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Lincoln National Forest

Draft Environmental Impact Statement

Volume 1: Chapters 1, 2, 3, 4, 5, References, and Glossary

Chaves, Eddy, Lincoln, and Otero Counties, New Mexico



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Draft Environmental Impact Statement
Volume 1: Chapters 1, 2, 3, 4, 5, Glossary, and References

Chaves, Eddy, Lincoln and Otero Counties, New Mexico

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Abstract: This programmatic draft environmental impact statement discloses the detailed analysis of five alternatives for revising the 1986 forest plan. The analysis documents the anticipated progress toward desired conditions, as well as potential environmental and social consequences of implementing each alternative. Alternative A, the no action alternative, reflects current management practices under the 1986 Forest Plan, as amended and implemented; alternative B is the proposed action and revised draft plan; alternative C emphasizes natural processes to manage natural resources; alternative D maximizes active management for natural resources; and alternative E promotes easier access to recreation and increases multiple use opportunities.

Contents

Summary.....	S-1
Chapter 1. Purpose of and Need for Action.....	1
Document Structure.....	1
Location.....	1
Purpose of and Need for Change.....	1
Revision Topic 1: Ecological Resources and Fire Management.....	4
Revision Topic 2—Recreation and Special Use.....	7
Revision Topic 3. Multiple Uses and Traditional Interests.....	8
Support for All Resources.....	10
Proposed Action.....	11
Scope of Analysis.....	12
Decision Framework.....	12
Public Involvement.....	12
Tribal Consultation.....	13
Issues that Served as the Basis for Alternatives Development.....	14
Theme 1: Access and Recreation.....	14
Theme 2: Natural Resource Management.....	14
Theme 3: Livestock Grazing and Rangeland Management.....	15
Theme 4: Economics.....	15
Theme 5: Wilderness and Special Management Areas.....	15
Other Comments and Concerns.....	16
Chapter 2. Alternatives, Including the Proposed Action.....	17
Introduction.....	17
Alternatives Development Process.....	17
Alternatives Considered in Detail.....	17
Elements Common to All Alternatives.....	17
Elements Common to All Action Alternatives.....	21
Elements Specific to Alternative A (No Action and 1986 Forest Plan).....	21
Elements Specific to Alternative B (Proposed Forest Plan).....	28
Elements Specific to Alternative C.....	38
Elements Specific to Alternative D.....	41
Elements Specific to Alternative E.....	42
Alternatives Considered but Eliminated from Detailed Study.....	45
Alternative That Would Prohibit Livestock Grazing.....	45
Alternative to Conduct a Grazing Suitability Analysis.....	45
Alternative That Removes Mining from the Entire Lincoln NF.....	45
Alternative That Prioritizes Watershed Protection and Aquatic Habitat Improvement.....	46
Alternative to Include All Lands in the Wilderness Inventory as Recommended Wilderness.....	46
Alternative That Would Open or Close Roads.....	46
Alternative That Focuses on Wildlife Movement and Connectivity.....	46
Alternative That Would Limit Road Density on the Lincoln NF.....	47
Alternative That Specifies How Desired Conditions Will Be Achieved.....	47
Alternative That Would Recommend Vacant Grazing Allotments for Closure.....	47
Comparison of Alternatives.....	47
Access and Recreation.....	47
Natural Resource Management.....	48
Livestock Grazing and Rangeland Management.....	54

Economics.....	54
Wilderness and Special Management Areas.....	55
Comparison of Effects of Alternatives.....	55
Chapter 3. Affected Environment and Environmental Consequences.....	115
Assumptions Common to All Resources.....	115
Incomplete or Unavailable Information.....	115
Upland Vegetation Communities.....	116
Affected Environment.....	116
Environmental Consequences for Vegetation Communities.....	138
Cumulative Environmental Consequences for Upland Vegetation Communities.....	158
Riparian and Wetland Ecosystems.....	159
Affected Environment.....	159
Environmental Consequences for Riparian and Wetland Ecosystems.....	163
Cumulative Environmental Consequences for Riparian and Wetland Ecosystems.....	172
Soils.....	173
Affected Environment.....	173
Environmental Consequences for Soils.....	178
Cumulative Environmental Consequences for Soils.....	188
Watersheds and Water.....	189
Affected Environment.....	189
Environmental Consequences for Watersheds and Water.....	200
Cumulative Environmental Consequences for Watersheds and Water.....	210
Wildlife, Fish, and Plants.....	212
Affected Environment.....	213
Environmental Consequences for Wildlife, Fish, and Plants.....	222
Cumulative Environmental Consequences for Wildlife, Fish, and Plants.....	241
Air Resources.....	243
Affected Environment.....	244
Environmental Consequences for Air Resources.....	249
Cumulative Environmental Consequences for Air Resources.....	253
Fire and Fuels.....	254
Affected Environment.....	254
Environmental Consequences for Fire and Fuels.....	262
Cumulative Environmental Consequences for Fire and Fuels.....	267
Scenery.....	268
Affected Environment.....	268
Environmental Consequences for Scenery.....	271
Cumulative Environmental Consequences for Scenery.....	277
Cultural Resources.....	279
Affected Environment.....	280
Environmental Consequences for Cultural Resources.....	284
Areas of Tribal Importance and Tribal Uses.....	290
Affected Environment.....	290
Environmental Consequences for Areas of Tribal Importance and Tribal Uses.....	292
Sustainable Forestry and Forest Products.....	297
Affected Environment.....	297
Environmental Consequences for Sustainable Forestry and Forest Products.....	303
Cumulative Environmental Consequences for Sustainable Forestry and Forest Products.....	308
Sustainable Rangelands and Livestock Grazing.....	309
Affected Environment.....	309
Environmental Consequences for Sustainable Rangelands and Livestock Grazing.....	310

Cumulative Environmental Consequences for Sustainable Rangelands and Livestock Grazing	318
Recreation.....	319
Affected Environment.....	320
Environmental Consequences for Recreation.....	324
Cumulative Environmental Consequences for Recreation	330
Transportation and Forest Access	331
Affected Environment.....	331
Environmental Consequences for Transportation and Forest Access	333
Cumulative Environmental Consequences for Transportation and Forest Access	336
Facilities and Infrastructure	336
Affected Environment.....	336
Environmental Consequences for Facilities Infrastructure.....	337
Cumulative Environmental Consequences for Facilities Infrastructure.....	338
Lands.....	338
Affected Environment.....	338
Environmental Consequences for Lands	340
Cumulative Environmental Consequences for Lands.....	341
Lands Special Uses.....	343
Affected Environment.....	343
Environmental Consequences for Lands Special Uses.....	343
Cumulative Environmental Consequences for Lands Special Uses.....	346
Minerals and Mining	347
Affected Environment.....	347
Environmental Consequences for Minerals and Mining	348
Cumulative Environmental Consequences for Minerals and Mining	351
Cave and Karst Resources	351
Affected Environment.....	351
Environmental Consequences for Cave Resources	352
Wilderness and Wilderness Study Areas.....	355
Affected Environment.....	355
Environmental Consequences for Wilderness and Wilderness Study Areas.....	357
Cumulative Environmental Consequences for Wilderness and Wilderness Study Areas.....	361
Inventoried Roadless Areas	362
Affected Environment.....	362
Environmental Consequences for Inventoried Roadless Areas	363
Cumulative Environmental Consequences for Inventoried Roadless Areas	365
National Scenic, Historic, and Recreation Trails	365
Affected Environment.....	366
Environmental Consequences for National Scenic, Historic, and Recreation Trails	367
Cumulative Environmental Consequences for National Scenic, Historic, and Recreation Trails	370
National Scenic Byways.....	370
Affected Environment.....	371
Environmental Consequences for National Scenic Byways.....	371
Cumulative Environmental Consequences for National Scenic Byways.....	374
Wild and Scenic Rivers	375
Affected Environment.....	375
Environmental Consequences for Wild and Scenic Rivers.....	378
Cumulative Environmental Consequences for Wild and Scenic Rivers	380
Research Natural Areas	380
Affected Environment.....	380
Environmental Consequences for Research Natural Areas.....	382

Cumulative Environmental Consequences for Research Natural Areas	384
Socioeconomics	384
Affected Environment.....	384
Environmental Consequences for Socioeconomics.....	395
Cumulative Environmental Consequences for Socioeconomics.....	409
Environmental Justice.....	409
Affected Environment.....	409
Environmental Consequences for Environmental Justice.....	413
Cumulative Environmental Consequences for Environmental Justice	417
Short-Term Uses and Long-Term Productivity	417
Unavoidable Adverse Effects.....	418
Irreversible and Irretrievable	418
Other Required Disclosures	418
Chapter 4. Public Engagement.....	419
Introduction	419
Public Engagement Activities and Milestones by Date.....	419
March 2015: Plan Revision Kickoff.....	419
June 2018: Draft Assessment Release	419
2018–2019: Wilderness Inventory.....	420
2019–2020: Wilderness Evaluation.....	420
2018–2020: Species of Conservation Concern.....	420
May 2019: Needs for Change Development, Final Assessment, and Draft Proposed Forest Plan...	420
2019–2020: Development of the Draft Plan and Alternatives	421
Cooperating Agencies.....	423
Tribes.....	424
Comment Review Process	424
Chapter 5. Preparers, Consultation, and Coordination	425
Preparers and Contributors	425
Consultation and Coordination	426
Federally Recognized Tribes and Pueblos.....	426
Federal and State Agencies	426
County and Local Government and Agencies	427
Nongovernmental Organizations and Others.....	427
Cooperating Agencies with Memoranda of Understanding.....	427
Distribution of the Environmental Impact Statement.....	427
References.....	429
Glossary	445
Index.....	457

Tables

2-1 Areas Common to All Alternatives	18
2-2 Management Areas in the 1986 Forest Plan.....	24
2-3 Comparison of Plan Components Changing by Action Alternative	49
2-4 Comparison of Expected Outputs by Alternative.....	54
2-5 Comparison of Management Areas Among the Five Alternatives	55
2-6 Comparison of Effects of Alternatives.....	56
3-1 Ecological Response Units	118
3-2 Spruce-Fir Forest ERU Seral State Proportion and Departure	120
3-3 Mixed Conifer with Aspen ERU Seral State Proportion and Departure.....	122
3-4 Mixed Conifer-Frequent Fire ERU Seral State Proportion and Departure.....	123

3-5	Ponderosa Pine Forest ERU Seral State Proportion and Departure.....	124
3-6	Ponderosa Pine-Evergreen Oak ERU Seral State Proportion and Departure	126
3-7	Piñon-Juniper Evergreen Shrub ERU Seral State Proportion and Departure	127
3-8	Juniper Grass ERU Seral State Proportion and Departure	128
3-9	Piñon-Juniper Woodland ERU Seral State Proportion and Departure.....	130
3-10	Piñon-Juniper Grass ERU Seral State Proportion and Departure.....	131
3-11	Gambel Oak Shrubland ERU Seral State Proportion and Departure.....	132
3-12	Mountain Mahogany Mixed Shrubland ERU Seral State Proportion and Departure	133
3-13	Chihuahuan Desert Scrub ERU Seral State Proportion and Departure	134
3-14	Montane/Subalpine Grassland ERU Seral State Proportion and Departure	135
3-15	Semi-Desert Grassland ERU Seral State Proportion and Departure	137
3-16	Acres of ERUs in Designated Wilderness.....	143
3-17	Proposed Mechanical Thinning Treatments.....	146
3-18	Proposed Prescribed and Naturally Ignited Fire Treatments for All Action Alternatives	147
3-19	Acres of ERUs in Wilderness	148
3-20	Acres of ERUs in Cave Management Areas	149
3-21	Mixed Conifer with Aspen Forest ERU Seral State Proportion and Departure.....	150
3-22	Mixed Conifer-Frequent Fire ERU Seral State Proportion and Departure.....	150
3-23	Ponderosa Pine Forest ERU Seral State Proportion and Departure.....	151
3-24	Piñon-Juniper Evergreen Shrub ERU Seral State Proportion and Departure	152
3-25	Juniper Grass ERU Seral State Proportion and Departure	153
3-26	Piñon-Juniper Woodland ERU Seral State Proportion and Departure.....	153
3-27	Piñon-Juniper Grass ERU Seral State Proportion and Departure.....	154
3-28	Mountain Mahogany Mixed Shrubland ERU Seral State Proportion and Departure	154
3-29	Montane/Subalpine Grassland ERU Seral State Proportion and Departure	155
3-30	Semi-Desert Grassland ERU Seral State Proportion and Departure	156
3-31	Distribution of Riparian ERUs on the Lincoln NF.....	160
3-32	Percentage of Functioning Condition for Watersheds in the Lincoln NF Watersheds	163
3-33	Acres of Riparian ERUs in Recommended Wilderness by Action Alternative	170
3-34	Acres of Soil Condition Ratings in the Plan Area	175
3-35	Acres of Erosion Hazard Ratings in the Plan Area	178
3-36	Acres of Percent Slopes in Plan Area	178
3-37	Acres of Soil for Indicators with Recommended Wilderness Under Alternative B.....	185
3-38	Acres of Soil for Indicators with Special Cave Management Areas Under Alternatives B, C, and D.....	186
3-39	Acres of Soil for Indicators with Recommended Wilderness Under Alternative C.....	187
3-40	Acres of Soil for Indicators with Recommended Wilderness Under Alternative E.....	188
3-41	Watershed Condition Framework Ratings for the Lincoln NF.....	190
3-42	Watershed Condition Framework Ratings for 103 Subwatersheds on the Lincoln NF (Number of Watersheds Listed by Indicator and Analysis Metric)	192
3-43	Streams, Waterbodies, and Seeps, and Springs on the Lincoln NF	194
3-44	ERUs on the Lincoln NF	213
3-45	Federally Listed Species on the Lincoln NF	216
3-46	Species of Conservation Concern on the Lincoln NF	218
3-47	Acres of ROS Overlap with Critical Habitat and Mexican Spotted Owl Protected Activity Centers for All Alternatives	224
3-48	Acres of Critical Habitat and Mexican Spotted Owl Protected Activity Centers in WSR Corridors.....	229
3-49	Acres of Critical Habitat in and Mexican Spotted Owl Protected Activity Centers in Recommended Wilderness	236
3-50	Acres of Critical Habitat and Mexican Spotted Owl Protected Activity Centers in RNAs	236

