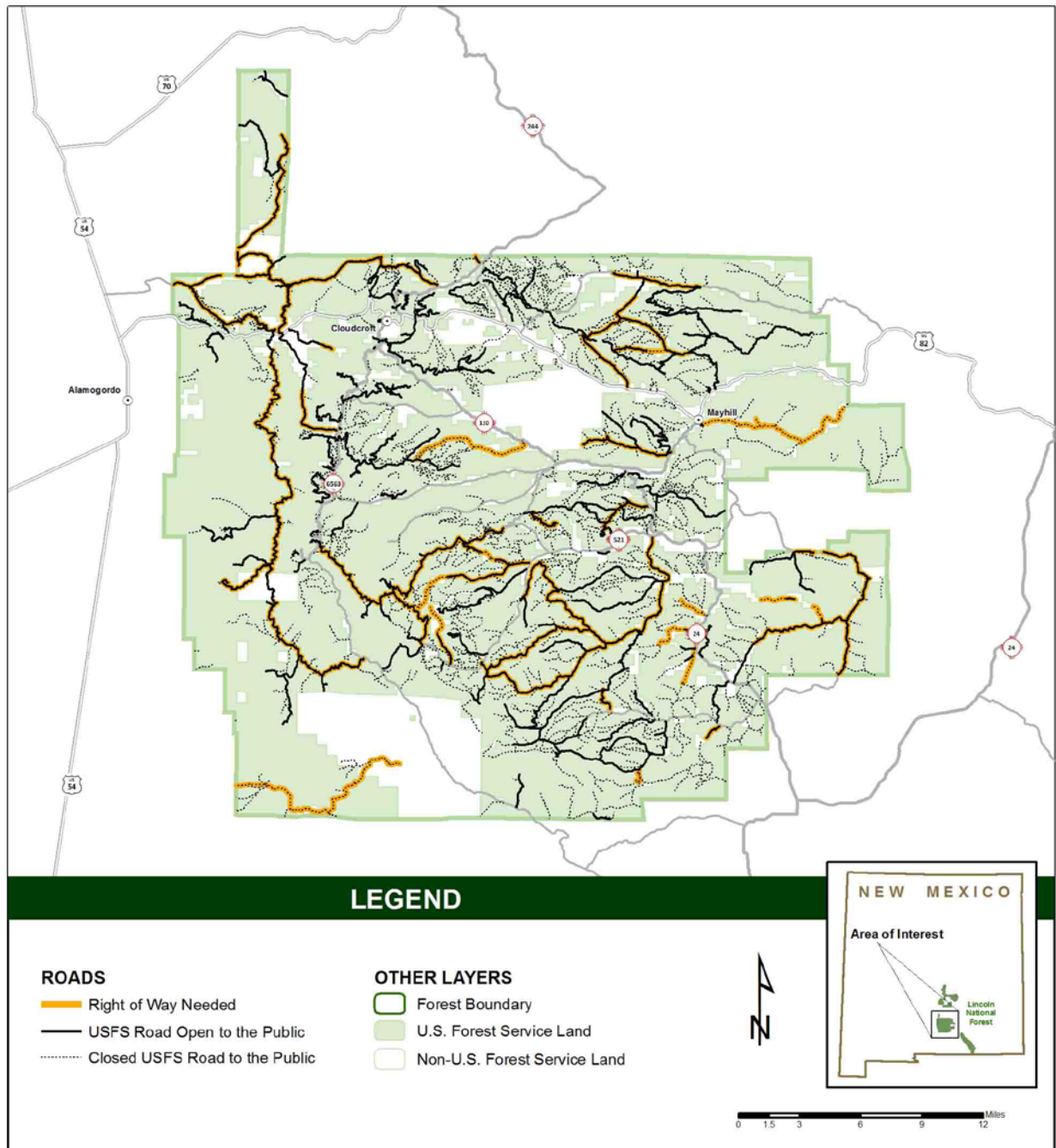


Figure 65. Roads without Right-of-Way Easements for the Sacramento RD



Figure 66. Roads without Right-of-Way Easement for the Guadalupe RD

Right-of-Way and Access Key Trends

The Lincoln NF's current trail system is trending towards being unsustainable with current and projected budgets. Maintenance has decreased as budgets decrease with some trails being maintained less frequently or at a lesser standard such as logging out a trail early in the season. This has increased deferred maintenance on system trails, which may lead to degradation of the trail, increased erosion and sedimentation, and increased negative experiences for users. As a consequence of decreased budgets and inability to maintain the trail system, the Lincoln staff is starting to rely more heavily on outside funding, partners and volunteers to manage and maintain the national forest trail system.

Trails not maintained to standard, non-system trails on the landscape, and unmanaged streamside camping may create environmental and cultural resource damage. A significant impact from development on adjoining private lands includes illegal private road building and user-created off-highway vehicle trails on National Forest System land, and as population and development continues to increase on these adjoining lands, such user-created trails will continue to increase.

Forest wide direction into the future is to acquire rights-of-way to provide access opportunities to National Forest System lands for public and administrative needs, as more use and development occurs near the national forest boundary. The Lincoln NF has very few trail access easements across the forest. Trends show access across private property via a trail will decrease eliminating public access to parts of the forest. As private lands change ownership or become subdivided more and more owners are choosing not to have designated public trails across their property.

Trends

- Loss of access due to Rights-of-Ways will increase in the future with possibly losing access to key roads.
- Right-of-Ways for Operational Maintenance Level 3 roads is lacking
- Future trail maintenance and reconstruction are highly dependent on budgets and partnerships with outside groups. In addition, authorized road access may decline as road maintenance funds decrease.
- The Lincoln's current trail system is trending towards being unsustainable with current and projected budgets. Maintenance has decreased as budgets decrease with some trails being maintained less frequently or at a lesser standard such as logging out a trail early in the season.
- Trails not maintained to standard, non-system trails on the landscape, and unmanaged streamside camping may create environmental and cultural resource damage
- The overall trend affecting the Lincoln NF transportation system is that budgets for repairs and maintenance are expected to continue to remain flat with fluctuations over time while national requirements and efforts for planning and maintenance continue to increase.

Stakeholder Input

Public comment and discussions have been ongoing in relation to forest plan revision since March of 2015 through presentations, meeting with working groups and many other venues. Between November 2015 and January 2016 the Lincoln NF conducted official public meetings to educate the public in our process as well as to hear what they had to say. As part of that effort, we conducted a survey to see what their issues or concerns were, asked about possible solutions to those issues and finally asked them to rate conditions of those issues to help us see what they saw the trend was. They were grouped into Areas of Interest (AOIs) based upon 15 AOI's for plan revision and then broken down into issues,

issues were then tallied for condition ratings. Following are extractions of these concerns/issues, recommendations, and conditions/trends.

Many of the comments received and compiled within land use are also associated with other chapter subjects such as travel management. Specific to land use are a number of comments on the problems between forest users and private land owner's properties. A number of trespass issues have occurred recently and seem to be on the rise. Another key issue is that of military use of Lincoln NF lands for training purposes. A number of stakeholders feel that the use is incompatible with the forest in general.

Concerns/Issues:

Transportation and Recreation

- Too much motor vehicle use and associated development on the Forest
- Increase in hunting trespasses from Lincoln NF onto private land

Management, Process, Coordination

- No respect for private landowner rights

Military Uses

- Limited high altitude landing zones and helispots for military use
- Military training (e.g., Fort Bliss HAMETS) does not always address potential fire danger and firefighting operational needs
- Military use (e.g., DOD) encroach on the Forest, including uses that are not compatible with the Forest environment
- Impacts to resources and forest users due to military operations on other forests where they have been authorized (e.g., Cibola NF)
- Inadequate agreements in place for military sites on the Lincoln NF
- Agency has failed to consider impacts from military use of airspace above National Forest System lands

Management Suggestions:

Transportation and Recreation

- Improve interagency communication and coordination with the military related to air space use and landing zones
- Lease Lincoln NF lands for commercial development and use including campground facilities
- Partner with communities and cities (e.g., Alamogordo) to restore and manage recreation areas and campgrounds (e.g., Bonito Lake)
- Consider land exchanges with communities and cities (e.g., Alamogordo) to improve management and recreation opportunities (e.g., Bonito Lake)

Military Uses

- Seek out mutual support missions with military and identification of high altitude landing zones and helispots.
- Prohibit or limit military operations and sites.
- Strengthen restrictions including speed and noise requirements for military use of air space and areas on the Forest.