3-51	Summary of Conditions and Trends of Air Quality, Visibility, and Critical Load Deposition Measures and Reliability of Conclusions	249
3-52	Fire Return Intervals by ERUs on the Lincoln NF.....	255
3-53	Fire Return Interval Departure and Trends for All ERUs under All Alternatives.....	256
3-54	Visual Quality Objective Definitions and Acreage Summary for the Existing Lincoln NF Plan.....	270
3-55	Visual Quality Objectives and Scenic Integrity Objectives Comparison Table.....	270
3-56	Forest Acres under SIOs Compared with Alternative A.....	275
3-57	Inventory of Lincoln NF Cultural Resources by District	280
3-58	National Register Historic Places: Listed Properties on the Lincoln NF.....	281
3-59	Forest Product Cut and Sold Reports from the Last 5 Complete Fiscal Years (Fiscal Years [FYs] 2015–2019) (volumes for products are represented in hundred cubic feet [CCF])	298
3-60	Sawmills in and adjacent to the Plan Area (volumes in million board feet [MMBF] or million cubic feet [MMCF])	299
3-61	Timber suitability classification on the Lincoln NF ¹	304
3-62	A Two-Decade Comparison of Projected Timber Sale Quantity and Projected Wood Sale Quantity on the Lincoln NF in millions of cubic feet (MMCF) by Alternative.....	307
3-63	Allotment Status on the Lincoln NF	310
3-64	Recreation Opportunity Spectrum Class Characterizations	322
3-65	Recreation Opportunity Spectrum Class Distribution for the Lincoln NF	323
3-66	Roads and Motorized Trails: Summary of Miles by Type.....	332
3-67	Surface Administration within Lincoln NF Boundary, by Ranger District.....	339
3-68	Overlapping Management Areas and Designated Areas with Recommend Wilderness Management Areas	360
3-69	Recommended Wilderness Management Areas by Alternative.....	361
3-70	Inventoried Roadless Areas	362
3-71	River segments on the Lincoln NF determined eligible for inclusion in the National Wild and Scenic Rivers System, by eligibility category and length.....	376
3-72	Results of the Lincoln NF RNA evaluation showing ecological types needed in the regionwide RNA system and whether specific areas should be recommended or withdrawn	381
3-73	Populations Trends	385
3-74	Housing Summary	387
3-75	Unemployment Trends	389
3-76	Employment Trends by Economic Sector – Area of Influence	389
3-77	Average Earnings and Per Capita Income.....	390
3-78	Labor and Nonlabor Income.....	390
3-79	Employment Trends by Economic Sector – Area of Influence	392
3-80	Summary of SRS Payments and PILT in the Area of Influence (2018).....	393
3-81	Estimated Annual Lincoln NF Visitors	397
3-82	Estimated Annual Forest Product Volume Harvest by Alternative.....	398
3-83	Key Issues and Indicators	400
3-84	Total Jobs Contributed*	401
3-85	Labor Income Contributed (\$1,000s of 2019\$).....	401
3-86	Ethnicity and Racial Diversity – County Level (2017).....	411
3-87	Ethnicity and Racial Diversity – Community Level (2017).....	411
3-88	Poverty – County Level (2017)	412
3-89	Poverty – Community Level (2017)	412
3-90	Disabilities – County Level (2018).....	412
3-91	Populations for Further Environmental Justice Consideration.....	413
4-1	Public Engagement Milestones.....	421
5-1	List of Preparers	425

Figures

1-1	Forest Plan Revision Area	2
1-2	Forest Plan Surface Administration	3
2-1	Designated Areas Common to All Alternatives.....	19
2-2	Rangeland Management Units Common to All Alternatives	20
2-3	Scenic Integrity Objectives Common to All Action Alternatives	22
2-4	Management Areas in the 1986 Forest Plan.....	26
2-5	Alternative A: Visual Quality Objectives.....	27
2-6	Alternative A: Timber Suitability	29
2-7	Alternative A: Eligible Wild and Scenic Rivers.....	30
2-8	Alternatives B and D: Timber Suitability	33
2-9	Alternatives B, C, D, and E: Eligible Wild and Scenic Rivers.....	34
2-10	Alternatives B and D: Recommended Wilderness	35
2-11	Alternatives B, C, D, and E: Research Areas and Research Natural Areas	36
2-12	Alternatives B, C and D: Special Cave Management Areas.....	37
2-13	Alternative C: Timber Suitability	39
2-14	Alternative C: Recommended Wilderness	40
2-15	Alternative E: Timber Suitability	43
2-16	Alternative E: Recommended Wilderness	44
3-1	Upland Ecological Response Units.....	119
3-2	Riparian Ecological Response Units, by Group.....	161
3-3	Soil Condition Ratings.....	176
3-4	Erosion Hazard Ratings	177
3-5	Slopes	179
3-6	Watershed Condition Ratings	191
3-7	Surface Water Features	193
3-8	Springs.....	196
3-9	Impaired Streams.....	198
3-10	Groundwater Basins	199
3-11	Class 1 Airshed.....	245
3-12	Wildfire Occurrence on the Lincoln NF from 1970 to 2019	257
3-13	Historic Fire Perimeters.....	260
3-14	Wildfire Suppression Zones.....	265
3-15	Existing Mills	300
3-16	Timber suitability workflow for determining timber	305
3-17	Educational Attainment of Individuals Age 25 or Older within the Lincoln National Forest Area of Influence.....	386

Appendices

- Appendix A. Documentation of the Analyses of At-Risk Species
- Appendix B. Documentation of Wilderness Recommendation Process
- Appendix C. Proposed Research Natural Areas Description and Evaluation
- Appendix D. Timber Production Suitability, Estimated Vegetation Practices, and Projected Harvest Levels
 Analysis Methodology
- Appendix E. State and Transition Modeling Process
- Appendix F. USFWS IPaC List
- Appendix G. Wild and Scenic River Evaluation Process

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Acronym or Abbreviation	Full Term
AUMs	animal unit months
BLM	U.S. Department of the Interior, Bureau of Land Management
CEQ	Council on Environmental Quality
DEIS	draft environmental impact statement
EIS	environmental impact statement
EPA	Environmental Protection Agency
ERU	ecological response unit
Forest Service	United States Department of Agriculture, Forest Service
FSH.....	Forest Service Handbook
GIS	Geographic information system
ID team	interdisciplinary team
IMPLAN.....	input-output model
IRA	inventoried roadless area
Lincoln NF.....	Lincoln National Forest
MMBF	million board feet
MMCF	million cubic feet
NFMA	National Forest Management Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NVUM.....	National Visitor Use Monitoring
NWPS.....	National Wilderness Preservation System
PFC.....	proper functioning condition
PILT	payments in lieu of taxes
PM _{2.5}	particulate matter smaller than 2.5 micrometer in diameter
PM ₁₀	particulate matter smaller than 10 micrometer in diameter
PNVT.....	potential natural vegetation type
RNA.....	research natural area
ROS	recreation opportunity spectrum
SIO	scenic integrity objective
SMS	scenery management system
SRS.....	Secure Rural Schools
TCP.....	traditional cultural property

Acronym or Abbreviation

U.S..... United States
USDA..... United States Department of Agriculture
USFWS..... United States Fish and Wildlife Service

VQO visual quality objective

WSA.....wilderness study area
WSR.....wild and scenic river

Summary

This draft environmental impact statement documents the analysis of alternatives developed for the programmatic management of approximately 1.1 million acres of the Lincoln National Forest (Lincoln NF). The proposed action will replace the 1986 Lincoln National Forest Land and Resource Management Plan, as amended, which guides all natural resource management activities on the Lincoln NF. The revised draft forest plan accomplishes the following:

- Addresses new information and concerns raised since the 1986 Forest Plan was published
- Meets the objectives of Federal laws, regulations, and policies
- Addresses the changes in management anticipated to be needed over the next 10 to 15 years identified in the analysis of the management situation
- Provides for clear direction in the form of desired conditions, objectives, standards, guidelines, suitability, management areas, and monitoring
- Incorporates the best available science
- Provides a framework for adaptive management

Significant Issues

The comments received serve to highlight anticipated and unanticipated effects that may occur from the proposed action. Addressing the variety of issues identified during scoping provides opportunities to reduce adverse effects and to develop alternatives to the proposed action to address those issues. Several issues and themes emerged from public comments received, specifically comments on the notice of intent published in the *Federal Register* on May 30, 2019, and also from additional public comments received since then. The planning team identified the following significant issues during the public involvement process, which drove the subsequent development of alternatives:

- Access and recreation
- Natural resource management
- Livestock grazing and rangeland management
- Economics
- Wilderness and special management areas

Alternatives

Five alternatives for revising the 1986 Forest Plan are described, compared, and analyzed in detail in this draft environmental impact statement. The analysis displays the anticipated progress toward the desired conditions, as well as the potential environmental and social consequences of implementing each alternative.

Alternative A, the no action alternative, represents the 1986 Forest Plan; it is referred to as the current management or no action alternative.

Alternative B is the revised draft plan and proposed action. The proposed action would accomplish the following:

- Reorganize and restructure the land management plan
- Provide more sustainable, ecologically based, and descriptive desired conditions and updated objectives
- Change standards and guidelines
- Establish new management areas, including two special cave management areas and the Upper McKittrick Research Natural Area
- Recommend designating 40,500 acres of additional wilderness areas
- Recalculate the projected timber sale quantity and projected wood sale quantity of timber resources

The proposed action also focuses on the needs for change to accomplish the following:

- Manage forested ecosystems to provide for resiliency to minimize the risk from uncharacteristic disturbance events. Accomplish resiliency by managing toward desired conditions and restoring historical fire regimes. Protect and restore water resources and watersheds
- Better manage vegetation associated within ecological response units
- Move ecological conditions toward desired conditions, while maintaining the Lincoln NF's role in contributing to local economies

In addition to the needs for change, the proposed action provides direction for uses and ecosystem services, including sustainable recreation opportunities, traditional uses, livestock grazing, primitive and backcountry uses, and species persistence.

Alternative C is similar to alternative B, but it would allow natural processes to manage the natural resources. It also would accomplish the following:

- Emphasize passive vegetation treatments
- Promote passive recreation opportunities over developed and motorized recreation
- Recommend more wilderness (a total of 402,000 acres)
- De-emphasize commercial use

Alternative D is similar to alternative C, but it would emphasize more active management of ecological response units to achieve the Lincoln NF's desired conditions for natural resources by focusing on increased restoration of riparian areas, wildlife habitat, and aquatic areas.

Alternative E promotes easier access and increased multiple-use opportunities on the Lincoln NF. It focuses on promoting more developed recreation opportunities, with increased motorized access to developed recreation sites. It has fewer restrictions on land uses, including limited recommended wilderness (a total of 21,900 acres) and no special management areas.

Chapter 1. Purpose of and Need for Action

Document Structure

The Forest Service has prepared this draft environmental impact statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. It discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

Location

The Lincoln National Forest (Lincoln NF) encompasses about 1.1 million acres within three ranger districts (Smokey Bear, Sacramento, and Guadalupe) in south-central New Mexico. It includes portions of Chaves, Eddy, Lincoln, and Otero Counties (figure 1-1 and figure 1-2). The towns of Ruidoso, Ruidoso Downs, Weed, Mayhill, Sacramento, Queen, and Cloudcroft are on the Lincoln NF. The Lincoln NF has five major mountain ranges—the Sacramento, Guadalupe, Capitan, White, and Jicarilla Mountains—and their elevations range from about 4,000 to 12,000 feet. These mountain ranges provide a visual backdrop to cities and roads in the surrounding deserts and include five different life zones: Chihuahuan desert, grassland and woodland, mountain transition, coniferous forest, and subalpine forest. The Lincoln NF encompasses the White Mountain and Capitan Mountain Wildernesses and the Guadalupe Escarpment Wilderness Study Area (WSA).

Purpose of and Need for Change

The 1986 Land and Resource Management Plan (1986 Forest Plan) for the Lincoln NF (Forest Service 1986) has been amended 18 times. It is the primary document guiding the Lincoln NF in meeting the Forest Service mission to manage lands for healthy, resilient ecosystems that meet the diverse needs of the American people. The National Forest Management Act of 1976 directs every national forest to develop and revise its forest plan as follows:

- Every 10 to 15 years
- When conditions or demands in the area covered by the forest plan have changed significantly
- When changes in agency policies, goals, or objectives would have a significant effect on forest-level programs
- When monitoring and evaluation indicate that a revision is necessary

Over 30 years have passed since the Forest Service’s regional forester approved the 1986 Forest Plan. During these years there have been new scientific information and understanding and changes in economic, social, and ecological conditions; this has resulted in a shift in management emphasis from outputs to outcomes.

A complete revision of the 1986 Forest Plan is needed for the following purposes:

- To address changes that have occurred over the past 34 years
- To meet the legal requirements of the National Forest Management Act and the provisions of the 2012 Planning Rule, as amended in 2017 and outlined in 36 Code of Federal Regulations (CFR) 219 and the accompanying Planning Rule Final Directives
- To guide natural resource management on the Lincoln NF for the next 10 to 15 years

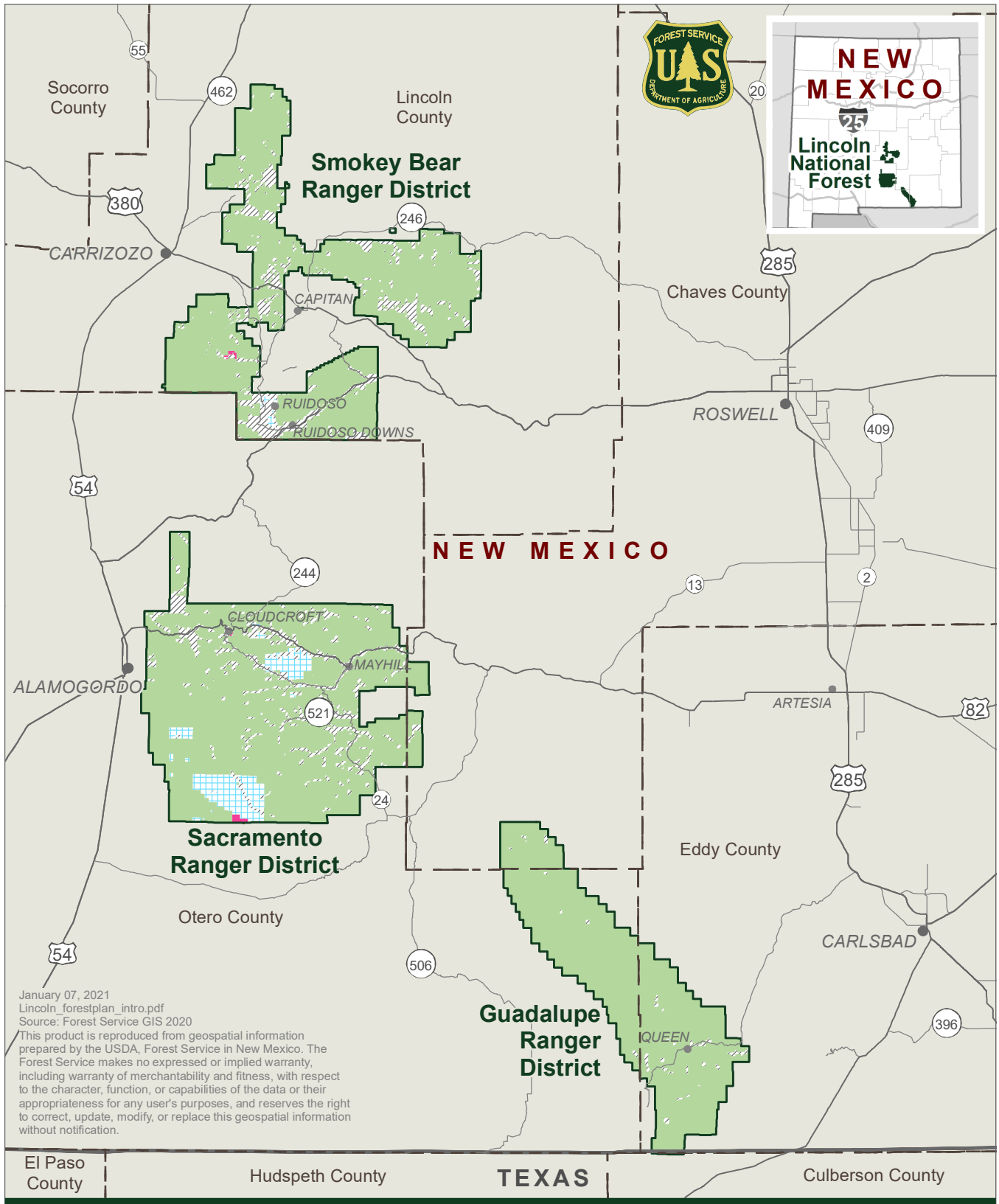
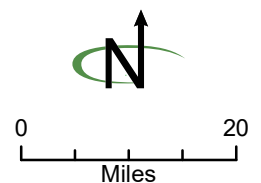


Figure 1-1 Forest Plan Revision Area

- Lincoln National Forest, Forest Plan revision area
- National Forest
- Private
- State
- Other government
- County



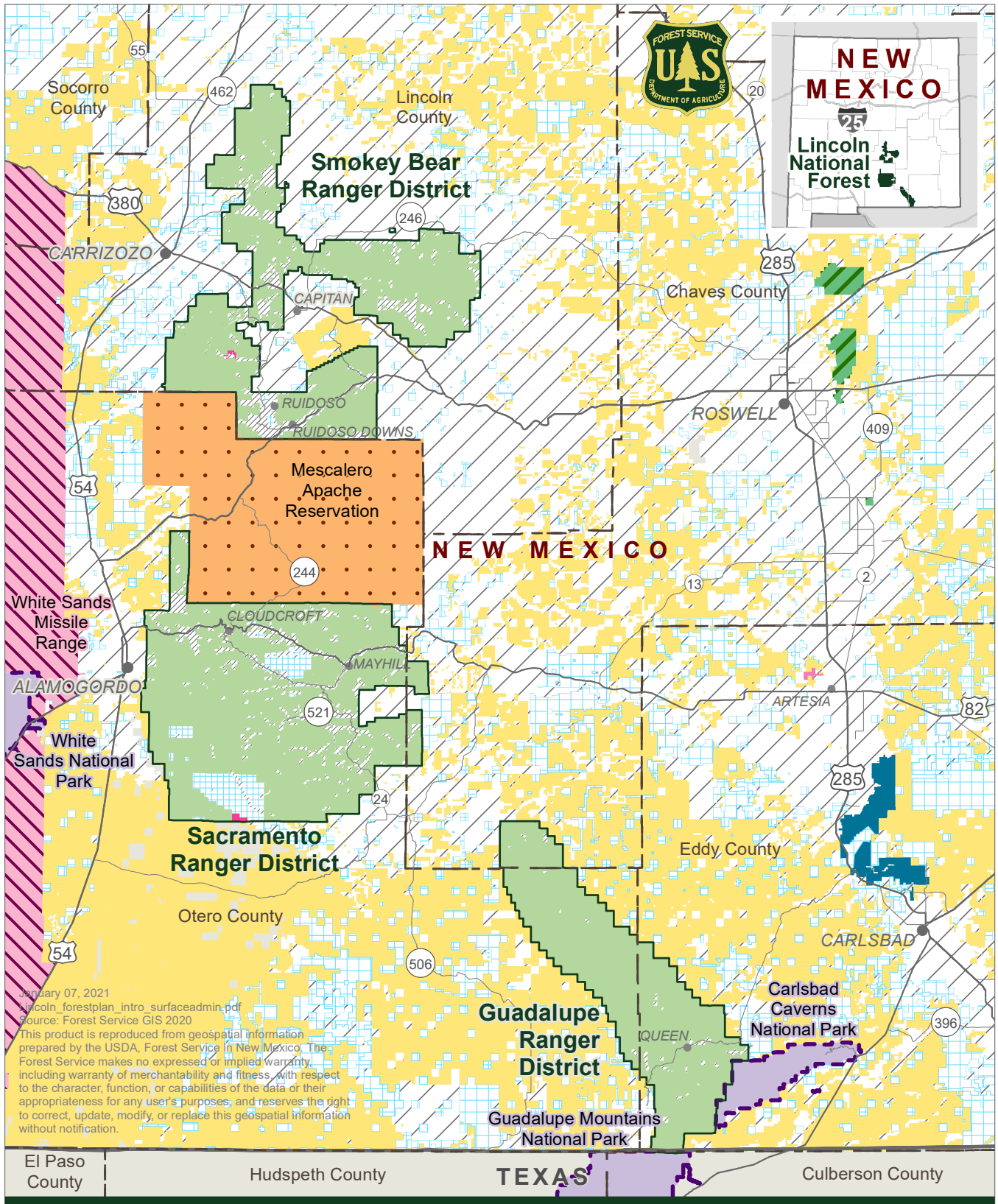


Figure 1-2 Surface Administration



- To address anticipated changes in management needed over the next 10 to 15 years, based on current conditions and trends
- To address the needs for change in management direction
- To provide for clear direction in the form of desired conditions, objectives, standards, guidelines, suitability, management areas, and monitoring
- To incorporate the best available scientific information
- To provide a framework for adaptive management

In preparation for the revision, the Forest Service identified guidance in the 1986 Forest Plan that is current and still applicable, new conditions that need to be addressed, and ongoing challenges that could be better addressed. This preparatory work is supported in two documents completed in May 2019, the Assessment Report of Ecological, Social, and Economic Conditions, Trends, and Sustainability (Forest Service 2019a) and Findings from the Final Assessment: Twenty-One Focus Areas and Needs for Change Statements (Forest Service 2019b).

The Forest Service identified current ecological and socioeconomic conditions and trends taking place on the Lincoln NF and associated needs for change to be addressed in the revised forest plan. Findings from the final assessment resulted in the need to change statements for 21 focus areas, grouped here into three main themes: restoration watersheds and vegetation, recreation and special use, and traditional communities.

Revision Topic 1: Ecological Resources and Fire Management

Conditions have changed since the 1986 Forest Plan was issued. Vegetation structure, composition, and function are currently departed from reference conditions. Lincoln NF conditions indicate a substantial departure from the natural wildfire regime. There are plant and animal species and habitat issues that need further consideration in the plan revision. There are also emerging issues not addressed in the 1986 Forest Plan, such as invasive plants and animals and climate change. For this document, ecological sustainability refers to the capability of ecosystems to maintain ecological integrity (36 CFR 219.19).

Vegetation Conditions

The Lincoln NF has the following:

- Five forested ecological response units (ERUs), four of which have moderate risk to sustainability,¹ and the Ponderosa Pine Forest ERU is at high risk to sustainability
- Four woodland ERUs, one of which, the Piñon-Juniper Evergreen Shrub ERU, is at high risk to future sustainability
- Three shrubland ERUs, two of which are trending toward sustainability; the Chihuahuan Desert Scrub is the only ERU that is at or close to desired conditions
- Two grassland ERUs at opposite ends of the Lincoln NF elevation gradient that are trending away from sustainability due to encroachment of woody vegetation

Departure from desired condition is high for both fire frequency and severity. Terrestrial ecosystems have been affected by historical management, such as high-grade, selective railroad logging and pre-Forest Service historical domestic grazing, and by modern issues, such as twentieth-century fire suppression.

¹ Risk to sustainability refers to the degree in which the ERU has departed from desired conditions and its susceptibility to natural and anthropogenic disturbances

Projected future climate change effects will worsen these for vegetation, mainly through increased fire risk, drought, or more periodic severe weather extremes.

The 1986 Forest Plan needs to be revised for vegetation for the following needs:

- There is a need to develop plan components that emphasize landscape-scale ecosystem restoration and resiliency through adaptive management strategies to changing environmental conditions and stressors.
- There is a need to develop plan components that encourage working with neighboring land managers to implement projects that improve landscape-scale connectivity across mixed ownership, where natural systems, such as watersheds and wildlife corridors, span multiple administrative boundaries.
- There is a need to develop desired conditions at multiple scales for vegetation structure and composition to promote a characteristic diversity of seral states and species composition and to meet management considerations for wildlife and plant species at risk; this includes a suite of desired conditions for patch size, ecological status (composition), ground cover, coarse woody debris, and snags that characterize different ecological response units.
- There is a need to include plan components that consider potential climate change impacts or stressors, such as increases in storms, uncharacteristic wildfires, droughts, and floods, on ecosystems and natural resources.
- There is a need to include plan components that address the need to increase resiliency to climate change, for example restoration of ecosystems, so that the Lincoln NF is better able to accept and functionally rebound from stressors.

Soil and Water

All watersheds have some areas with unsatisfactory soil conditions and streams with reduced water quality and quantity. Watershed, water resources, and aquatic ecosystems have been negatively affected. On the Lincoln NF, 36 percent of perennial stream miles are impaired (Forest Service 2017). Ninety-three percent of the Lincoln NF's sub-watersheds are rated as functioning-at-risk or impaired. Soils are inherently highly erodible. Uncharacteristic wildfire, historical grazing, invasive species, historical logging, road construction, decreased vegetation cover, and droughts worsen these issues.

Current rates of soil loss may begin to affect long-term site productivity. Poorer soil conditions are disproportionately found at lower elevations and in woodlands, shrublands, and grasslands.

Watersheds have been negatively affected by large wildfires. High burn severity leads to accelerated soil erosion and sedimentation. Water diversions, unnaturally dense forests, grazing, and prolonged drought have altered streamflow, water availability, and riparian conditions.

The forest plan needs to be revised for watersheds for the following reasons:

- There is a need for plan components that promote the maintenance and restoration of soil condition and function, such as soil and water movement, stability, and nutrient cycling, by limiting the amount of exposed bare soil and by restoring and maintaining sufficient vegetative cover, including downed woody material.
- There is a need to manage Lincoln NF resources to improve groundwater recharge and surface water flow.

- There is a need for plan components that identify appropriate riparian characteristics, such as biodiversity, connectivity, vegetation structure, and water availability, that promote functionality and resiliency, while taking into account multiple stressors.
- There is a need for plan components that improve the ecological integrity of riparian areas, because most of the at-risk species on the Lincoln NF are associated with aquatic, wet, or relatively moist microenvironments and habitats.
- There is a need for plan components that minimize ecological impacts of multiple uses on riparian areas.
- There is a need to provide plan direction to address maintenance of roads and motorized trails not open to public motor vehicle use (not on the motor vehicle use map) in watersheds identified as impaired or functioning-at-risk.
- There is a need to develop objectives for restoring riparian areas to improve function, such as fixing incised channels, restoring riparian vegetation, and restoring floodplain connectivity.

Wildlife and Fish Habitat

The 2012 Planning Rule requires habitat to be managed to sustain and maintain viable populations of native and desired nonnative vertebrate and plant species in the plan area. Species of conservation concern are a new concept introduced by the 2012 Planning Rule, which defines them as follows (Forest Service Handbook 1909.12, chapter 10, section 12.52):

A species of conservation concern is a species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species capability to persist over the long term in the plan area.

At-risk species known to occur on the Lincoln NF are of two major categories: those listed as federally threatened, endangered, proposed, or candidate under the Endangered Species Act and those designated by the regional forester as species of conservation concern. The Endangered Species Act requires Federal agencies to conserve and recover endangered and threatened species and their habitats. The Forest Service has identified 7 federally listed species, 2 Federal candidate or proposed species, and 47 potential species of conservation concern considered at-risk in the plan area.

The forest plan needs to be revised for at-risk species for the following reasons:

- There is a need for plan components that support ecological conditions that contribute to the recovery and conservation of federally listed species (threatened and endangered) and maintain stability to increasing populations of the species of conservation concern.
- There is a need for monitoring that will support documentation of baseline conditions and establishment of terrestrial and aquatic habitat linkages and connectivity for species migration and movement across the landscape.

Nonnative Invasive Species

Nonnative invasive species are a growing threat to native species and ecosystem function and can affect the quantity of forest goods and services. Invasive plants are infesting the Lincoln NF, outcompeting native vegetation, and altering natural processes. Nonnative invasive species are less effective at preventing erosion, provide less productive forage, and may predispose areas to uncharacteristic wildfire. Invasive animals, such as hogs, can carry and spread disease to wildlife and domestic livestock, prey on

and outcompete native species, and degrade native species habitats. Invasive species contribute to ecosystems moving away from the natural range of variation.

The forest plan needs to be revised considering invasive species for the following reasons:

- There is a need to include plan components that have a special emphasis on prevention or early detection and eradication of new nonnative invasive species.
- There is a need to include plan components that emphasize coordinated, cooperative, all lands, landscape management approaches, including outreach and education.
- There is a need to include plan components that focus on addressing the impacts of well-established or naturalized nonnative invasive species on terrestrial and aquatic ecosystems that cause ecologic or economic harm.

Threats from Wildfire and Fire Management

Many nearby communities (e.g., Ruidoso, Cloudcroft, and other towns mentioned above) and portions of the Lincoln NF are at increased risk from wildfires. This is because vegetation conditions are differing from desired conditions, including tree densities and fuel loads at uncharacteristically high levels. The events surrounding the 2012 Little Bear Fire that burned into the community, burning homes and community infrastructure, increased public concern. The 1986 Forest Plan was amended to account for lightning ignitions; however, it does not provide adequate direction to address communities at risk from uncharacteristic wildfire and the treatment of the wildland-urban interface. It does not provide the appropriate vegetation desired conditions and fire regime.

The forest plan also needs to be revised for fire management for the following reasons:

- There is a need for plan components that recognize fire-adapted ecosystems, the role of fire on the landscape (including in wilderness), and its use as a management tool.
- There is need for plan direction that allows Lincoln NF managers the flexibility to manage unplanned fires to meet resource objectives.

Revision Topic 2—Recreation and Special Use

There are several concerns related to recreation and special uses that are not adequately addressed in the 1986 Forest Plan. Since 1986, many more people are recreating on the Lincoln NF and user demographics are changing. There are increasing demands for access to Lincoln NF lands, goods, services, and amenities from growing populations and development that borders the Lincoln NF.

Recreation Opportunities

People use the Lincoln NF for outdoor recreation more than for any other purpose. The Lincoln NF provides a variety of opportunities for relaxing and escaping the heat, fishing, hiking, riding off-highway vehicles, viewing natural features and wildlife, camping, driving for pleasure, picnicking, gathering in large groups, and hunting.

In addition, the demographics of the recreating public are changing. People in an aging and urban population may desire more developed recreation amenities, others may want more motorized use and routes, while some desire more primitive recreation and solitude. These uses all contribute to a demand for varied recreation opportunities.

Concurrent with the desire for recreation opportunities, Lincoln NF managers face challenges in maintaining and developing quality recreation opportunities and providing safe, sustainable user access, while managing for resource protection and restoration.

The forest plan needs to be revised for recreation for the following reasons:

- There is a need for plan components to address changing trends in services, activities, and types of facilities desired by the public, while balancing those trends with other resource management, such as soils and vegetation.
- There is a need for plan components to minimize conflicts in use, such as those between recreational shooters, equestrians, hikers, and bicyclists, and motorized and nonmotorized users.
- There is a need for plan components to address the long-term sustainability of maintenance, design, and improvement on such infrastructure as trails, administrative and recreation facilities, range improvements, and roads.

Special Uses

There are numerous sub-transmission, distribution, and underground transmission and communication lines cross the Lincoln NF, serving local communities and neighboring counties. There may be future needs for energy corridors or developments, such as electric transmission lines, pipelines, solar farms, and wind turbines; this is because of the expected increased demand for electricity to serve the growing populations of the Southwest. There may be natural gas and oil exploration and development on the Lincoln NF within the next 10 to 15 years.

The forest plan needs to be revised for special uses for the following reason:

- There is a need for plan components that address transmission corridors and nonrenewable and renewable energy generation, including wind, solar, biomass, and geothermal, in order to protect natural resources, heritage and sacred sites, traditional tribal activities, caves, and scenery.

Revision Topic 3. Multiple Uses and Traditional Interests

Traditional communities, in this context, generally refer to prominent traditions and uses that predate the establishment of the Lincoln NF but continue to be practiced and to be important contributions to local communities. They can be communities of place, such as a town or subdivision, or communities of interest.