- Require military operations (e.g., HAMETS) to address fire risk in the event of crashes, fuel spillage, and evacuation.
- Work with partners (e.g., BLM, White Sands Missile Range, Tribes) where adjacent lands occur to ensure management consistency and effectiveness.
- Improve communications with military partners (e.g., White Sands, Fort Bliss, and Holloman) and support air space use.
- Consider the Army Compatible Use Buffer Program and similar areas in the plan revision.
- Identify plan direction that will avoid impacts (ecological and socioeconomic) associated with military use of air space and ground sites.
- Identify plan direction that addresses issue of special use permits for military training, missions, and operations.

Management, Process, Coordination

- Sell or trade USFS lands adjacent to or connected to private lands to improve management of invasive weeds and fire.
- Consider land exchanges with communities and cities (e.g., Alamogordo) to improve management and recreation opportunities (e.g., Bonito Lake).
- Work with partners (e.g., BLM, White Sands Missile Range, Tribes) where adjacent lands occur to ensure management consistency and effectiveness.
- Establish an agreement with landowners to permit treating adjacent Lincoln NF lands to mitigate fire risk.

Conditions/Trends

A total of 23 comments were gathered with no consistent issue dominating the topics. Issues, in many instances, overlapped between Areas of Interest (AOIs) such as Forest Health which is not directly part of the Land Use chapter. Portions of their comments were associated with Land Use and thus were included in the results. General, which is basically a miscellaneous category, has the most comments of 7 is slightly trending upwards along with wildlife and permits. The remaining range from only 1 to 3 comments per issue and trend at getting worse.

Summary of Findings for Land Ownership, Status, Use, and Access

Conditions and trends are key to move into the next phase of our plan revision process because it tells us what may need to change and what may be working fine under current management direction. Conditions and trends have been discussed in detail within this chapter along with any trends that follow. In the overall trends section following are bulleted quick references to these trends. For further detail, please refer to the chapter sections for these subjects.

Overall Trends

- Special use demand on the Lincoln NF is expected to increase.
- Infrastructure (power, communication, water, and transportation) needs will require additional facilities on national forest land.
- Staffing levels of both qualified special use personnel and specialists required to review environmental analysis documents are in decline and not expected to recover.
- Budgets for both lands and special uses are also in decline and not expected to rise.
- Right-of-Ways for Operational Maintenance Level 3 roads is lacking
- The need to partner, share and cooperate with adjacent communities and agencies is increasing

- Development on private lands continues to affect public lands and resources through unauthorized and illegal occupation and use of the adjoining public lands.
- Title claims, encroachments and trespasses cases continue to grow.
- Housing developments on private and rural lands are increasing
 - Management challenges associated with control of property lines.
 - Limited funding, resources, and workforce have not kept pace with increased development on adjacent private lands.
- Future trail maintenance and reconstruction are highly dependent on budgets and partnerships with outside groups. In addition, authorized road access may decline as road maintenance funds decrease.
- The Lincoln's current trail system is trending towards being unsustainable with current and projected budgets. Maintenance has decreased as budgets decrease with some trails being maintained less frequently or at a lesser standard such as logging out a trail early in the season.
- Trails not maintained to standard, non-system trails on the landscape, and unmanaged streamside camping may create environmental and cultural resource damage
- The overall trend affecting the Lincoln NF transportation system is that budgets for repairs and maintenance are expected to continue to remain flat with fluctuations over time while national requirements and efforts for planning and maintenance continue to increase.
- Loss of access due to Rights-of-Ways will increase in the future with possibly losing access to key roads.

CHAPTER 10 - Energy Resources, Mineral Resources, and Geologic Hazards

Introduction

This assessment identifies relevant information concerning mineral resources that have historically been developed within the planning area, as well as the potential availability of mineral resources for current and future exploration and development. Included in the assessment are:

1. The potential for renewable energy sources such as wind, solar, geothermal, and hydroelectric power within the planning area;
2. The presence and potential for nonrenewable mineral resources which include locatable mineral deposits, leasable mineral resources, and mineral materials;
3. Information regarding existing and proposed energy transmission corridors; and trends that affect energy and mineral activity.

Energy resource information will be addressed both state and Forestwide due to the large-scale utility application for these resources and will be organized by renewable source type.

Mineral information will be specific to each commodity type and mining district where key minerals occur. The relevant information regarding mineral occurrence, current activity, potential activity, and trends specific to that known mineralization is delineated by ranger district then mining district.

Administration of federal minerals, including energy resources, is subdivided into three categories: locatable minerals, leasable minerals, and mineral materials. Each of these is administered under separate laws and regulations.

Mineral Classifications

Locatable minerals are, in general, hardrock minerals mined and processed for metals; for example, gold, silver, copper, etc. Uranium and rare earth elements (REE) are also locatable minerals. These minerals are classified as locatable since they are subject to mining claim location under the United States mining laws. All public domain lands are open to entry and location for the purposes of mineral prospecting, and potentially exploration and development, unless otherwise withdrawn from mineral entry. Withdrawn lands include congressionally withdrawn areas such as wilderness, lands with special designation such as national parks and national monuments, and administrative withdrawals such as recreation areas and campgrounds.

Leasable minerals, are, in general, nonrenewable energy resources defined by the Mineral Leasing Act of 1920. They are subdivided into solid minerals and fluid minerals. Solid minerals include coal, sodium, phosphate, potassium, sulfur, oil shale, and gilsonite. Fluid minerals include oil, natural gas, and geothermal resources. Locatable minerals found on acquired lands are also considered leasable. Leasing of these minerals on acquired lands is administered by the Department of Interior's Bureau of Land Management. Forest Service authority for leasable minerals lies with managing the surface-disturbing activities related to development of the lease.

Mineral Materials/Salable/Common Variety Minerals are a class of minerals that can be sold under a mineral material contract and occur commonly in nature. These minerals include sand, gravel, cinders, landscape stone, decorative stone, building stone, and flagstone. These types of minerals are either sold by weight or volume through an appraised value sales contract or may be provided, free of charge, through a free use permit to other government or nonprofit entities. Many of the materials issued for free use are used in road surfacing and maintenance. Issuance of a mineral materials sales contract or free use permit is discretionary.

The discretion of the Forest Service to allow mining operations is governed by the United States mining laws, which includes the 1872 Mining Law and supporting case law. In *United States versus Weiss*, 642 F.2d 296 (9th Cir. 1981), it was ruled that the Forest Service cannot categorically deny an otherwise reasonable plan of operation for locatable minerals. The Forest Service does have the authority to deny an unreasonable plan of operations or a plan otherwise prohibited by law. In such cases, the Forest Service would return the plan to the claimant and request submission of a new plan.

Discretion to allow or deny surface use in the development of energy leasable minerals lies in regulations that require a leasing analysis to determine the suitability of lands nominated for lease. The geologic conditions within the planning area are not favorable for leasable minerals, since those types of minerals occur typically in sedimentary strata rather than igneous and metamorphic rock types, which predominantly make up the planning area.

Current Extent of Energy and Energy Facilities

Renewable Resources

Renewable energy are resources that are naturally replenishing but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy may include wind, hydropower, solar, biomass, and geothermal resources. (USDOE Energy Information Administration 2016a)

Solar and Wind

The U.S. Department of Energy and the National Renewable Energy Laboratory (NREL) have published wind and solar resource maps for New Mexico, depicting wind resources for potential future industry development. NREL identified the Lincoln NF as a National Forest Unit with a high potential for the development of two or more solar and wind energy sources. Potential for wind energy is highest on the Guadalupe Ranger District and fair-to-moderate on the rest of the forest (USDOE National Renewable Energy Laboratory 2005).

Potential for solar power and wind development in all four counties and on the Lincoln NF is moderate to high, which shows a trend to potential future development.

Drivers, Stressors, Trends

At this time there is not any development of solar or wind energy on the Lincoln NF but there has been significant development in areas adjacent to the Forest since 1986. The New Mexico Renewable Portfolio Standard attracted industry to the region by offering incentives for companies to invest in the technology. As of 2016, there is a utility-scale solar plant in all four counties generating a total of 29.9 megawatts of power. Two more facilities are permitted for development in the near future and two are pending approval. The Anderson Wind Project, in Chaves County, is currently operating with a capacity of 15.0 megawatts (Gaiser 2016).