The Lincoln NF is literally the backyard for many residents in the Jicarilla, Capitan, Sacramento, and Guadalupe Mountains region of south-central New Mexico. Many communities adjoin the Lincoln NF, some completely surrounded and others connected through economic exchange.

There is a long and rich history related to settlement and utilization of resources that continue today, such as logging, livestock grazing, mining, and traditional and subsistence gathering for food, water, and shelter to name a few. These uses continue to be a prominent factor for some communities that rely directly on the conversion of commodities and natural resources into household income or for such necessities as firewood or drinking water. Utilization of forest products provides financially sustainable households and businesses that contribute to local communities and fund schools, post offices, fuel, and groceries. These functional, sustainable, rural communities also contribute to functioning intact ecosystems and landscapes.

Ranching and forage use factor prominently in the fabric of landscape ecological integrity and rural community stability. Functional ranches contribute by keeping wildlands intact. The trend more often than not seen throughout the West is that, when private ranches are sold, they are subdivided and fragmented into house plots and ranchettes. This fragmentation usually confounds natural processes, accelerates the introduction of exotic species, interrupts wildlife habitat and behaviors, possibly blocks access to the Lincoln NF if easements are not granted, and increases the cost and complexity of adjacent land management actions.

Commodity use and forest product outputs have shown declines from the past; however, these forest outputs and associated uses contribute to sustaining the lifestyles, traditions, heritage, and economies of communities. There are local benefits and needs associated with raw materials and resources, such as gravel mining for roads, wood harvesting, grazing, and gathering forest products. In turn, economic activity or subsistence gathering help to bolster household economic stability and community functioning. In addition, energy resource demands are increasing, and nonrenewable and renewable energy technology continues to develop and grow.

The area timber industry has declined, and ranching is affected through declines in forage as a result of woody encroachment, soil erosion, invasive species, and drought. There is competition for forage between cattle, feral horses, elk, other wildlife, and endangered species. There is additional conflict over the management of forage and water in riparian areas. Local economic conditions and social and traditional cultural values depend on the Lincoln NF's resources and need to be considered in forest management. The forest plan needs to be revised for economic, social, and traditional resources for the following reasons:

- There is a need for plan components that recognize the Lincoln NF's role in contributing to local economies, such as timber, grazing, and other multiple-use activities and products.
- There is need for plan components regarding the management of locatable, salable, and leasable minerals, while protecting natural resources and scenery.
- There is a need for plan components to ensure the sustainability and availability of such forest products as timber, firewood, and other special forest products for economic uses.
- There is a need to add plan components for rangeland management that maintain or restore ecological integrity and productivity of rangelands.
- There is a need for plan components that build stronger relationships with the public, including State and Federal agencies, cities and counties, tribal governments, recreational and forest user groups, environmental groups, local communities, youth, vendors, and other users with cultural and historic ties to the Lincoln NF for the management of such resources as water, timber, and other forest products.

Tribal Resources

The Mescalero Apache rely on the Lincoln NF for products for personal, commercial, and ceremonial use. They use plants for food, medicine, and such items as cradle boards and 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 them for income. Firewood is another forest product that tribal members widely collect for personal and ceremonial use. The current 1986 Forest Plan does not provide any direction for the management of tribal uses and resources such as ceremonies, firewood gathering, and plant collection.

There are several concerns related to tribal use and rural economics not adequately addressed in the 1986 Forest Plan. The Mescalero Apache Tribal lands are between two forest ranger districts, yet the current plan addresses boundary fencing and the management of Ski Apache only. The Hopi and Zuni consider the Lincoln NF to be their ancestral lands. The Mescalero Apache consider the Lincoln NF to be their ancestral lands, and it is important in part for gathering raw materials for both personal and ceremonial uses.

The forest plan needs to be revised for tribal resources for the following reason:

- There is a need for plan components to ensure the sustainability and availability of such forest products as timber, firewood, medicinal and ceremonial plants, edible plants, and other special forest products for economic and cultural uses.
- There is need for plan components regarding the management of locatable, salable, and leasable minerals, while protecting heritage and sacred sites and traditional tribal activities.

Support for All Resources

Overall, there is a need for plan direction that is strategic and that accomplishes the following:

- Identifies desired conditions with objectives for how resources should be managed
- Eliminates redundancies with existing laws, regulations, and policies
- Removes requirements to prepare additional resource plans
- Incorporates the best available scientific information into all plan components
- Strengthens or maintains the Forest Service's relationships, working toward the development of partnerships
- Provides opportunities to incorporate traditional knowledge in forest planning and management

Monitoring is a critical element of adaptive management. Monitoring questions need to be relevant to plan components, including desired conditions, standards, guidelines, suitability, and other strategic goals of the proposed forest plan. In addition, monitoring at appropriate scales is needed, including using available information from beyond the Lincoln NF boundary to compare resources on the Lincoln NF with their status on a larger context scale. The forest plan needs to be revised for adaptive monitoring for the following reasons:

- There is a need for monitoring plans that track progress toward desired conditions and allow for responsive adaptive management with available resources.
- There is a need for monitoring questions and associated indicators that look at the status of resources at appropriate scales.
- There is a need for partnerships and collaboration to accomplish monitoring needs.

Relationships and effective partnerships are key to the successful implementation of the proposed forest plan that will protect the land and serve the people.

The forest plan needs to be revised for relationships and partnerships for the following reasons:

- There is a need to include management approaches that will strengthen existing relationships, promote new relationships, and incorporate strategies that prioritize partnerships between local, State, and Federal agencies; tribal governments; law enforcement; permittees; recreation and

Lincoln NF user groups; environmental groups; users with historic ties to the Lincoln NF; and youth groups.

- There is a need for management approaches that promote seeking outside assistance and working with partners and volunteers to manage resources and monitor activities.
- There is the need to integrate other entities' objectives in management, where objectives are consistent with Forest Service policies and do not significantly increase the cost of projects.

Proposed Action

The Forest Service proposes to revise its 1986 Forest Plan to provide strategic, program-level guidance for managing the Lincoln NF's resources and uses over the next 10 to 15 years. Changes to the proposed forest plan include incorporating resource desired conditions and management areas, as well as updating objectives, standards, guidelines, suitability, and monitoring requirements. The draft proposed forest plan changes the description and allocation of the management areas to move most of the land toward Lincoln NF-wide desired conditions. The proposed action (draft forest plan) focuses on the needs for change identified in the assessment and incorporates significant issues raised during the public scoping process.

The proposed forest plan has components that guide future project activity and decision-making. These components are the main substance for the document and are as follows:

- Desired conditions describe the vision for each resource, designated area, management area, or geographic area and form the basis for the types of projects, activities, and uses that occur under the proposed forest plan.
- Objectives suggest specific actions that may contribute to moving toward forest plan desired conditions in some of the highest priority areas that have the biggest need for change. They help guide a long-term program of work for the Lincoln NF.
- Standards provide required design criteria to focus and constrain management actions to move resources toward or keep resources in desired conditions throughout the draft forest plan, especially in areas with the biggest need for change, such as soils, watersheds, vegetation, fire and fuels, rangelands, cultural and historic resources, dispersed recreation, and recommended and designated wilderness areas.
- Guidelines provide design or operational constraints on projects and activities to help achieve or maintain desired conditions, to avoid undesirable effects, or to meet applicable legal requirements. Guidelines serve the same purpose as standards; but, they differ from standards in that they provide flexibility in defining compliance, while standards are absolute constraints. Suitability determinations provide information to indicate which areas on the Lincoln NF could have the capability to sustain a variety of multiple uses or activities based on applicable desired conditions.
- Designated areas and management areas are geographical locations on the Lincoln NF that need supplementary specific management direction above what is provided for Lincoln NF-wide resources. They may have additional site-specific desired conditions, standards, and guidelines.
- Monitoring and evaluation requirements allow the Forest Service to track management actions. This ensures that the Forest Service is appropriately moving resources toward desired conditions and indicates if future actions or the forest plan need modification.

The proposed forest plan does not authorize any projects or activities. Site-specific decisions are made following project-specific proposals and analyses that comply with the proposed forest plan, and with additional opportunities for public involvement. Specific details about the proposed forest plan are provided in chapter 2.

Scope of Analysis

Analysis in this draft EIS is limited to the revision topics listed under Purpose of and Need for Change, above, and to significant issues, discussed below. Many issues raised during the scoping process are beyond the scope of this plan revision process and are not considered in the EIS. For example, issues associated with site-specific activities are not addressed. The designation of specific roads, trails, and areas for motorized vehicle travel are not considered during this plan revision. This is because these were addressed in and analyzed as an amendment to the 1986 Forest Plan (Forest Service 1986). Some issues, such as an increase in law enforcement staffing, although important, are not within the scope of this analysis.

Decision Framework

The Lincoln NF supervisor is the responsible official for this project and will make the final decision on the selected alternative for the forest plan. The Lincoln NF supervisor will review the proposed forest plan, the other alternatives, and their environmental consequences. The supervisor will decide which alternative best meets the desired conditions, the identified needs for change and issues raised during the scoping process, the diverse needs of the people, sustainable management of the Lincoln NF, and the requirements of the National Forest Management Act, the 2012 Planning Rule, and the Multiple-Use Sustained-Yield Act of 1960.

Based on the analysis in this draft EIS and subsequent public comments, the Forest Service will prepare a final EIS. The Lincoln NF supervisor then will identify a selected alternative in a draft record of decision that will be subject to an objection process guided by direction in 36 CFR 219.50–219.62. A final record of decision and accompanying forest plan will set a course of action for managing the Lincoln NF for the next 10 to 15 years.

This environmental analysis is conducted according to the Council on Environmental Quality's (CEQ's) 1978 regulations for implementing the procedural provisions of the NEPA (40 CFR 1500–1508, as amended). The CEQ issued revised regulations for implementing the procedural provisions of the NEPA, effective September 14, 2020. The revised regulations provide the responsible official the option of conducting an environmental analysis under the 1978 regulations if the process was initiated prior to September 14, 2020 (40 CFR 1506.13, 85 *Federal Register* 137, p. 43373, July 16, 2020). The Lincoln NF published the notice of intent on May 30, 2019, so this environmental analysis follows the 1978 regulations.

Public Involvement

In accordance with the 2012 Planning Rule, Forest Service personnel have engaged the public frequently throughout the planning process. Prior to the May 30, 2019, publication of the notice of intent to develop the draft EIS, the Forest Service hosted several conventional public meetings and collaborative work sessions. It also shared information on social media, and its personnel attended local agency and tribal meetings around each of the three ranger districts on the Lincoln NF. For example, in June 2018 the Forest Service released the Draft Lincoln National Forest Assessment Report for public review and input. The assessment report presented and evaluated existing information about relevant ecological, economic, and social conditions, trends, and risks to sustainability and their relationship to the 1986 Forest Plan within the context of a broader landscape. Developing the Lincoln NF Assessment Report allowed the Forest Service to evaluate current management and identify needs for change in the plan revision. A detailed list of meetings and workshops is identified in chapter 4, Public Engagement.

At meetings and presentations, the Forest Service heard from the public, continued ongoing relationships, and built new relationships with private stakeholders, local community leaders, and local, state, and tribal governments. This helped set the stage for the development of the draft EIS. Dates of the meetings are identified on the Lincoln National Forest Plan Revision website at:

<https://www.fs.usda.gov/detail/lincoln/landmanagement/planning/?cid=STELPRD3814307>.

Following public comment on the draft assessment report, the Forest Service finalized the assessment in May 2019 and published the notice of intent. Following the publication of the notice of intent on May 30, 2019, the Forest Service published its Need for Change Document and Preliminary Draft Forest Plan. The public had 60 days to review and provide comment during this scoping period. The official public scoping period lasted until July 31, 2019. The Forest Service held four community meetings, from July 16 to 19, 2019, for the public to comment on the forest plan revision at public workshops and to submit comments.

The public responded with 29 unique submissions during the scoping period; no campaign form letters were submitted. The Forest Service identified 1,133 substantive comments and grouped them into 70 issue categories.

The Forest Service used the public scoping comments to identify issues and inform development of alternative approaches to managing the Lincoln NF.

With the release of the draft EIS, the notice of availability was published concurrently in the *Federal Register*, initiating the formal 90-day comment period on the draft EIS and proposed revised plan; this is required by Forest Service NFMA and NEPA regulations. The comment period is an opportunity for commenters to provide additional comments on the plan and the EIS.

The decision to approve the revised Forest Plan for the Lincoln NF will be subject to the objection process identified in 36 CFR 219 (B) (219.50 to 219.62). According to 36 CFR 219.53(a), those who may file an objection are individuals and entities who have submitted substantive formal comments related to plan revision during the opportunities provided for public comment during the planning process.

Tribal Consultation

Treaties, statutes, executive orders (EO), judicial decisions, and agreements define the unique political relationship between the United States government and federally recognized tribes. This relationship has created a special Federal trust responsibility, involving the legal commitments and obligations of the United States toward federally recognized tribes, their traditional lands and tribal trust resources, and the exercise of tribal rights.

Tribal engagement for the forest plan revision has been accomplished through three avenues. The Forest Service has included the Hopi, Mescalero Apache, and Zuni Tribes in all correspondence regarding public engagement and consultation on the land management planning process. To date there has been no response from the Hopi and Zuni Tribes on requests to consult.

The Mescalero Apache Tribe has been engaged to discuss the land management planning process on three occasions. The first meeting occurred on Friday, May 26, 2017, between the Forest Service's tribal liaison and the Mescalero Apache Tribal Historic Preservation Officer. The meeting addressed the status of forest land management planning and the assessment of ecological and socioeconomic conditions and trends (Forest Service 2019a, b). The next meeting took place on April 23, 2019, when the Forest Service staff and the Tribal Historic Preservation Officer met to discuss the status of planning and the cultural and tribal language in the assessment. Subsequently, comments were not received from the Mescalero Apache Tribe. On April 30, 2019, copies of the final assessment were sent to the Mescalero Apache Tribe. On

March 9, 2020, Mescalero Apache President Robert “Gabe” Aguilar and other tribal representatives met with the forest supervisor and other members of the Lincoln NF leadership team. The land management planning status was reviewed.

Government-to-government consultation will continue throughout the Lincoln NF forest plan revision process to ensure that management actions are consistent with sovereign rights retained by federally recognized tribes and that the concerns of interested tribes are considered. This consultation will continue to be informal, until an agreement on the process is reached. This consultation may come in various forms, such as tribal attendance at government-to-government meetings, planning meetings, or individual tribal consultation meetings.

Issues that Served as the Basis for Alternatives Development

The comments received serve to highlight anticipated and unanticipated effects that may occur from the proposed action. Addressing the variety of issues identified during scoping provides opportunities to reduce adverse effects and to develop alternatives to the proposed action to address those issues. Several issues and themes emerged from public comments received, specifically comments on the notice of intent published in the *Federal Register* on May 30, 2019, and also from additional public comments received since then. The public and other government agencies submitted 37 letters, which contained 1,133 comments in response to the notice of intent and initial plan components. These comments were analyzed to identify issues and to frame their associated cause and effect relationships. The issues are grouped by theme below.

Theme 1: Access and Recreation

Areas of the Lincoln NF have experienced an increased concentration of recreation use over the life of the 1986 Forest Plan. Public opinions are divided on the appropriate mix of different types of recreation settings and opportunities that should be provided. The draft forest plan was developed to provide a balance of recreation opportunities. Some commenters wanted additional developed recreation facilities and advocated for more motorized recreation, while others supported more dispersed and nonmotorized recreation or primitive recreation opportunities. There are also differences of opinion about the amount of land that should be managed for motorized versus nonmotorized activities. These comments include:

- The lack of road maintenance and secured rights-of-way reduces recreation access and opportunities.
- The extensive motorized road and trail system currently exceeds the budget capacity for maintenance, resulting in sediment delivery to riparian areas, adverse effects on aquatic ecosystems, and habitat fragmentation.
- Elk and other wildlife species are sensitive to human travel patterns and activity, especially during calving, fawning, and lambing seasons.