The Bureau of Land Management (BLM) manages land throughout the four counties and borders the Lincoln NF on the Guadalupe Ranger District and is managed by the Carlsbad BLM. In 2005, the BLM implemented a comprehensive Wind Energy Development Program, which established policies and best management practices for the administration of wind energy development activities and identified specific areas where development was restricted. The BLM's Carlsbad Land Use Plan contains restrictions placed on wind energy development. These restrictions include areas that are critical habitat for sensitive, threatened/endangered species; viewshed of the Carlsbad Caverns National Park; cave/karst areas, and those areas that are within the Guadalupe National Backcountry Byway and the Guadalupe Escarpment Scenic Area.

The Lincoln NF will work with local, county and state agencies to continue to identify areas that may contribute to the sustainable development and use of energy resources. In addition, the Lincoln NF will ensure solar and wind energy developments are consistent with our management decisions and objectives, including critical habitat concerns and visual quality management ratings.

Hydroelectric and Geothermal

There are currently no hydroelectric or geothermal facilities on the Lincoln NF or within the four county area of interest with none predicted in the near future. Potential for hydroelectric development within the plan area is extremely low due to the lack of water resources on the Forest. Potential for geothermal development on the Forest is unknown at this time due to lack of exploration.

Drivers, Stressors, Trends

Water resources within the plan area are unlikely to increase where hydroelectric development could be possible.

New Mexico currently utilizes low and intermediate temperature geothermal resources for aquaculture, greenhouses, recreation, district heating and space heating. According to the industry, the expense for new exploration drilling coupled with a lack of demand for the resource has been a limiting factor for development in New Mexico. Another challenge is that many of the geothermal resources are “blind” systems without apparent surface manifestations. (Fleischmann 2006) Within the assessment area, Otero County has the most potential for geothermal development followed by Lincoln County.

Biomass

There are currently no biomass facilities on the Lincoln NF. Since 1986, interest has grown and technology has improved related to developing this renewable resource as part of removing timber off the forest. In the past ten years, Otero and Lincoln Counties have investigated the feasibility of woody biomass facilities but as of 2016, there are still no active projects.

Forest Potential

Small diameter wood products produced by the Lincoln NF could potentially have great social value by creating another local economy while meeting and enhancing restoration efforts. The Lincoln NF currently has a strong local infrastructure that is vital to meeting the needs of these potential markets. Potential markets may include biochar and pellets products. See the [Multiple Uses chapter](#) for more information.

Drivers, Stressors, Trends

In 2008, the Agency published the Woody Biomass Utilization Strategy to aid forests in meeting sustainable woody biomass utilization. The strategy describes how Forest Service programs can better

coordinate to improve the use of woody biomass in tandem with forest management activities on both Federal and private lands. Sustainable woody biomass utilization restores resilience and productivity, slows the pace of global climate change, reduces U.S. fossil fuel dependence, and creates economic opportunities. In many forests, this requires the removal of large quantities of small-diameter and low-quality wood that currently has little or no commercial value. Because this material has little commercial value in today's markets, removing it requires large expenditures with little or no economic return thus, far fewer acres are being treated than needed (USDA Forest Service 2008).

This renewable resource will continue to grow as it becomes economically feasible, technologies improve, markets and uses become available, and sufficient resource supplies are secured. The Lincoln NF, in combination with other sources, has great potential to supply woody biomass for local industries.

Nonrenewable Mineral Resources

Locatable Mineral Resources

The Lincoln National Forest has a long history of mining. The following sections describe the mineral activity of each ranger district and the potential for future activity. Figure 67 shows the locations of non-renewable mineral resources on the Lincoln NF.

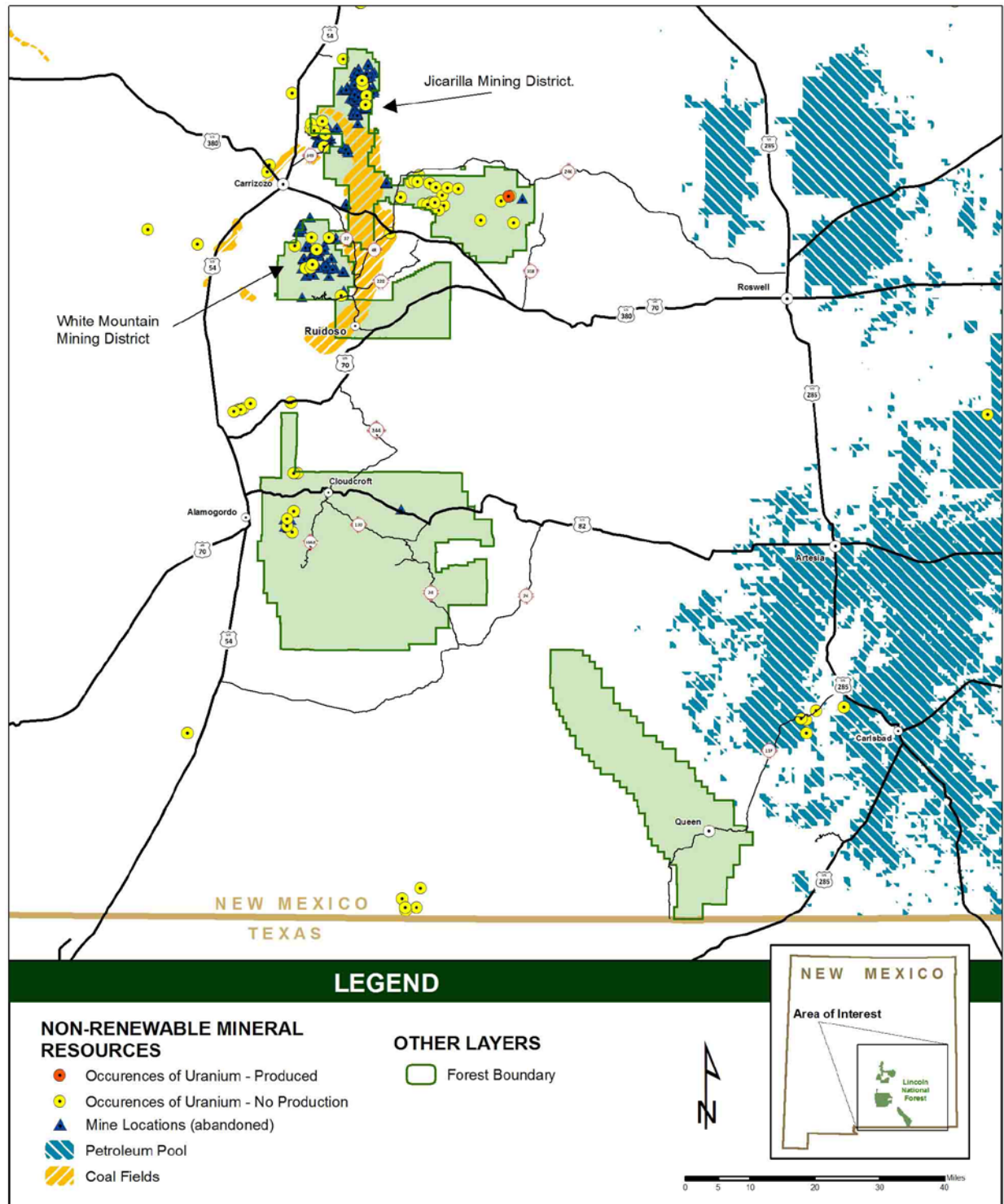


Figure 67. Non-renewable mineral resources on the Lincoln NF

Smokey Bear Ranger District

Current Type, Extent, and General Location of Mineral Activity

There were selected areas within the Smokey Bear Ranger District that were historically mined, including in the White Oaks, Nogal, and Gallinas Districts, which produced significant amounts of precious and heavy metals (i.e., gold, silver, lead and copper) in the early 1900s. Lesser districts such as Oscuro, Jicarilla, and Schelerville produced metals intermittently in the late 1800s to early 1900s. World War II caused a revival of mining for a limited time in these districts but economic conditions limited production following the war. The known deposits of the area do not favor economic exploitation and the sporadic production and irregular prospecting history likely preclude the development of major mines in the area. Mineral activity now consists of individual prospecting by claimants, primarily in the Jicarilla district.

Copper and lead mining contributed to the economy have historically occurred on near the High Rolls area on the Sacramento Ranger District. This largely occurred from 1900 through 1945 and has declined since World War II. There are currently no active mines on the Sacramento or Guadalupe Ranger Districts.

Potential for Mineral Activity, Trends

Future development would depend upon the variances of base and precious metals markets, with iron and fluorite deposits being the potential exceptions. Large areas have been withdrawn from mineral entry by the establishment of the White Mountain and Capitan Mountains Wildernesses. At present, the Smokey Bear Ranger District has one authorized Plan of Operation for access across a National Forest System road to an iron mine on private lands.

Leasable Mineral Resources

Leasable minerals are subdivided into two classes: fluid and solid. The most common fluid leasable minerals include oil and gas resources, geothermal resources, oil shale, and tar sands. Solid leasable minerals include coal, sodium, potassium, and phosphate.

As of 2016, there are no oil or gas leases within the plan area and there are no leases for solid resources, including on acquired land.

Smokey Bear Ranger District

Coal mining was once a prosperous industry in Lincoln County, NM, being mined in the White Oaks area and with extensive coal deposits found near Capitan, NM in the late 1800s. From the late 1800s to the early 1900s Lincoln County was the third-ranking producer of coal in New Mexico. Coal beds were found to be interrupted by numerous faults and dikes, making them difficult to mine and that led to closing of the majority of the coal mines in the early 1900s. The White Oaks District continued to produce coal for local use, including generating electric power for the town of Carrizozo, NM until 1939. It is unlikely any future coal mining will occur due to economic costs and value of the resource.

Sacramento Ranger District

There currently are no leases for fluid or solid leaseable minerals of the Sacramento Ranger District and the potential for future leases is unlikely, as there are presently no known deposits.

Guadalupe Ranger District

Although there is oil and gas exploration adjacent to the Guadalupe Ranger District, there are no known economically recoverable oil and gas deposits below lands managed by the Lincoln NF.

Saleable Mineral Resources

Mineral materials, such as sand, gravel, and other common variety materials, fall under the category of “saleable” mineral resources. Forest Service policy is to make mineral materials on National Forest lands available to the public and to local, State, and Federal government agencies where reasonable mitigation of effects on other resources is assured and where disposal of these commodities is allowed by forest plans. In general, mineral materials are disposed through a sales contract, personal use permit, or a free use permit. Unlike locatable minerals, disposal of mineral materials on National Forest System lands is discretionary.

Smokey Bear Ranger District

Interest from the public regarding mineral material sales contracts on the Smokey Bear Ranger District is limited to small personal use permits issued for minimal tonnage, generally less than ½ ton or what could fit in a pickup bed. Although the reasons for the lack of interest in larger volumes of material disposal is unknown, speculation points to the abundance of these types of minerals found on adjacent Federal and State lands where topography is more conducive to larger scale developments and located in more accessible areas.

Sacramento Ranger District

There is one active commercial salable minerals pit on the Lincoln NF and it is located on the Sacramento Ranger District. The Apache Pit gravel site covers approximately 18 acres and has operated for more than 20 years. In 2011, a pit expansion plan was developed for future use based on the available material (approximately 1.5 million cubic yards) for an estimated 30 years of additional operation (USDA Forest Service 2011b).

This commercial pit is easily accessible and provides a commodity that is beneficial to the local economy. This allows the operator to keep costs down by reducing the distance it takes to transport the material from pit site to destination site. It is anticipated that this pit will remain open for the additional operating period, but that no new mineral material pits will be opened. This is based on the location of the current pit and the ability of the operator to provide materials at a lower cost than operators from lower elevations.

Guadalupe Ranger District

Interest from the public regarding mineral material sales contracts on the Guadalupe Ranger District is limited to small personal use permits issued for 8 tons but actual collection is for minimal tonnage, generally less than ½ ton or what could fit in a pickup bed. The reasons for the lack of interest in larger volumes of material is the abundance of these types of minerals found on adjacent Federal and State lands where topography is more conducive to larger scale developments and located in more accessible areas.

Non-Commercial Mineral Collection Activity

The Lincoln NF has multiple non-commercial mineral collecting activities. They are as follows: Panning for gold in most streambeds is allowed on the Lincoln NF. To protect surface resources such as scenic values, riparian vegetation and recreational opportunities, the use of hand tools is recommended

and work must remain in the streambed. If there is no likelihood of significant surface disturbance then notice is not required.

Metal detecting, recreational prospecting, and geocaching are allowed, without permits, unless they are a commercial (business) venture. Commercial activities require a permit. Reclamation is required of all activities and should leave the area in the condition it was found.

Insignificant amounts of rock collecting does not require a permit or fee collected from the Lincoln NF as long as the specimens are for personal use, non-commercial gain, and significant surface disturbance does not occur. In addition, no mechanical equipment may be used and any collection must not conflict with existing mineral permits, leases, claims or sales. The collection and removal of quartz crystals from the White Mountain Wilderness area of the Lincoln NF is strictly prohibited. A closure order is in effect for this activity (USDA Forest Service Southwest Region).

Drivers, Stressors, Trends

Non-commercial mineral collection on the Forest are low use activities overall compared to other recreational activities like hunting, camping, and trail use. If these activities were to increase significantly they could potentially impact animal and plant species, other recreational activities, cultural resources, workload, budgets, and sensitive habitats.

Transmission Corridors

Current Condition

There are numerous sub-transmission, distribution, and unground transmission lines across the Lincoln NF serving local communities and neighboring counties. There are currently no high voltage transmission lines (greater than 229 kilovolts) crossing the Forest. Within Lincoln County, the SunZia Southwest Transmission Line, two 500 kilovolt overhead parallel lines and substations serve southwest New Mexico and southern Arizona. Another major transmission line, a 345 kilovolt line, crosses Otero, Chavez, and Eddy Counties serving western Texas and southern New Mexico.

Forest Potential

Since the 1986 Lincoln NF Plan there has been a push towards renewable energy development on public lands. The State of New Mexico requires investor-owned electric utilities and rural electric cooperatives to acquire percentages of power from renewable energy sources. Additional development of renewable energy risks maxing out existing transmission corridors and any additional development in the next twenty years might prompt a need for new transmission lines over Forest Service lands.

Drivers, Stressors, Trends

Transmission corridors will continue to be built or improved as the need to serve growing populations remains. Major corridors will continue to be linked throughout the nation to provide more stable delivery systems, to accommodate shifts in energy production, and to maximize energy usage.

The United States has three transmission interconnection systems serving the nation: the Eastern Interconnect, the Western Interconnect, and the Texas Interconnect. For the most part, these interconnections operate separately. New Mexico happens to “straddle” both the Eastern and Western Interconnects affording it the opportunity to export power both eastward and westward. The state is

also adjacent to Texas Interconnect. Thus far, the majority of the focus on exporting New Mexico's renewable energy out-of-state has been on western markets like Phoenix, San Diego and Los Angeles. However, there are significant opportunities to export power to eastern markets particularly as more and more states adopt renewable portfolio standards. (Governor's Task Force 2010)

In addition to transmission interconnection systems and a push towards renewable energy development, new technological discoveries and needs are continually being brought forth. One such need is the ability to store energy. Developing technology to store electrical energy so it can be available to meet demand whenever needed would represent a major breakthrough in electricity distribution. Helping to try and meet this goal, electricity storage devices can manage the amount of power required to supply customers at times when need is greatest, which is during peak load. These devices can also help make renewable energy, whose power output cannot be controlled by grid operators, smooth, and dispatchable. (USDOE Office of Electricity Delivery & Energy Reliability 2016).

Energy storage and other new discoveries like this may directly impact the Lincoln NF in the coming years.

Socioeconomic Contributions of Energy and Mineral Resources

Energy and mineral production provide the raw materials necessary to sustain the quality of life we all enjoy. Along with the direct benefit of usable minerals or energy resources for homes, businesses and transportation, these resources provide economic and social benefits through jobs and taxes, and the cultural service of educational and research experience. Limited resource extraction of the Forest means the contributions, at present, are limited. Fluctuations in market prices may lead to increased interest, exploration, and development in Forest energy and mineral resources in the future.

Abandoned Mine Lands and Geologic Hazards

The main geologic hazards of the Lincoln NF are flash flooding, rock falls and debris flows. All of these to an extent have affected roads, trails, recreation areas, and their infrastructure. Recreation residences on the Smokey Bear Ranger District have been impacted by flash flooding and debris flows.

The earliest mining in this area probably was done by the Spaniards, but there is little information on these early operations. Widely unregulated, production from mines throughout the Lincoln NF yielded a variety of metals and minerals with booms in the late 1800s and again during World War II. The decline of mining since in mid-19th century has left behind hundreds of abandoned mines, many on National Forest System lands.

An abandoned mine (and related features, facilities, and equipment) is:

- A mine on or off affecting public lands;
- Where all activities have ceased with:
 - no evidence that the mine operator or any identified successor claimant, operator, or other third party has the authorization to resume any of those activities.