Theme 2: Natural Resource Management

Overall, public commenters expressed a desire to restore vegetation composition and structure, so they are in line with historical conditions and have a reduced risk of uncharacteristically severe wildfires; however, commenters differed as to whether restoration should be more active or passive. Some commenters focused on more passive restoration approaches, reducing impacts from other uses and letting nature take its course. Other commenters advocated for a more active approach, using more direct forms of management, such as mechanical treatments, to help the Lincoln NF reach the desired conditions.

Healthy riparian areas and wetlands were also identified as important and in need of restoration. Compromised riparian and wetland vegetation is one of the primary contributors to watershed impairment on the Lincoln NF. Comments varied about the level of protection needed for riparian areas, including more robust restoration versus using these areas and their water for such activities as livestock grazing. These comments include:

- The proposed action does not adequately protect, restore, and enhance native fish, wildlife, and riparian habitat.
- The proposed fire and forest treatments should be designed to minimize catastrophic wildfire and return wildfire to the role of a driver rather than stressor of ecological change.

Theme 3: Livestock Grazing and Rangeland Management

Livestock grazing is an appropriate use of National Forest System lands when managed in a responsible manner. Some commenters promoted continuing current grazing and rangeland management Lincoln NF-wide. Others suggested limiting or excluding grazing in certain areas, particularly riparian areas. These comments include:

- To protect riparian ecological resources, protections are needed to ensure that livestock troughs, tanks, and holding facilities do not adversely affect riparian management zones (e.g., along streams, around seeps, springs, lakes, and wetlands).
- Livestock grazing reduces plant diversity, fawning cover, and forage availability for wildlife species.
- The proposed action does not adequately promote forage production.
- The proposed action does not provide adequate protection for soil and vegetation resources following major disturbances such as fires and floods.
- Salting and mineral supplements can adversely affect at-risk plant species, archeological sites, and riparian ecosystems.
- The proposed action does not provide enough areas of refugia for wildlife that is free from livestock grazing impacts.

Theme 4: Economics

There is a need for plan direction that recognizes the Lincoln NF's role in contributing to local economies through extractive uses of the Lincoln NF, such as timber and mining. Commenters advocated for both more and less extractive uses. These comments include:

- The proposed action does not provide adequate support for local economies and uses.
- Mining and other extractive uses have adverse impacts on wildlife habitat, riparian ecosystems, and other resources.
- The proposed action does not provide adequate support for recreation, including hunting, fishing, trapping, and shooting sports that are critical to support local economies.

Theme 5: Wilderness and Special Management Areas

The 2012 Planning Rule requires the Forest Service to evaluate areas for recommended wilderness. Public comments were divided on whether to recommend these areas in the proposed land management plan. Some wanted to see more land as recommended wilderness. This is because it would emphasize natural

processes in remote settings and important corridors for wildlife connectivity. Others wanted to see less land recommended as wilderness because it would restrict access, motorized and mechanized use, and the ability to improve grazing allotments. These comments include:

- Recommended wilderness could reduce the ability to conduct needed restoration activities, to maintain infrastructure, and other potential land uses.
- The proposed action does not provide enough recommended wilderness for refugia, wildlife connectivity, solitude, and wildlife habitat, which could affect wildlife populations.

Other Comments and Concerns

The Forest Service identified six comments and concerns raised during scoping that did not meet the definition of an issue because they either informed issues, did not have a cause and effect relationship of the proposed action, or were outside the scope of the plan decision. Many of these comments and concerns still informed plan development and the effects analysis. These comments include:

- Specific suggestions/edits for the need for change document
- A desire for more integration of partnerships or public education
- Suggestions of methods for analyzing environmental consequences
- Specific suggestions related to the Lincoln NF's road system
- Specific suggestions related to wilderness, which are addressed during the wilderness inventory and evaluation process
- Concerns already addressed by law, regulation, and policy

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes each alternative considered for the revision of the 1986 Forest Plan. Alternatives were developed to address the issues identified. Chapter 2 compares the alternatives and describes the differences between each that will be the basis for choosing among options. The Lincoln NF supervisor will make a reasoned choice among the alternatives based on the analysis in chapter 3.

Alternatives Development Process

Alternatives were developed to represent the range of issues raised and possible management options. Alternatives to the proposed action achieve the desired conditions to different degrees and emphasize specific land and resource uses; they de-emphasize other uses through differing objectives, standards, and guidelines.

Environmental, social, and economic desires do not always coincide to provide a uniform path of action. When issues could not be incorporated into the proposed revised plan due to inherent conflicts, such as not enough wilderness areas versus too many wilderness areas, an alternative was developed. Some alternatives were analyzed in detail, while others were considered but eliminated from further study.

The responsible official identified three alternatives to the proposed action that are reasonable and address one or more of the issues raised.

All action alternatives address the following:

- The purpose and need, as described in chapter 1, which includes the need for change
- Changes in socioeconomic or environmental conditions since the 1986 Forest Plan
- Comments received during scoping and feedback received on initial plan components, alternatives themes, and management areas
- Climate change consideration identified in the Southwestern Region Climate Change Trends and Forest Planning (Forest Service 2010a)
- Budget, resource, and time constraint considerations
- Substantive requirements under the Planning Rule regulations in 36 CFR 219 (requirements related to sustainability, plant and animal diversity, multiple uses, and timber)

Alternatives Considered in Detail

The interdisciplinary team developed five alternatives: alternative A, the no action alternative or 1986 Forest Plan; alternative B, the proposed action or draft forest plan; alternative C, where natural processes would be emphasized; alternative D, where active management of natural resources would be emphasized; and alternative E, where human uses would be emphasized.

Elements Common to All Alternatives

All five alternatives share a number of features, as follows:

- They comply with applicable laws, regulations, and policies.

- They conserve soil and water resources.
- They protect riparian areas.
- They provide necessary ecological conditions to support at-risk species in the plan area (see appendix A).
- They include mechanical treatments (thinning and commercial harvests), while offering opportunities for fuelwood collection when projects allow.
- They provide sustained multiple uses, products, and services in an environmentally acceptable manner, including timber, livestock forage, recreation opportunities, and leasable and locatable minerals.
- They follow the travel analysis process¹ as depicted on the motor vehicle use maps updated annually by the Forest Service.
- They maintain air quality that meets or exceeds applicable Federal, State, and local standards and regulations.
- They protect cultural resources.
- They recognize the value of traditional and cultural uses and their relationship to the Lincoln NF.
- They retain existing designated wilderness, a WSA,² scenic byways, inventoried roadless areas, and national recreation trails (table 2-1 and figure 2-1).
- They manage 935,200 acres of active allotments (figure 2-2).

In addition, progress toward desired conditions and objectives and the effectiveness of standards and guidelines are evaluated by a monitoring plan that provides continual feedback and evaluation.

Table 2-1. Areas Common to All Alternatives

Type	Name
Designated wilderness	White Mountain and Capitan Mountains
Wilderness study area (WSA) ¹	Guadalupe Escarpment
Scenic byways	Billy the Kid National Scenic Byway, Sunspot Highway National Forest Scenic Byway, and Guadalupe Backcountry Byway
National recreation trails	Dog Canyon, Rim, and Guadalupe Ridge
Inventoried roadless areas	12 inventoried roadless areas

¹ The Guadalupe Escarpment WSA is included in all the alternatives. The 1986 Forest Plan does not include wilderness-specific plan components.

¹ The Forest Service used travel analysis to define the open road and trail system, in compliance with the Travel Management Rule. It is separate from the forest planning process.

² The Guadalupe Escarpment WSA was created by the New Mexico Wilderness Act of 1980; however, it was recommended for non-wilderness designation in the 1986 Forest Plan. The 1986 Forest Plan includes its forest plan components in Management Area 3A, South Guadalupe, but the 1986 Forest Plan does not include wilderness-specific plan components.

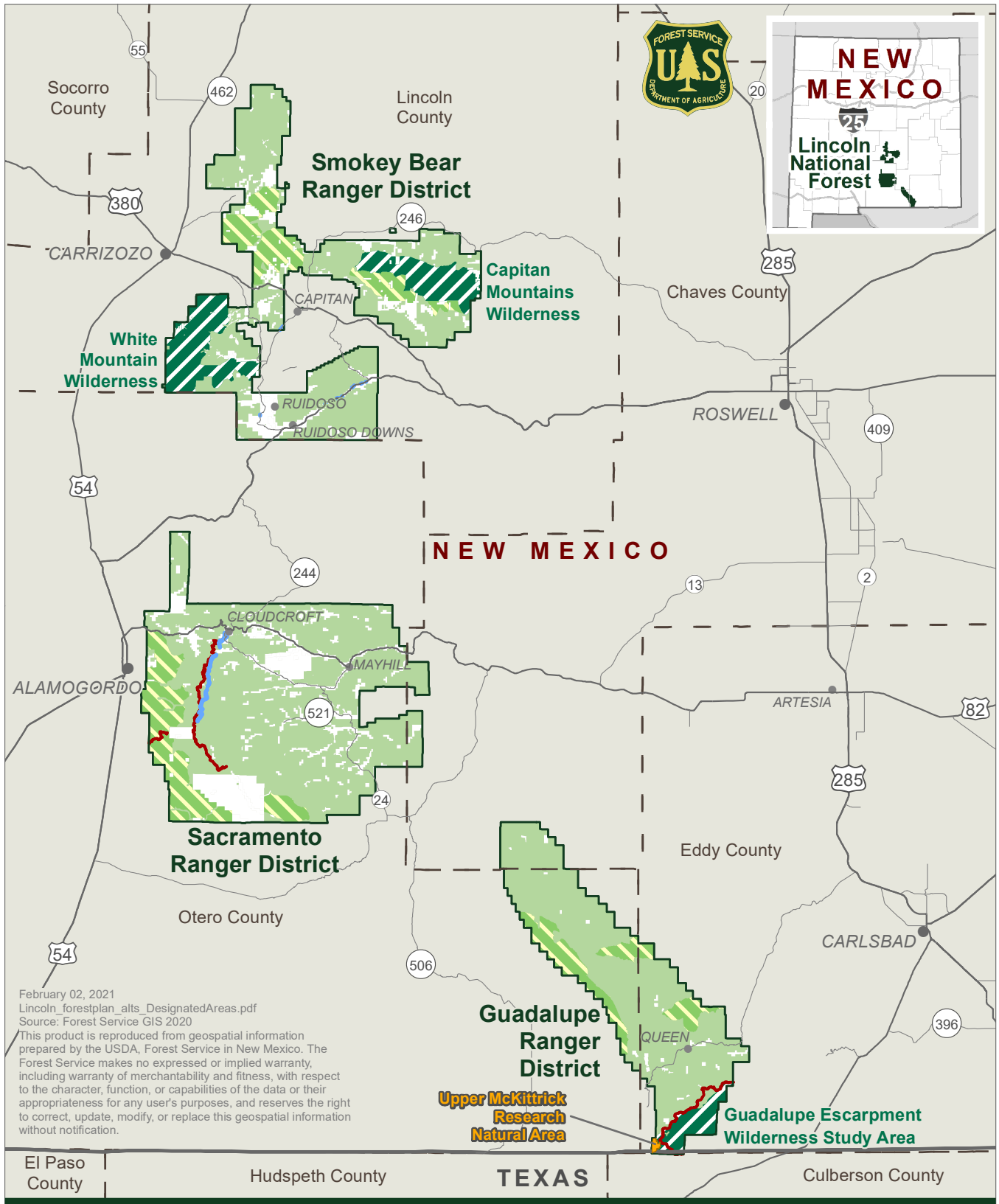









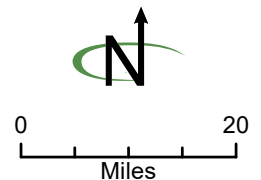


Figure 2-1 Designated Areas Common to All Alternatives

- | | |
|---|--|
|  Scenic byway |  National Forest |
|  National recreation trail |  Private or other |
|  Research natural area |  Lincoln National Forest, Forest Plan revision area |
|  Inventoried roadless area |  County |
|  Wilderness or wilderness study area | |



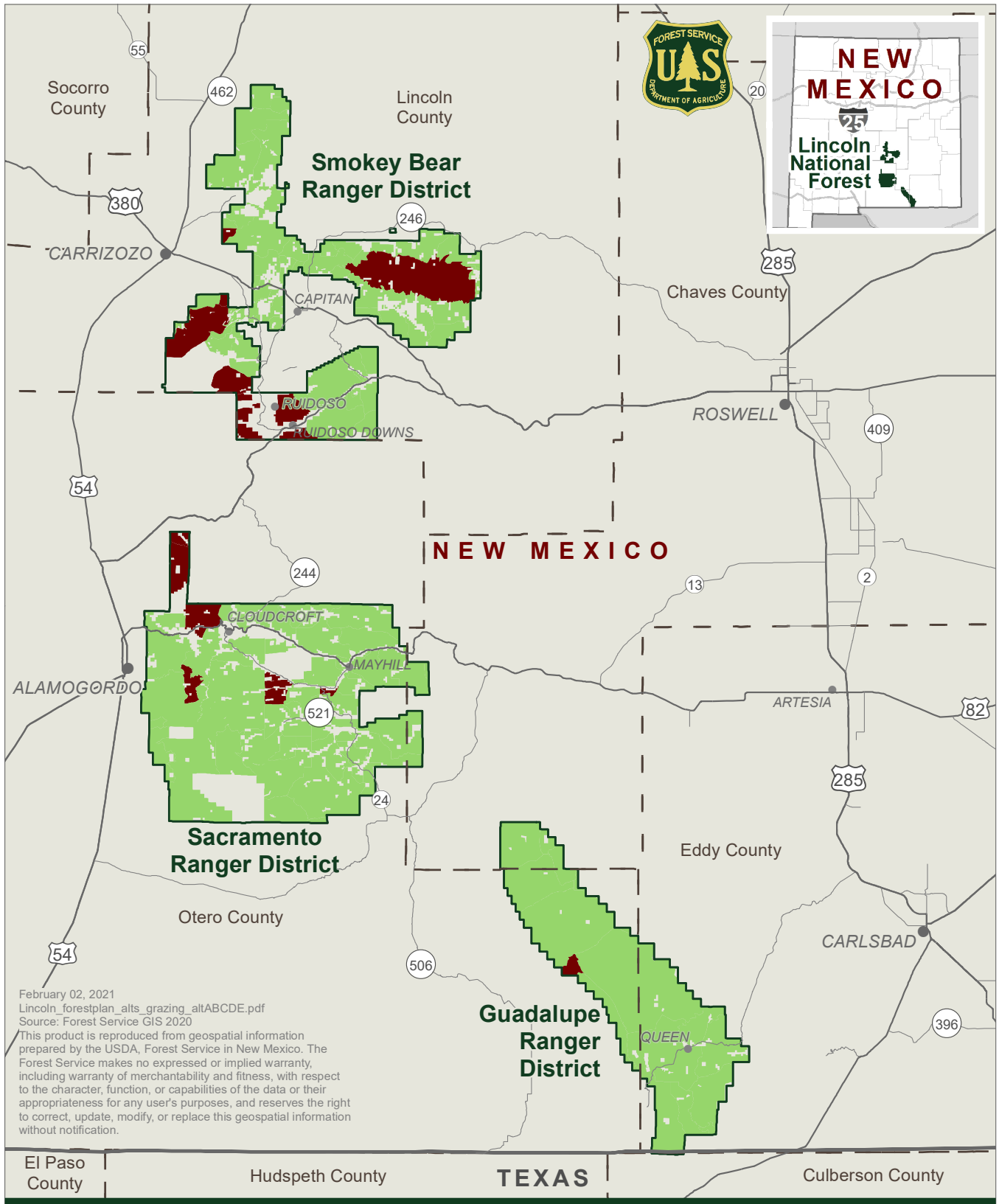
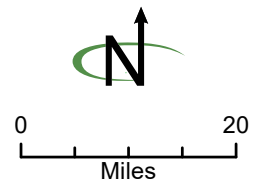