The Southwestern Region and the Lincoln NF have an active abandoned mine land (AML) program with the program priorities being closing AML sites near trails, campgrounds, roads, and any other populated areas. Over the past 20 years, about 50 abandoned mine features on the Lincoln NF have been addressed, including mines currently being closed in the Smokey Bear Abandoned Mine Lands (AML)

project. These mines have been remediated through Forest Service AML and Environmental Compliance and Protection and Comprehensive Environmental Response, Compensation, and Liability Act Program contracts, and a New Mexico Energy, Minerals & Natural Resources Department project. The most hazardous abandoned mine features that are known have been targeted and remediated, including most of the sites located near trails, towns and frequently-visited areas. Accurately estimating the number of abandoned mines on the Forest that still need to be remediated is difficult. The inventory data was accumulated from a number of sources including the former Bureau of Mines, U.S. Geological Survey, and State of New Mexico reports. It includes sites on federal, state and private lands. The types of mines listed range from extensive underground lode mines, to shallow prospect pits, placer mines, sand and gravel quarries, and undeveloped mining claim groups. Thus, many of the sites listed are not hazardous. The Regional Abandoned Mine Lands Program estimates as many as 10 to 20 more abandoned mine features within the Lincoln NF may require remediation.

Stakeholder Input

Throughout the assessment period, 2015-2016, there have been numerous public meetings, presentations, emails and more about the Forest Plan Revision Process. No comments, concerns, or issues were brought forth concerning energy and minerals.

Issues/Comments

- Increase in illegal (non-permitted) use and harvest of forest resources (wood, minerals, etc.)

Management Suggestions

- Implement more restrictions to protect forest resources
- Provide for and implement photovoltaic solar energy technologies across the forest where electricity is needed

Conditions/Trends

Within the official survey period of November 2015 through January 2016 there were no issues received regarding energy and minerals

Summary of Findings for Energy and Minerals

Conditions and trends are key to move into the next phase of our plan revision process because it tells us what may need to change and what may be working fine under current management direction. Conditions and trends have been discussed in detail within this chapter along with any trends that follow. In the overall trends section following are bulleted quick references to these trends. For further detail, please refer to the chapter sections for these subjects.

Overall Trends

- Development of wind energy could be a future trend
- Development of solar energy could be a future trend
- Need for more powerlines as populations increase

References

- Alamogordo Daily News, Alamogordo, New Mexico. 2009. Affidavit of Publication: Lincoln National Forest Travel Management Rule Public Notice.
- Amick, D. S. 1994. Folsom Diet Breadth and Land Use in the American Southwest. Unpublished Ph.D. dissertation. University of New Mexico, Albuquerque.
- Anschuetz, K.F. 2012. The Pueblo of Acoma Ethnographic Study and Traditional Cultural Properties Consultation for the Proposed Roca Honda Uranium Mine at the Foot of Kaweshtima Kuutyu in the San Mateo Valley, New Mexico. Report on File, Lincoln National Forest and Grasslands.
- Archaeological Excavations at Two Prehistoric Campsites near Keystone Dam, El Paso, Texas. 1985. Cultural Resource Management Division Report 577. New Mexico State University, Las Cruces.
- Archaeological Survey in the Southern Tularosa Basin of New Mexico. 1986a. Historic and Natural Resources Report No. 3. Environmental Management Office Directorate of Engineering and Housing, United States Army Air Defense Artillery Center, Fort Bliss, Texas. Publications in Anthropology No. 10. El Paso Centennial Museum, The University of Texas at El Paso
- Archeological Investigations in the North Hills Subdivision, Northeast El Paso, Texas. 1990. Batcho and Kauffman Associates Cultural Resources Report No. 100. Las Cruces, New Mexico.
- Archeology of the Sierra Blanca region of southeastern New Mexico. 1984. Anthropological Papers, Museum of Anthropology, University of Michigan 74. Ann Arbor.
- Architecture and Social Integration in Jornada Mogollon Pueblos. 2005b. Paper presented at the 14th Biennial Jornada Mogollon Conference, El Paso Museum of Archaeology, El Paso.
- Ball, M.W. 2000. Mountain Spirits: Embodying the Sacred in Mescalero Apache Tradition. Unpublished Ph.D. dissertation. University of California at Santa Barbara, Santa Barbara.
- Ball, Martin. 2000. Sacred Mountains, Religious Paradigms, and Identity Among the Mescalero Apache. *Worldviews: Global Religions, Culture & Ecology* 4(3): 264-282.
- Baranick, M., McElwee, D., & Zazycki, M. (2011). Biochar Feasibility Study.
- Basehart, H. W. 1967. The Resource Holding Corporation Among the Mescalero Apache. *Southwest Journal of Anthropology* 23(3):277-291.
- Basso, Keith. 1996. *Wisdom sits in places*. University of New Mexico Press, Albuquerque.
- Bernardini, W. 1998. Conflict, Migration, and the Social Environment: Interpreting Architectural Change in Early and Late Pueblo IV Aggregations. In *Migration and Reorganization: The Pueblo IV Period*

-
- in the American Southwest, Spielmann, K.A. ed., pp. 91-114. Arizona State University Anthropological Research Papers 51, Tempe.
- Bodine, M. W., Jr. 1956. Geology of the Capitan coal field, Lincoln County, New Mexico: New Mexico Bureau of Mines and Mineral Resources, Circular 35, 27 pp.
- Boldurian A T and J L Cotter 1999. Clovis Revisited: New Perspectives on Paleo-Indian Adaptations from Blackwater Draw, New Mexico. University Museum Monograph 103.
- Bradley, R. J. 1983. La Cabrana: A Study of Fourteenth Century Resource Utilization in Southern New Mexico. Unpublished M. A. thesis, Department of Sociology and Anthropology, The University of Texas at El Paso, El Paso.
- Browning, C. B., V. Gibbs, R. Phippen, R. Giese, and T. Church 1998. New Target Complex Cultural Resource Survey Fort Bliss, McGregor Range Otero County, New Mexico. Science Applications International Corporation, Boise, Idaho.
- Carmichael, D. L. 1983. Archaeological settlement Patterns in the Southern Tularosa Basin: alternative models of prehistoric adaptation. Ph.D. dissertation, University of Illinois.
- Chaves County. 2015. Chaves County Comprehensive Plan. 1, 10, 17, 18, 35 pp.
- Chronometric and Relative Chronology Project, Sections I-IV. 1996. Anthropology Research Center and Department of Sociology and Anthropology Archaeological Technical Report No. 5. University of Texas at El Paso, El Paso.
- City of Alamogordo. 2003. Alamogordo Comprehensive Plan 2000. 21, 22, 25-33, 35, 37, 49 pp.
- Colwell-Chanthaphonh, C., and Ferguson, T.J. 2012a. Dewankwin Kyaba:chu Yalanne: The Zuni Cultural Landscape and the Proposed Roca Honda Uranium Mine. Report on File, Lincoln National Forest and Grasslands.
- Colwell-Chanthaphonh, C., and Ferguson, T.J. 2012b. The Pueblo Laguna and Tsibina: Mount Taylor and the Proposed Roca Honda Uranium Mine. Report on File, Lincoln National Forest and Grasslands.
- Cordell, L.S. 1984. Prehistory of the Southwest. Academic Press, San Diego.
- Cordell, L.S., and McBrinn, M. 2012. Archaeology of the Southwest. 3rd ed. Left Coast Press, Walnut Creek, CA.
- deBuys, W.E. 1985. Enchantment and Exploitation: The Life and Hard Times of a New Mexico Mountain Range. University of New Mexico Press, Albuquerque.
- Deloria, V., Jr. 1994. God is Red: A Native View of Religion. Fulcrum Publishing, Golden.
- Eddy County, New Mexico. 2008. Eddy County Comprehensive Plan. iv, 3, 15 pp.

-
- Embid, E. and S. Finch, Jr. 2011. *White Sands National Monument inventory of water rights and groundwater evaluation data*. Prepared for White Sands National Monument, New Mexico. John Shomaker & Associates, Inc., Albuquerque, New Mexico. November 2011. Available at: [http://www.oterowcd.org/PDF/White%20Sands%20National%20Monument%20GW%20Database%20Rpt_11-30-11%20\(1\).pdf](http://www.oterowcd.org/PDF/White%20Sands%20National%20Monument%20GW%20Database%20Rpt_11-30-11%20(1).pdf).
- Exploring Patterns in Late Archaic and Early Ceramic Residential Occupation in the Northern Chihuahuan Desert. 1996. In *Early Formative Adaptations in the Southern Southwest*, edited by B. J. Roth, pp. 85-97. Monographs in World Archeology No. 25. Prehistory Press, Madison.
- Fleischmann, Daniel J. 2006. Geothermal Resource Development Needs in New Mexico. <http://www.geo-energy.org/reports/NewMexicoGeothermalReportSept06.pdf> 5, 14 pp.
- Foster, M. S., R. J. Bradley, and L. L. Scarbrough. 1993. Archaeological Investigations at Pueblo Sin Casas (FB6273), a Multicomponent Site in the Hueco Bolson, Fort Bliss, Texas
- Gaiser, Mark. 2016. Personal communication between Heather Berman, Recreation Program Manager, Lincoln National Forest Supervisor's Office and Mark Gaiser, Clean Energy Manager, State of New Mexico, Energy, Minerals, & Natural Resources Department. April 7, 2016.
- Gonzales, P.B. 2003. Struggle for Survival: The Hispanic Land Grants of New Mexico, 1848-2001. *Agricultural History* 77:293-324.
- Greaves, R. D. 2002. Archaeological Testing of Four Sites on Camp Bowie, Brown County, Texas. Archaeological Survey Report, No. 335. Center for Archaeological Research, the University of Texas at San Antonio.
- Griffin-Pierce, T. 2000. *Native Peoples of the Southwest*. University of New Mexico Press, Albuquerque.
- Groping for the Past: Investigating Archaeological Patterns Across Space and Time in the Southern Southwestern United States. 1995. Unpublished Ph.D. dissertation, Department of Anthropology, University of New Mexico, Albuquerque.
- Hoover, K. (2016). Forest Service Appropriations: Five-Year Data and Trends and FY2017 Budget Request. Congressional Research Service.
- Huckell, B.B. 1996. The Archaic Prehistory of the North American Southwest. *Journal of World Prehistory* 10:305-373.
- Hyde, G. E, 1959. *Indians of the High Plains: From the Prehistoric Period to the Coming of Europeans*. University of Oklahoma Press, Norman.
- Keegan, C. E., Chase, A., Morgan, T. A., Bodmer, S. E., Van Hooser, D. D., & Mortimer, M. (2001). *New Mexico's Forest Products Industry: A Descriptive Analysis*. Missoula, MT: The Bureau of Business and Economic Research.

-
- Kelley, J. H. 1966. The Archaeology of the Sierra Blanca Region of Southeastern New Mexico. Ph.D. dissertation, Harvard University, Cambridge.
- Knaut, A. 1995. The Pueblo Revolt of 1680: Conquest and Resistance in the Seventeenth-Century New Mexico. University of Oklahoma Press, Norman.
- Knaut, A. 1995. The Pueblo Revolt of 1680: Conquest and Resistance in the Seventeenth-Century New Mexico. University of Oklahoma Press, Norman.
- Lane L J; Nichols M H; and Paige G B 1995. Modeling erosion on hillslopes: concepts, theory and data. In: Proceedings of International Congress on Modeling and Simulation (Bining P; Bridgman H M; Williams B, eds), Vol. I, pp 1–7
- Lehmer, D. 1948. The Jornada Branch of the Mogollon. University of Arizona Social Science Bulletin 17. University of Arizona Press, Tucson.
- Lincoln County, New Mexico. 2007. Lincoln County Comprehensive Plan. 3, 5, 31, 32, 35-37 pp.
- Long Term Adaptive and Demographic Patterns in the Jornada Mogollon Region and Implications for a Broader Understanding of Southwestern Prehistory. 2002. Paper presented at the Symposium “Rethinking the Prehistory and History of the Northern Chihuahuan Desert. ” 67th Annual Meeting of the Society for American Archaeology, Denver, Colorado.
- Longworth, J.W., J.M. Valdez, M.L. Magnuson, and K. Richard. 2013 *New Mexico water use by categories 2010*. Technical Report 54, New Mexico Office of the State Engineers, October 2013. Available at: <http://www.ose.state.nm.us/Pub/TechnicalReports/TechReport%2054NM%20Water%20Use%20by%20Categories%20.pdf>.
- Lowry, C. 2000. Feature Form and Function. In Roasting Pits, and Lithic Procurement, and Logistical Mobility: The Piñon Data Recovery Project, Investigations of 18 Sites in Otero County, South-Central New Mexico. editors C.B. Browning, C. Lowry, M.C.
- Maudlin, R. P. 1986. Settlement and Subsistence Patterns During the Pueblo Period on Fort Bliss, Texas: A Model. In Mogollon Variability, edited by C. Benson and S. Upham, pp. 255-270. University Museum Occasional Papers No. 15. New Mexico State University, Las Cruces.
- Mauldin, R. P., T. B. Graves, and M. T. Bentley 1998. Small Sites in the Central Hueco Bolson: A Final Report on Project 90-11. Directorate of Environment, Fort Bliss, Texas.
- Mauldin, R. P., T. B. Graves, and M. T. Bentley 1998. Small Sites in the Central Hueco Bolson: A Final Report on Project 90-11. Directorate of Environment, Fort Bliss, Texas.
- Mauldin, R., and B. L. O’Leary. 1994. HAR-074 (LA 104,276), The Boles Wells Paleo-Indian Site: Data Collection and Test Excavations, Holloman Air Force Base, Otero County, New Mexico. HAFB Report No. 1994-021. Human Systems Research Report No. 9349E. Tularosa, New Mexico.

-
- McEnany, T.G., Schutt, J.A., and Chapman, R. 2001. An Archaeological Survey along New Mexico 165 in Las Huertas Canyon, Sandoval and Bernalillo Counties, New Mexico. FS Report 2001-03-073. Report on file, Heritage Report, Lincoln National Forest and National Grasslands, Supervisor's Office, Albuquerque.
- Mescalero Apache Subsistence Patterns and Socio-Political Organization. 1974. In *Apache Indians XII: American Indian Ethnohistory: Indians of the Southwest*, edited by David Agee Hor, pp. 9-178. Garland Publishing Co., New York.
- Mescalero Apache Subsistence Patterns. 1973. In *Survey of the Tularosa Basin, Human Systems Research Technical Manual*, Three Rivers, New Mexico.
- Miller, M. R. 1989. Archeological Excavations at the Gobernadora and Ojasen Sites: Doña Ana Phase Settlement in the Western Hueco Bolson, El Paso County, Texas. Center for Archaeological Research Report 673, New Mexico State University, Las Cruces.
- Miller, M. R., and N. A. Kenmotsu. 2004. Prehistory of the Eastern Trans-Pecos and Jornada Mogollon Regions of West Texas. In *The Prehistory of Texas*, edited by T. K. Perttula, pp. 205-265. Texas A&M University Press, College Station.
- Montgomery, C. 2002. *The Spanish Redemption: Heritage, Power, and Loss on New Mexico's Upper Rio Grande*. University of California Press, Berkeley.
- Moving Out of the Archaic on the Edge of the Southwest. 1994. *American Antiquity*.
- Nevins, M. E. 2008. They live in lonesome dove: Media and contemporary Western Apache place-naming practices. *Language in Society*, 37(2), 191-215.
- New Mexico Environment Department (NMED). 2010. Surface Water Quality Bureau Water Quality Standards: Outstanding National Resource Waters. Available at: <https://www.env.nm.gov/swqb/ONRW/>.
- New Mexico Interstate Stream Commission (NMISC). 2013. Updated regional water planning handbook; Guidelines to preparing updates to New Mexico regional water plans. December 2013.
- New Mexico Interstate Stream Commission (NMISC). 2016a. Lower Pecos Valley regional water plan. December 2016.
- New Mexico Interstate Stream Commission (NMISC). 2016b. Tularosa-Sacramento-Salt Basins regional water plan. December 2016.
- New Mexico Water Quality Control Commission (NMWQCC). 2002. Water quality and water pollution control in New Mexico, 2002: NMED/SWQ-02/1. Available at: https://www.env.nm.gov/swqb/305b/2002/2002_305b_Report-Introduction.pdf.
- Oakes, Y. R. 2000. Cultural Associations in the Sierra Blanca Region. In *The Angus Site: A Late Prehistoric Settlement Along the Rio Bonito, Lincoln County, New Mexico*, by Dorothy Zamora and Yvonne Oaks. Museum of New Mexico Archaeology Note 276.