Figure 2-2 Rangeland Management Units Common to All Alternatives

- Open
- Closed
- Lincoln National Forest, Forest Plan revision area
- County



Elements Common to All Action Alternatives

Alternatives B, C, D, and E are the action alternatives and share the following plan components:

- Objectives for mechanical vegetation treatments and prescribed burning in forested-frequent fire forest types and piñon-juniper woodland that are highly departed from desired conditions, including historical fire regimes
- Objectives, standards, and guidelines for restoration treatments that benefit water resources and riparian areas, including stream channel and watershed condition class; treat nonnative species; and identify riparian management zones
- Standards and guidelines for at-risk species, which include federally listed species and species of conservation concern
- Objectives for public education about wildlife, plant, and riparian resources on the Lincoln NF
- Objectives and guidelines that would improve habitat quality and connectivity for terrestrial and aquatic species to reduce nonnative fish in streams, remove unneeded structures, and complete connectivity improvement projects
- Management approaches that support fostering relationships and developing opportunities to leverage partnerships and collaboration and enhance communication
- Desired conditions, standards, and guidelines for soil protection, maintenance, and restoration, such as after vegetation treatment projects or human disturbance
- Desired conditions for the traditional uses important for the unique cultural and social fabric of rural historic communities and tribes
- Desired conditions, standards, and guidelines for sustainable recreation, including guidance on implementing a sustainable recreation program
- Use of the scenery management system to define scenic integrity objectives across the Lincoln NF
- Inclusion of site-specific plan components for management areas, including recommended wilderness
- Inclusion of the Forest Service scenery management system (SMS) that uses scenic integrity objectives (SIOs) to manage scenic integrity rather than the current visual quality objectives (VQOs) under alternative A (figure 2-3).

Many of the plan components identified under alternative B, the proposed plan, are carried forward under alternatives C through E. Unless the alternative description specifies an objective, standard, or guideline, these are assumed to be the same as stated under alternative B. Plan components that differ between alternatives are identified below and are summarized in table 2-3.

Elements Specific to Alternative A (No Action and 1986 Forest Plan)

Alternative A, the no action alternative, reflects current management practices under the 1986 Forest Plan, as amended and implemented. It provides the basis for comparing alternatives to current management and levels of output. This alternative provides a baseline for estimating the effects of the other alternatives. The 1986 Forest Plan was developed before the new 2012 Planning Rule landscape management approach. When developing the plan, the preparers developed management goals, standards, and guidelines for management areas on the forest. These management areas provide management direction for specific geographic locations on the Lincoln NF (figure 2-2). Although these planning components

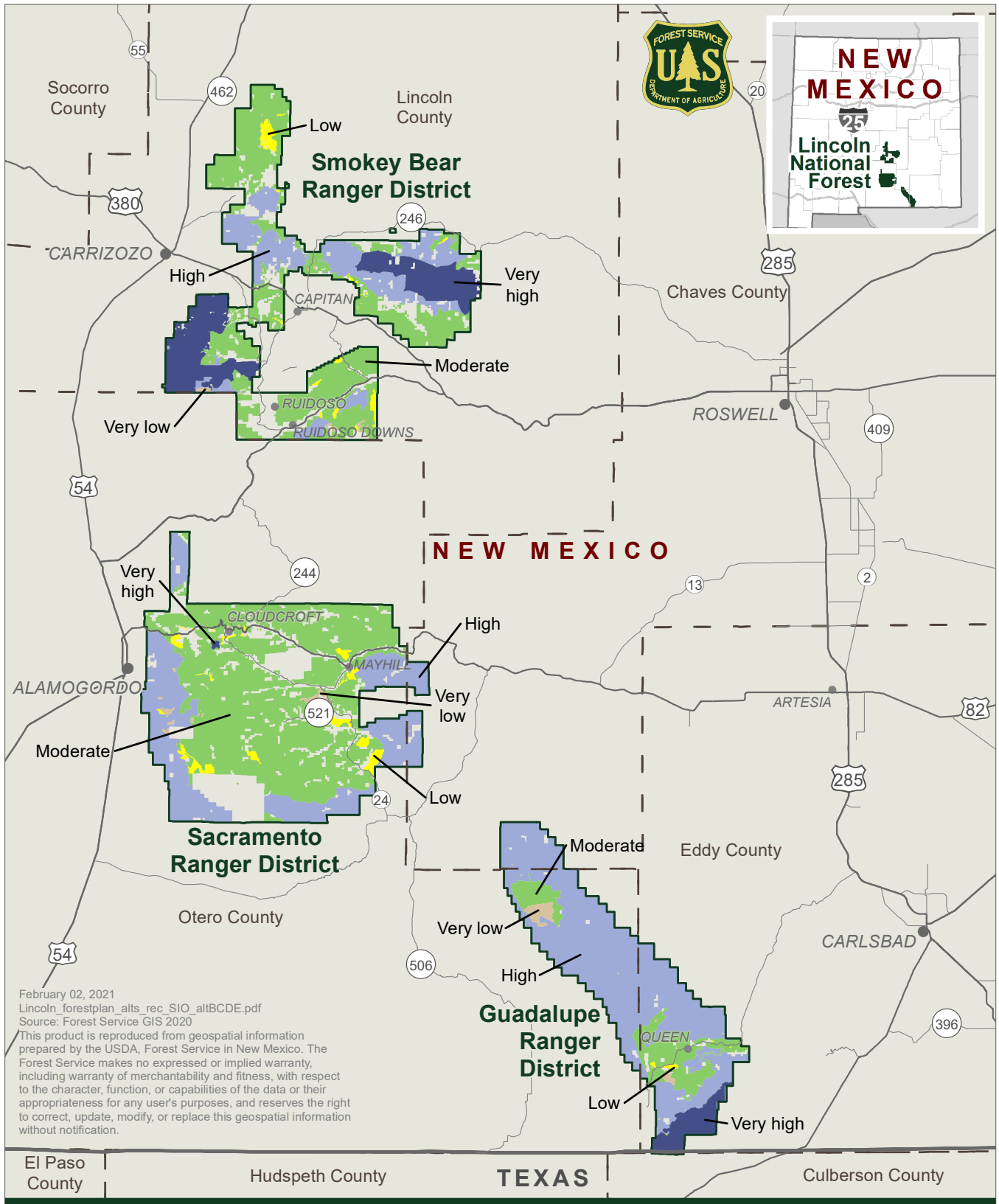
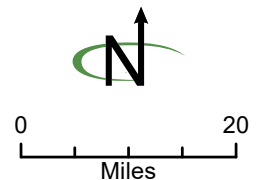


Figure 2-3 Scenery Integrity Objectives Common to all Action Alternatives

- Very low
- Low
- Moderate
- High
- Very high
- Lincoln National Forest, Forest Plan revision area
- County



were developed, they were limited in direction and only apply to each geographic location for which they were developed. This specific management area approach did not take into account overlapping management and overarching landscape-level management of the whole forest. Implementing the 1986 Forest Plan extrapolates direction from the special management areas to apply to the entire Lincoln NF and lacks the landscape-level approach required under the 2012 Planning Rule.

This management approach is less efficient than a landscape-level approach and is problematic when there is conflicting management. The text below summarizes management in the 1986 Forest Plan under the issue areas raised during scoping.

Access and Recreation

Alternative A manages for a variety of developed and dispersed recreation experiences, while maintaining the current spectrum of opportunities. It provides a system of trails and roads for motorized recreation use, while protecting other resources. It includes an objective to close or decommission 100 miles of roads over the life of the plan; however, actual closures have not equaled this amount.

Natural Resource Management

Alternative A is output-driven management. Standards and guidelines for much of the vegetation are focused on habitat and increasing forage production. Alternative A emphasizes timber management as a tool for providing forest products for local and regional industrial and individual needs, while meeting wildlife habitat needs. There are no objectives for vegetation management and no objectives for prescribed burning.

Alternative A provides direction for rehabilitating and maintaining riparian conditions, including the use of native species during restoration; however, it lacks clarification on where to prioritize riparian restoration, contains no objectives for riparian restoration, and does not establish riparian management zones.

There are no Lincoln NF-wide objectives to improve terrestrial and aquatic wildlife habitat and connectivity; however, there are forest plan components to maintain and enhance fish habitat. Wildlife habitat management focuses on maintaining sensitive species, with special emphasis on the Mexican spotted owl and northern goshawk. In several of the management areas where the emphasis is on wildlife habitat (table 2-2 and figure 2-4), management includes objectives for vegetation treatments, such as burning oak, planting willows, creating meadow openings for habitat, and wildlife infrastructure projects, such as spring development.

Alternative A manages some level of visual or scenic quality for all lands on the Lincoln NF through the use of VQOs. Management area standards and guidelines assign VQOs for each management area. Figure 2-5 includes VQOs for the Lincoln NF as stated in the 1986 Forest Plan.

Livestock Grazing and Rangeland Management

Alternative A manages livestock grazing to bring permitted grazing use in balance with the forage allocated for domestic livestock to achieve moderate and high levels of forage usage on all full-capacity allotments. This alternative lacks forestwide livestock management plan components that address ecological conditions on the Lincoln NF; it relies on allotment-level decisions. Under alternative A, there would most likely be no change in livestock management from current practices.

Table 2-2. Management Areas in the 1986 Forest Plan

Management Area	Name	Purpose or Emphasis	Acres
1A	Jicarilla Mountains	The primary emphasis is on range management, using construction of improvements and increased management to balance permitted livestock with capacity.	58,700
1B	North Capitans	The primary emphasis is on managing wildlife habitat and fuelwood production.	38,300
1C	Capitan Wilderness	The primary emphasis is on wilderness management.	34,500
1D	South Capitans	The primary emphasis is on range management and fuelwood production.	69,600
1E	Carrizo Mountain/Nogal Canyon	The primary emphasis is managing resources at levels compatible with preserving soil productivity.	22,300
1F	White Mountain Wilderness	The primary emphasis is on wilderness management.	48,400
1G	Rio Bonito	The primary emphasis is on dispersed and developed recreation and wildlife management.	11,600
1H	South Fork Bonito	The primary emphasis is on developed recreation.	1,200
1H-RNA	William G. Telfer Research Natural Area (RNA)	The primary emphasis is on providing conditions suitable for research on natural ecosystems.	N/A ¹
1I	Upper Ruidoso	The primary emphasis is on developed recreation.	16,600
1J	Lower Ruidoso	The primary emphasis is managing resources at low levels, prioritizing soil productivity.	60,100
2A	La Luz	The primary emphasis is managing resources at levels compatible with preserving soil productivity.	24,500
2B	Alamo	The primary emphasis is on range management.	51,200
2C	Grapevine	The primary emphasis is managing resources at low levels, prioritizing soil productivity.	32,500
2D	Sacramento River	The primary emphasis is on managing wildlife habitat and timber.	19,900
2E	Upper Peñasco	The primary emphasis is on developed and dispersed recreation, wildlife habitat, and timber management.	40,500
2F	Mountain Park	The primary emphasis is on developed and dispersed recreation, wildlife habitat, and timber management.	13,800
2F-RNA	Haynes Canyon RNA	The primary emphasis is on providing conditions suitable for research on natural ecosystems.	N/A ²
2G	Silver Spring	The primary emphasis is on managing wildlife habitat and timber.	8,800
2H	Upper James	The primary emphasis is on developed and dispersed recreation, wildlife habitat, and timber.	18,400
3A	South Guadalupe	The primary emphasis is on cave management and dispersed recreation compatible with managing caves.	21,300

Management Area	Name	Purpose or Emphasis	Acres
3A-RNA	Upper McKittrick RNA(Proposed)	The primary emphasis is on providing conditions suitable for research on natural ecosystems.	N/A ³
3B	West Guadalupe	The emphasis is on managing wildlife habitat.	28,700
3C	Dark Canyon	The primary emphasis is on dispersed recreation, range, and wildlife habitat management and fuelwood.	26,600
3D	Central Guadalupe	The primary emphasis is on dispersed recreation, range management, and fuelwood production.	70,500
3E	East Guadalupe	The primary emphasis is on developed recreation.	47,000
3F	North Guadalupe	The primary emphasis is on grazing and fuelwood production.	89,100
4I	James/Peñasco	The primary emphasis is on managing wildlife habitat and timber.	24,800
4J	Upper Agua Chiquita	The primary emphasis is on managing wildlife habitat and timber.	20,500
4K	Carrisa	The primary emphasis is on managing wildlife habitat and timber.	37,800
4M	Bluewater	The primary emphasis is on managing wildlife habitat.	20,600
4N	Lower Agua Chiquita	The primary emphasis is on range management.	19,400
4O	Sixteen Springs	The primary emphasis is on managing wildlife habitat.	39,600
4Q	Cuevo Canyon	The primary emphasis is on managing resources at low levels, prioritizing soil productivity.	28,400
4U	Snow Canyon	The primary emphasis is on managing resources at low levels, prioritizing soil productivity.	27,800