-
- O'Laughlin, T. C. 1977. Excavations at the Sandy Bone Site, Doña Ana County, New Mexico. *A WANYU* 5(2): 11-42.
- Opler, M. E. 1994. *Myths and Tales of the Chiricahua Apache Indians*. University of Nebraska Press, Lincoln.
- Opler, M.E. 1983. Mescalero Apache. In *Handbook of North American Indians: Southwest Vol. 10*, Ortiz, A. ed., pp. 419-443. Smithsonian Institution, Washington, D.C.
- Otero County, New Mexico. 2005. *Otero County Comprehensive Plan*. 2-1, 5-5, 6-1, 6-9 pp.
- Otis, A.T., Honey, W.D., Hogg, T.C., and Lakin, K.K. 1986. *The Forest Service and the Civilian Conservation Corps: 1933-42*. United States Department of Agriculture, Forest Service Publication No. FS-395.
- Parezo, N.J. 1996a. The Diné (Navajos). In *Paths of Life: American Indians of the Southwest and Northern Mexico*, Sheridan, T.E., Parezo, N.J., eds. pp. 3-33. University of Arizona Press, Tucson.
- Parezo, N.J. 1996b. The Hopis: Hopivotskwani, The Hopi Path of Life. In *Paths of Life: American Indians of the Southwest and Northern Mexico*, Sheridan, T.E., Parezo, N.J., eds. pp. 237-266. University of Arizona Press, Tucson.
- Parker, P.L., and King, T.F. 1998. *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. National Register Bulletin 38. Revised. U.S. Department of Interior, National Park Service, Washington D.C.
- Peripheral Basins and Ephemeral Polities: INAA of Mimbres Black-on-White Ceramics and Insights into Mimbres and Jornada Mogollon Social Relationships. 2005a. Paper presented in the symposium "Using Nuclear Chemistry to Answer Cultural Questions: Recent Applications of INAA in the American Southwest", 70th Annual Meeting of the Society for American Archaeology, Salt Lake City, Utah.
- Pevar, Steven L. 2004. *The rights of Indian and tribes: the authoritative ACLU guide to Indian and tribal rights*. New York University Press, New York.
- Potyondy, J.P. and T.W. Geier. 2011. *Watershed Condition Classification Technical Guide*. FS-978. Washington DC. Available at: http://www.fs.fed.us/sites/default/files/media/types/publication/field_pdf/watershed_classification_guide2011FS978_0.pdf.
- Pueblos, Spaniards, and History. 1999. In *What Caused the Pueblo Revolt of 1680*, Weber, D.J. ed., pp. 3-18. Bedford/St. Martin's, Boston.
- Puseman, K., and Scott Cummings, L. 2010. *Pollen and Macrofloral Analysis at Sites in the Lincoln National Forest, New Mexico*. On file, Lincoln National Forest.
- Raish, C., and McSweeney, A.M. 2008. Land Grants and the U.S. Forest Service. *Natural Resources Journal* 48:1039-1055.

-
- Reed, P. F. 1987. Reinterpreting Jornada Mogollon Prehistory. *North American Archaeologist* 8:3.
- Reeve, F.D. 1959. The Navaho-Spanish Peace: 1720's—1770's. *New Mexico Historical Review* 34:9-40.
- Revision of the Jornada Mogollon Ceramic Period Sequence and Alignment with the Greater Southwest. 2005c. In *Archaeology Between the Borders: Papers from the 13th Biennial Jornada Mogollon Conference*, edited by M. Thompson, J. Jurgena, and L. Jackson, pp. 59-88. El Paso Museum of Archaeology, El Paso.
- Sale, M. 1996. North Area, Tularosa Peak, and Boles Wells cultural resource survey, Holloman Air Force Base, Otero County, New Mexico University of Arizona Press, Tucson.
- Samuels, David. 2001. Indeterminacy and History in Britton Goode's Western Apache Placenames: Ambiguous Identity on the San Carlos Apache Reservation. *American Ethnologist* 28(2): 277-302
- Sanchez, L. A. 2014. Apache Legends & Lore of Southern New Mexico.
- Sapir, Edward. 1912. Language and Environment. *American Anthropologist* 14:226-42
- Schroeder, A.H. 1997. Pueblos Abandoned in Historic Times. In *Handbook of North American Indians*, Vol. 9, Southwest, Ortiz, A. ed., pp. 236-254. Smithsonian Institution, Washington, D.C.
- Seaber, P., P. Kapinos, and G. Knapp. 1987. *U.S. Geological Survey Hydrologic Unit Maps Water-Supply Paper*. Reston, VA: U.S. Geological Survey.
- Seawolf, R. D., N. K. Ashcroft Jr., and J. M. Fowler. (2007). The Lincoln National Forest and the Economic Stability of South Central New Mexico. Las Cruces, NM: Range Improvement Task Force, NMSU.
- Settlement Patterns in the Western Hueco Bolson. 1978. El Paso Centennial Museum Publications in Anthropology No. 6. University of Texas at El Paso, El Paso.
- Seymour, D. J. 2003. The Cerro Rojo Complex: A Unique Indigenous Assemblage in the El Paso Area and Its Implications for the Early Apache. *Proceedings of the XII Jornada Mogollon Conference in 2001*. Geo-Marine, El Paso
- Seymour, D. J. 2003. The Cerro Rojo Complex: A Unique Indigenous Assemblage in the El Paso Area and Its Implications for the Early Apache. *Proceedings of the XII Jornada Mogollon Conference in 2001*. Geo-Marine, El Paso.
- Shafer, H. J., J. E. Dockall, and R. L. Brewington. 1999. Archaeology of the Ojasen (41EP289) and Gobernadora (41EP321) Sites, El Paso County, Texas. Center for Ecological Archaeology Report of Investigation No. 2, Texas A&M University, College Station, and Archeology Studies Program Report 13, Texas Department of Transportation, Austin.
- Shaw, J. D. 2006. Forest Resources of the Lincoln National Forest . Rocky Mountain Research Station .

-
- Silko, Leslie Marmon. 1996. *Landscape, History, and the Pueblo Imagination*. The Eco Criticism Reader: Landmarks in Literary Ecology. The University of Georgia Press. New York.
- State of New Mexico, Department of Game and Fish, Off-Highway Vehicle Program. 2011. *Off-Highway Vehicle Guide and Places to Ride in New Mexico*. 1-2 pp.
- State of New Mexico, Energy, Minerals, & Natural Resources Department, New Mexico Mining and Minerals Division. *Mine Registrations and Permits*. [No date].
<http://wwwapps.emnrd.state.nm.us/MMD/MMDWebInfo/> (accessed August 9, 2016c).
- State of New Mexico, Energy, Minerals, & Natural Resources Department. *New Mexico Energy Policy and Implementation Plan*. <http://www.emnrd.state.nm.us/EnergyPolicy/> (accessed August 9, 2016b).
- State of New Mexico, Energy, Minerals, & Natural Resources Department, New Mexico Mining and Minerals Division. *Mine Registrations and Permits*. [No date].
<http://wwwapps.emnrd.state.nm.us/MMD/MMDWebInfo/> (accessed August 9, 2016c).
- State of New Mexico, Energy, Minerals, & Natural Resources Department. *New Mexico Energy Policy and Implementation Plan*. <http://www.emnrd.state.nm.us/EnergyPolicy/> (accessed August 9, 2016b).
- State of New Mexico, New Mexico Department of Transportation. 2015. *New Mexico Transportation Plan, Southeast Regional Transportation Plan*. 6-11 pp.
- State of New Mexico, New Mexico Legislative Finance Committee. No Date. *Performance Report Card, Department of Transportation, Fourth Quarter, Fiscal Year 2016*. 1-2 pp.
- State of New Mexico. [No date.] Energy, Minerals, & Natural Resources Department. *Coal Mines in New Mexico*.
- State of New Mexico. 2016. *New Mexico Senate Bill 270: Off-Highway Vehicles On Paved Roads*. 1-3 pp.
- State of New Mexico. Governor Bill Richardson's Task Force. 2010. *New Mexico Electricity Transmission Planning Report*.
- Steven W. Hayes, T. A. 2012. *The Four Corners Timber Harvest and Forest Products Industry, 2007*. Fort Collins, CO : U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station.
- Tagg, M. D. 1996. Early Cultigens from Fresnal Shelter, Southeastern New Mexico. *American Antiquity* 61(2):31-324.
- Transitional pueblo occupation on Doña Ana Range, Fort Bliss, New Mexico. 1985b. In *Views of the Jornada Mogollon*, edited by C. M. Beck, pp. 45-53. Eastern New Mexico University Contributions in Anthropology 12.