Source: Forest Service 1986

¹Acreage included in the South Fork Bonito and Upper Ruidoso Management Areas

²Acreage included in the Mountain Park Management Area

³Acreage included in the South Guadalupe Management Area

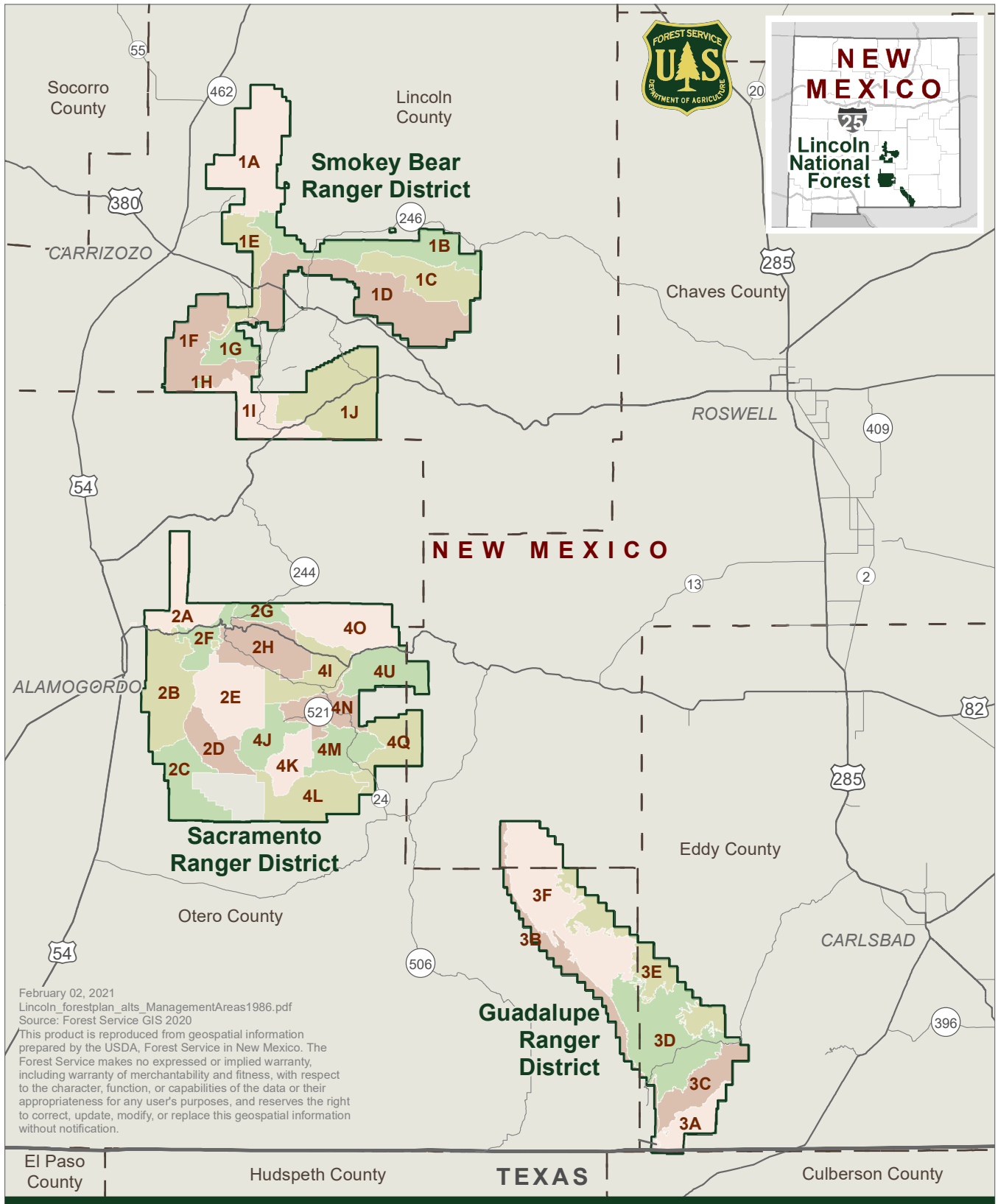
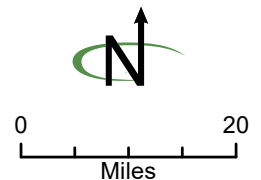


Figure 2-4 Management Areas in the 1986 Forest Plan

- Management area
- Lincoln National Forest, Forest Plan revision area
- County



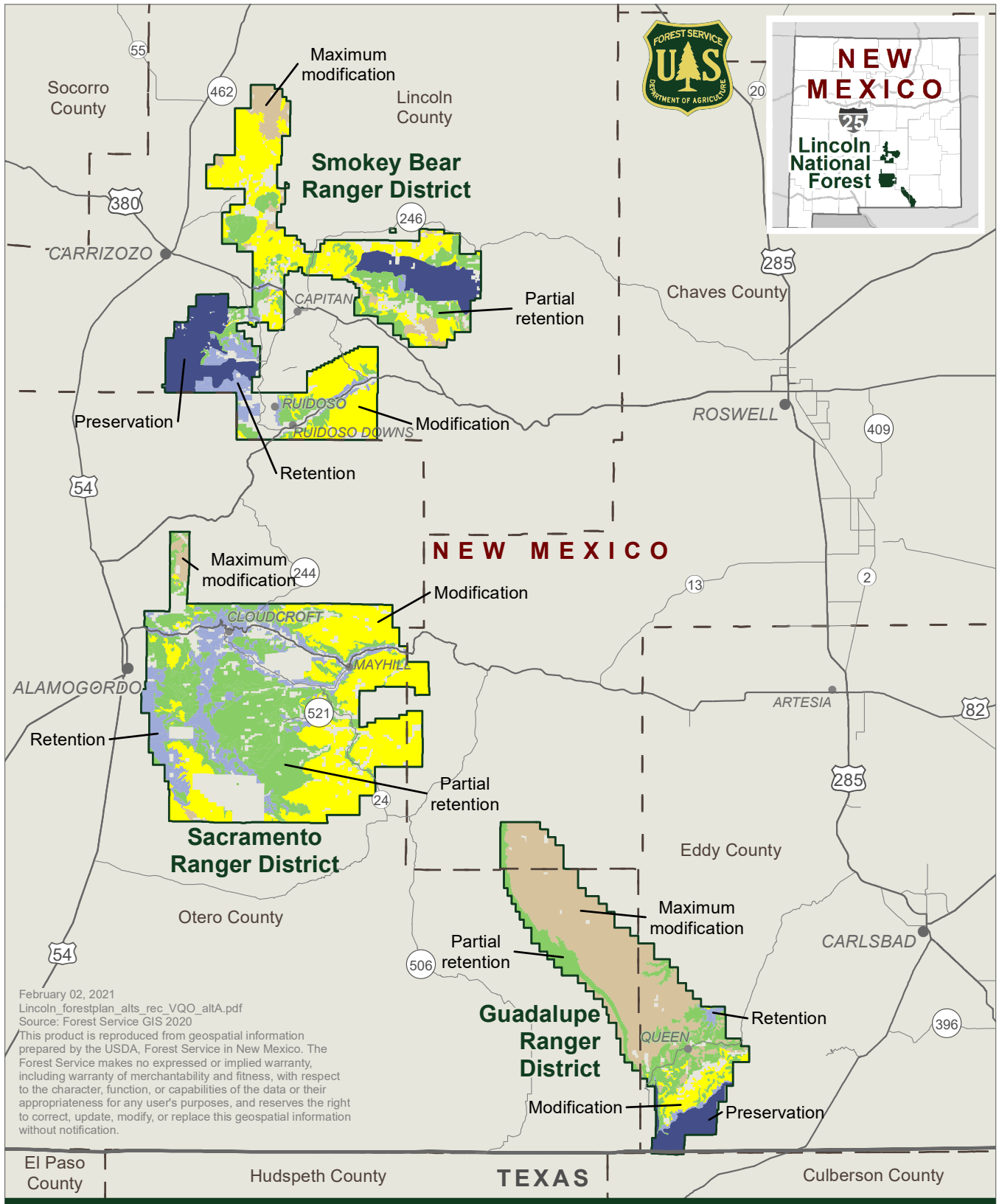
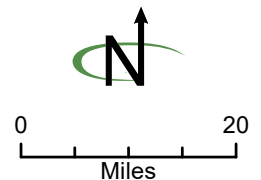


Figure 2-5 Alternative A: Visual Quality Objectives

- Maximum modification
- Modification
- Partial retention
- Retention
- Preservation
- Lincoln National Forest, Forest Plan revision area
- County



Economics

The 1986 Forest Plan is primarily commodity driven with an emphasis on outputs by the Lincoln NF. The purpose of the 1986 Forest Plan is to provide for multiple use and sustained yield of goods and services from the Lincoln NF. The economic focus for the 1986 Forest Plan was on timber and grazing, while providing guidance for mining. Alternative A would include 166,700 acres suitable for timber (figure 2-6).

Wilderness and Special Management Areas

Management under alternative A includes 55 eligible wild and scenic river segments (figure 2-7) with plan components developed to maintain their outstandingly remarkable values.

The 1986 Forest Plan does not recommend any areas for wilderness designation and does not include any special cave management areas.

The 1986 Forest Plan divided most of the Lincoln NF into management areas, each with its own set of plan components, based on their emphasis (table 2-2 and figure 2-4). Most management areas have multiple emphases, which can result in no specific emphasis in those areas.

Elements Specific to Alternative B (Proposed Forest Plan)

Alternative B is the Forest Service's proposed draft forest plan that was developed under the 2012 Planning Rule. It was developed to address key issues identified by the interdisciplinary team and the public to address the needs for change and issues, as identified in chapter 1. The proposed forest plan removes the piecemeal management used under the current forest plan. It provides desired conditions for resources that apply forestwide with objectives, standards, and guidelines to move conditions across the forest toward those desired conditions. Any management or geographic areas included in the proposed plan include additional plan components for those specific themes or geographic locations, but they do not remove the forestwide management. This provides Lincoln NF staff with clear direction on how to manage resources on the forest; it also provides landscape-level management as required under the 2012 Planning Rule.

Alternative B uses ERUs to manage vegetation on the Lincoln NF by developing desired conditions to improve the ERUs. It also addresses how to move the ERUs toward desired conditions, while maintaining the Lincoln NF's role in contributing to local economies. The economies are supported by revenue from recreation, timber and forest products, livestock grazing, and minerals extraction. It responds to the need for restoring fire regimes, reintroducing natural fire, and restoring sensitive resources, such as riparian and aquatic areas and wildlife habitat.

Access and Recreation

Alternative B includes a mix of developed and dispersed recreation forest plan components similar to what currently occurs on the Lincoln NF. Maintaining infrastructure, such as developed recreation sites and trails, would contribute toward sustainable recreation by better meeting the needs of visitors and reducing ecological damage. The proposed plan includes plan components for other resources that would reduce impacts from developed and dispersed recreation, including rehabilitating dispersed campsites that affect riparian areas and protecting poorly drained soils from concentrated use. These plan components would maintain recreational use on the Lincoln NF, while providing additional protection for sensitive resources. Increasing recreation infrastructure would be unlikely under this alternative.

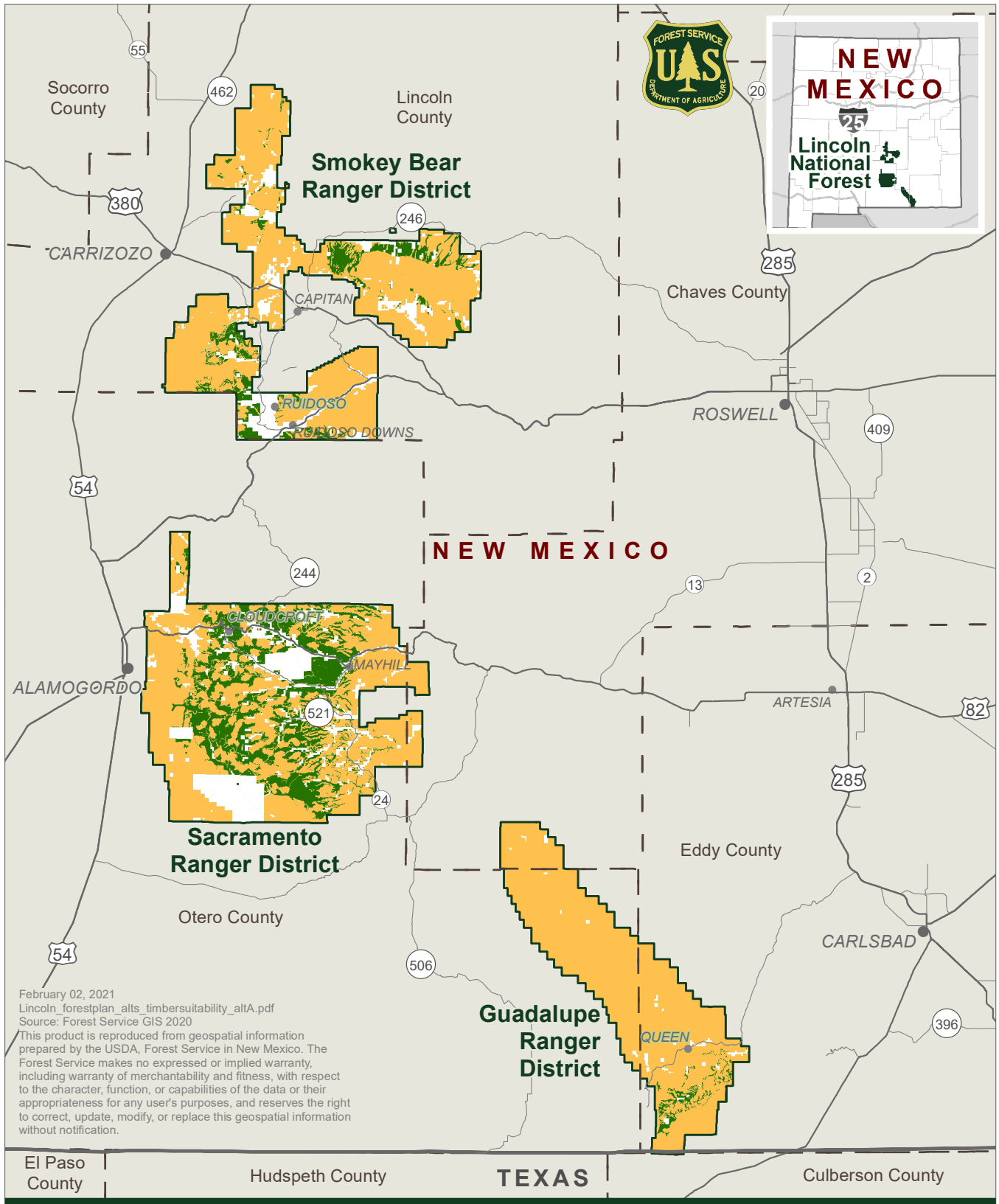


Figure 2-6 Alternative A: Timber Suitability

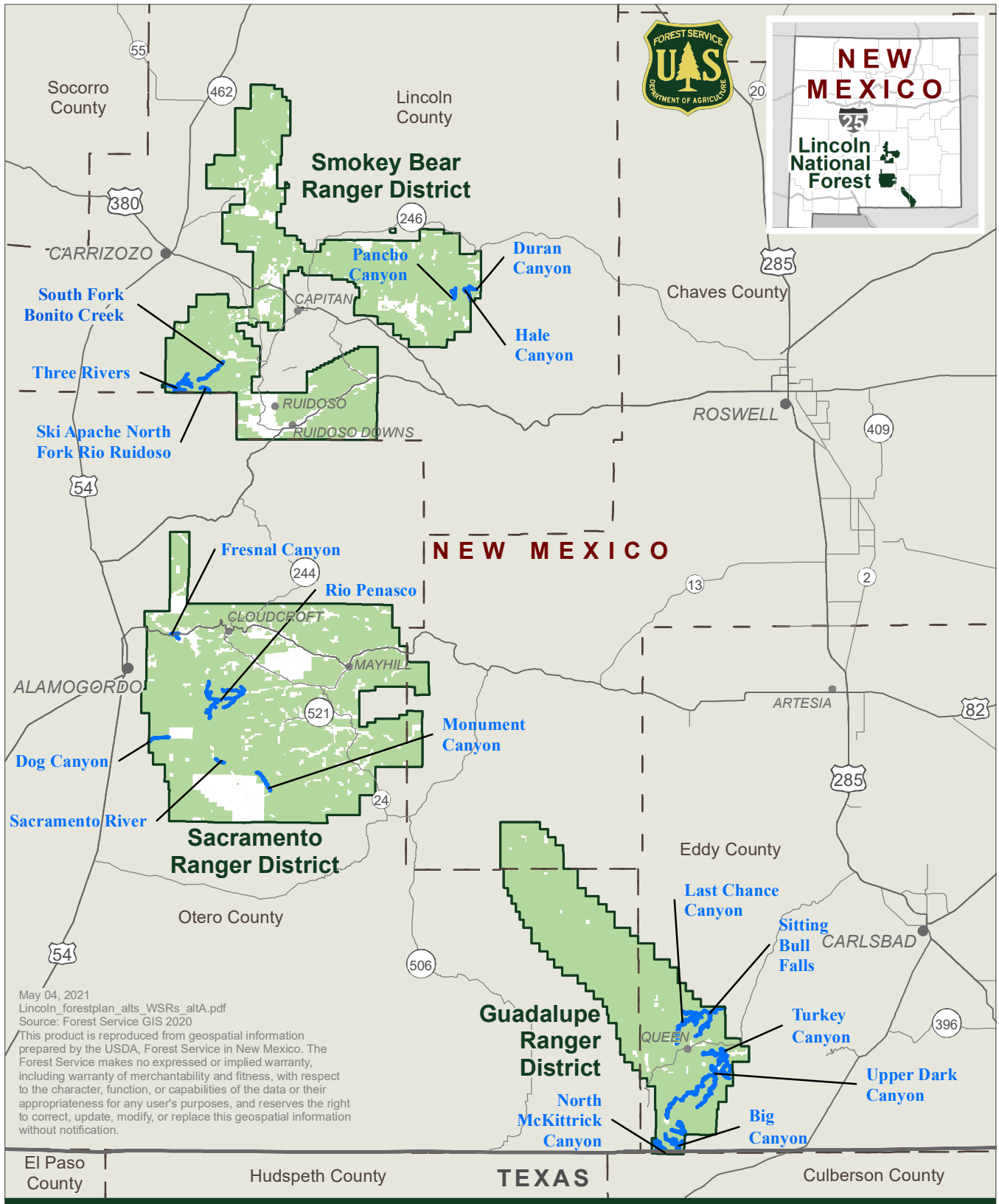
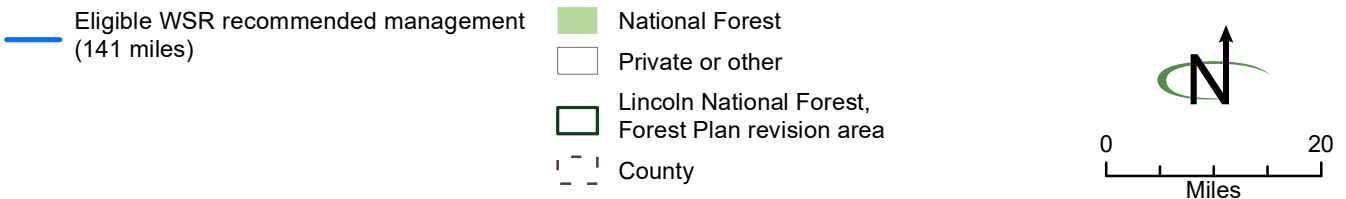