Travel Management; Designated Routes and Areas for Motor Vehicle Use: Final Rule and Record of Decision. Federal Register Vol. 70, No. 216, November 9, 2015, pp. 68264-68291

U. S. Department of Agriculture, Forest Service. Special Uses Program.
https://www.fs.fed.us/specialuses/special_about.shtml (accessed 10/05/2016).

U.S. Department of Agriculture, Forest Service, Lincoln National Forest. 1986. Lincoln National Forest Land and Resource Management Plan. 201 pp.

U.S. Department of Agriculture, Forest Service, Lincoln National Forest. 2008a. Travel Analysis Report for the Lincoln National Forest. 21 pp.

U.S. Department of Agriculture, Forest Service, Lincoln National Forest. 2009a. News Release: No Change to Current Designated Motorized Use Policy On Lincoln National Forest. 1-2 pp.

U.S. Department of Agriculture, Forest Service, Southwest Region. (No Date). Gold Panning on the Lincoln. 1, 2 pp.

U.S. Department of Agriculture, Forest Service, Washington Office. 2009b. Forest Service Handbook, 7709.59 Road System Operations and Maintenance Handbook, Chapter 60 Road Maintenance. 5 pp.

U.S. Department of Agriculture, Forest Service, Washington Office. 2008b. Forest Service Handbook, 2309.18 Trails Management Handbook, Chapter 10 Trail Planning. 6-13 pp.

U.S. Department of Agriculture, Forest Service, Washington Office. 2010. Forest Service Manual, 7700 Travel Management. 20-22 pp.

U.S. Department of Agriculture, Forest Service, Washington Office. 2009b. Forest Service Handbook, 7709.59 Road System Operations and Maintenance Handbook, Chapter 60 Road Maintenance. 5 pp.

U.S. Department of Agriculture, Forest Service, Washington Office. 2008b. Forest Service Handbook, 2309.18 Trails Management Handbook, Chapter 10 Trail Planning. 6-13 pp.

U.S. Department of Agriculture, Forest Service, Washington Office. 2010. Forest Service Manual, 7700 Travel Management. 20-22 pp.

U.S. Department of Agriculture, Forest Service. 2008. Woody Biomass Utilization Strategy.

U.S. Department of Agriculture, Forest Service. 2011a. Strategic Energy Framework.

U.S. Department of Agriculture, Forest Service. 2011a. Strategic Energy Framework.

U.S. Department of Agriculture, Forest Service. 2011b. Decision Notice and Finding of No Significant Impact: Apache Pit Plan of Operations and Reclamation Plan. Cloudcroft, NM: Lincoln National Forest 2, 3 pp.

-
- U.S. Department of Agriculture, Forest Service. 2012. Retrieved from USDA Forest Service:
<http://www.fs.fed.us/news/releases/forest-service-distributes-secure-rural-schools-payments>
- U.S. Department of Agriculture, Forest Service. 2015. Washington Office. Land Areas of the National Forest System. 6 pp.
- U.S. Department of Energy, Argonne National Laboratory. 2012. Renewable Energy Atlas of the United States. <http://www.ipd.anl.gov/anlpubs/2012/04/73128.pdf> 13 p.
- U.S. Department of Energy, Energy Information Administration. [No date]. Glossary: Renewable energy resources. <http://www.eia.gov/tools/glossary/index.cfm?id=R> (accessed August 8, 2016a).
- U.S. Department of Energy, Energy Information Administration. [No date] New Mexico Profile Analysis. <http://www.eia.gov/state/analysis.cfm?sid=NM> (accessed on August 9, 2016b).
- U.S. Department of Energy, Energy Information Administration. [No date]. Glossary: Renewable energy resources. <http://www.eia.gov/tools/glossary/index.cfm?id=R> (accessed August 8, 2016a).
- U.S. Department of Energy, Energy Information Administration. [No date] New Mexico Profile Analysis. <http://www.eia.gov/state/analysis.cfm?sid=NM> (accessed on August 9, 2016b).
- U.S. Department of Energy, National Renewable Energy Laboratory. 2005. Assessing the Potential for Renewable Energy on National Forest System Lands. <http://www.nrel.gov/docs/fy05osti/36759.pdf> 27, 32 pp.
- U.S. Department of Energy, Office of Electricity Delivery & Energy Reliability. [No date]. Energy Storage. <http://energy.gov/oe/services/technology-development/energy-storage> (accessed August 9, 2016)
- U.S. Department of Interior, Bureau of Land Management. [No date]. Solid Minerals. http://www.blm.gov/nm/st/en/prog/energy/solid_minerals.html (accessed August 8, 2016).
- U.S. Department of Interior, Bureau of Land Management. 2005. Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendments. <http://www.windeis.anl.gov/documents/docs/WindPEISROD.pdf>
- U.S. Department of Interior, National Park Service, National Register of Historic Places. 2002. How to Apply the National Register Criteria for Evaluation. National Register Bulletin 15. Revised. Washington D.C.
- U.S. Department of the Interior, Bureau of Land Management. 1986. Las Cruces District Office. White Sands Resource Area, Resource Management Plan. 2 pp.
- U.S. Department of the Interior, Bureau of Land Management. 1997a. Roswell District Office. Roswell Resource Area, Resource Management Plan. 1 and 14 pp.

-
- U.S. Department of the Interior, Bureau of Land Management. 1997b. Roswell District Office. Carlsbad Resource Area. Carlsbad Approved Resource Management Plan Amendment and Record of Decision. ROD-1 and 19 pp.
- U.S. Department of the Interior, Bureau of Land Management. 1998. Roswell District Office. Carlsbad Resource Area. Carlsbad Resource Management Plan. C-33 pp.
- U.S. Department of the Interior, Bureau of Land Management. 2006. Las Cruces District Office. McGregor Range Record of Decision and Resource Management Plan Amendment. 1 & 6 pp.
- U.S. Department of the Interior, Bureau of Land Management. 2011. Roswell District Office. Fort Stanton-Snowy River Cave National Conservation Area, Draft Resource Management Plan/Environmental Assessment. 4 pp.
- U.S. Department of the Interior, National Park Service. 2012. Guadalupe Mountains National Park. General Management Plan, Environmental Impact Statement. 3 and 25 pp.
- U.S. Department of Transportation, Federal Highway Administration. 2016. www.fhwa.dot.gov/policyinformation/statistics/2013/hm20.cfm
- U.S. Global Change Research Program (USGCRP). 2009. *Global Climate Change Impacts in the United States: 2009 Report*. <<http://nca2009.globalchange.gov/southwest>>
- Upham, S. 1984. Adaptive Diversity and Southwestern Abandonment. *Journal of Anthropological Research*. 40:235-256.
- Upper Hondo Soil and Water Conservation District. 2015. Land Use Policy Plan. 25 pp.
- Village of Cloudcroft. 2014. Village of Cloudcroft Comprehensive Plan. III – 1, 10-14, 17-19, 21-23 pp.
- Village of Ruidoso. 2010. Village of Ruidoso 2010 Comprehensive Plan. 1, 18, 22, 24, 39 pp.
- Weber, D.J. 1982. *The Mexican Frontier, 1821-1846*. University of New Mexico Press, Albuquerque.
- Welch, John and Ramon Riley. 2001. Reclaiming Land and Spirit in the Western Apache Homeland. *American Indian Quarterly* 25(1): 5-12
- Weston, J. D., and R. P. Mauldin. 2003. Archaeological Testing of Four Sites on Camp Bowie, Brown County, Texas. Archaeological Survey Report, No. 335. Center for Archaeological Research, The University of Texas at San Antonio.)
- Whalen, M. E. 1977. Settlement Patterns in the Eastern Hueco Bolson. *El Paso Centennial Museum Publications in Anthropology* No. 4. University of Texas at El Paso, El Paso.
- Wills, W. H. 1995. Archaic Foraging and the Beginning of Food Production in the American Southwest. In *Last Hunters, First Farmers: New Perspectives on the Prehistoric Transition to Agriculture*. Price, T.D., Gebauer, A.B., eds., pp. 215-242. School of American Research Press, Santa Fe.

Zier, C. J. (editor). 1996. Archaeological Inventory, Test Excavations, Construction, Monitoring, and Geomorphological Overview of the D.S.E. El Paso Pipeline, Texas and New Mexico. Centennial Archaeology, Inc., Fort Collins, Colorado and Albuquerque, New Mexico.