Figure 2-7 Alternative A: Eligible Wild and Scenic Rivers



Alternative B includes objectives to decommission 75 miles of administratively closed roads over 15 years and maintain 112 miles of level 3 passenger car roads and 60 miles of level 2 high-clearance roads per year. Alternative B would limit resource damage by including a guideline for roads constructed for projects (timber extraction, development, mineral development, and others) to be closed to public access and rehabilitated once the project is complete, unless required for operation or maintenance. This alternative would consider using the criteria outlined in table 2-3 to prioritize land exchanges.

Natural Resource Management

Under alternative B, vegetation management would focus on restoring fire as a key ecosystem process in frequent fire ERUs, with a particular emphasis on forested-frequent fire ERUs (mixed conifer with aspen, mixed conifer/frequent fire, and ponderosa pine). This would be accomplished through a balance of mechanical treatments and wildland fire (wildfire and prescribed fire) and may include the use of chemical treatments in accordance with current Lincoln NF policy. Depending on the ERU, a variety of other treatments, such as nonnative, invasive species treatments or reseeding native species, may be necessary to meet plan objectives.

Objectives include mechanical thinning and prescribed burning for 10-year periods, described as follows:

- Mechanically treat 11,000 to 19,500 acres for the forested-frequent fire ERUs (mixed conifer with aspen, mixed conifer/frequent fire, and ponderosa pine) and the piñon-juniper woodland ERU, during each 10-year period following plan approval. This includes 1,000 to 3,000 acres of treatment for the mixed conifer with aspen ERU and 1,000 to 2,500 acres of treatment for the piñon-juniper grass ERU that are consistent across all action alternatives.
- Using prescribed fire, treat at least 200,000 acres spread across the forested-frequent fire ERUs and the piñon-juniper woodland ERU, during each 10-year period following plan approval

Alternative B balances riparian management with other resources and multiple uses. It would provide management direction for livestock grazing in riparian areas, but it would not prohibit grazing. In addition, it provides guidelines for grazing infrastructure and motorized use in riparian areas.

Alternative B would improve terrestrial and aquatic wildlife habitat and connectivity through the following objectives:

- Improve a minimum of 12 miles of riparian areas considered to be functioning at risk or nonfunctioning over a 10 year period
- Restore or enhance at least 50,000 acres of terrestrial wildlife habitat during each 10-year period following plan approval
- Reduce nonnative fish in native fish populations in at least four stream reaches during each 10-year period following plan approval
- Complete at least five projects to improve habitat connectivity for aquatic and riparian species—for example, removing barriers, relocating and decommissioning roads, restoring dewatered stream segments, connecting fragmented habitat, and installing wildlife passage friendly fences—during the 10-year period following plan approval
- Restore or protect 5 miles of aquatic habitat over a 10-year period
- Improve the watershed condition framework (WCF) score for at least two watersheds over the life of the plan
- Restore or enhance at least 20 acres of wetlands over 10 years

Livestock Grazing and Rangeland Management

Alternative B balances livestock numbers with resource conditions. The proposed plan develops desired conditions for rangelands, then identifies objectives, standards, and guidelines to assist rangeland managers when making decisions at the allotment level. These plan components provide a consistent management framework for rangelands.

Economics

Alternative B includes plan components that balance economic uses of the Lincoln NF with protecting resources. Timber production and sales would occur where applicable to complement an emphasis on completing ERU treatments. Grazing would continue at current levels, but plan direction would provide additional protection for sensitive natural resources, including riparian areas. Alternative B would include 179,200 acres suitable for timber (figure 2-8).

Wilderness and Special Management Areas

Under alternative B, one wild and scenic river segment was removed due to encroaching development. This leaves 54 wild and scenic river segments managed under alternative B (figure 2-9).

The Forest Service recommends 40,500 acres for wilderness designation, including the Guadalupe Escarpment WSA (figure 2-10; table 2-5). These areas have the highest level of wilderness characteristics and would be managed as wilderness. These areas were selected for the following reasons (see appendix B for an analysis of the individual polygons recommended for wilderness designation and a more detailed explanation of the evaluation criteria):

- They had a very high cumulative wilderness characteristics rating during the wilderness evaluation³ (cumulative scores of 9-10).
- They had a location in or next to designated wilderness areas, which improves the management of those areas.
- There are no tradeoffs identified, such as a high need for restoration treatments for wildfire danger (e.g. mixed conifer/ponderosa pine ERUs), burned area rehabilitation, or woodland encroachment in ERUs. Areas needing intensive riparian restoration may also be excluded.

Alternative B would propose the Upper McKittrick Research Natural Area (RNA) in order to preserve a unique mountain mahogany shrubland for research (figure 2-11; table 2-5). Appendix C includes the rationale for inclusion of the Upper McKittrick RNA and exclusion of the proposed Haynes Canyon and William G. Telfer RNAs from alternative A.

In addition to forest plan components for management of caves on the Lincoln NF, alternative B would also propose the Guadalupe and Snowy River Special Cave Management Areas to further protect sensitive cave resources (figure 2-12; table 2-5). Additional standards for these areas are as follows:

³ As part of forest plan revision, the Forest Service must identify and evaluate lands that may be suitable for inclusion in the National Wilderness Preservation System, and it must determine whether to recommend lands to Congress for wilderness designation. As part of the evaluation process, each area receives a wilderness characteristic rating that includes the degree to which the area appears to be affected by the forces of nature, with little influence from human activities, and the degree to which the area has outstanding opportunities for solitude or for a primitive and unconfined type of recreation (Forest Service Handbook 1909.12, chapter 70). The wilderness evaluation report is included on the Lincoln National Forest Plan Revision website:

<https://www.fs.usda.gov/detail/lincoln/landmanagement/planning/?cid=STELPRD3814307>.

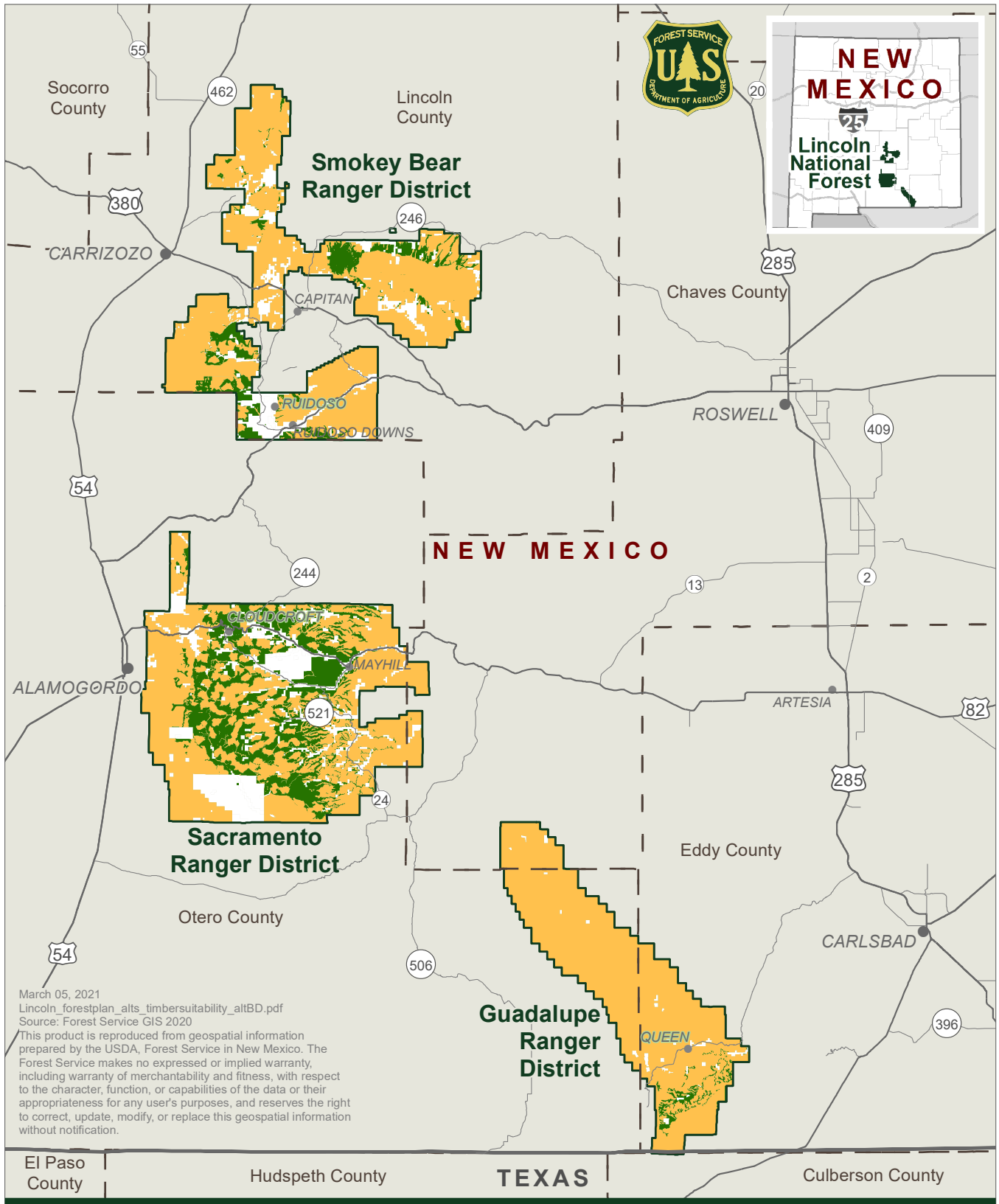


Figure 2-8 Alternatives B and D: Timber Suitability

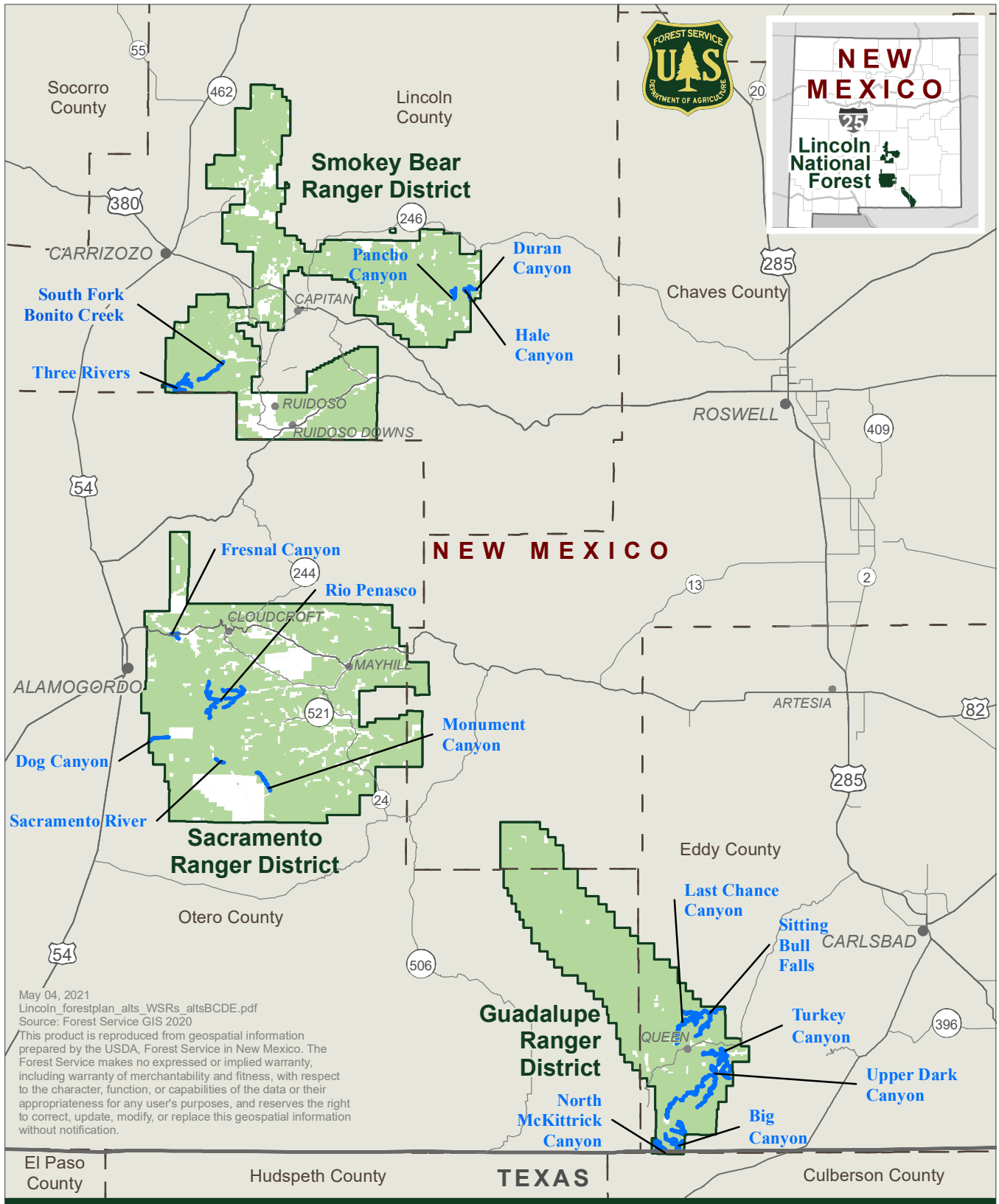


Figure 2-9 Alternatives B, C, D, and E: Eligible Wild and Scenic Rivers

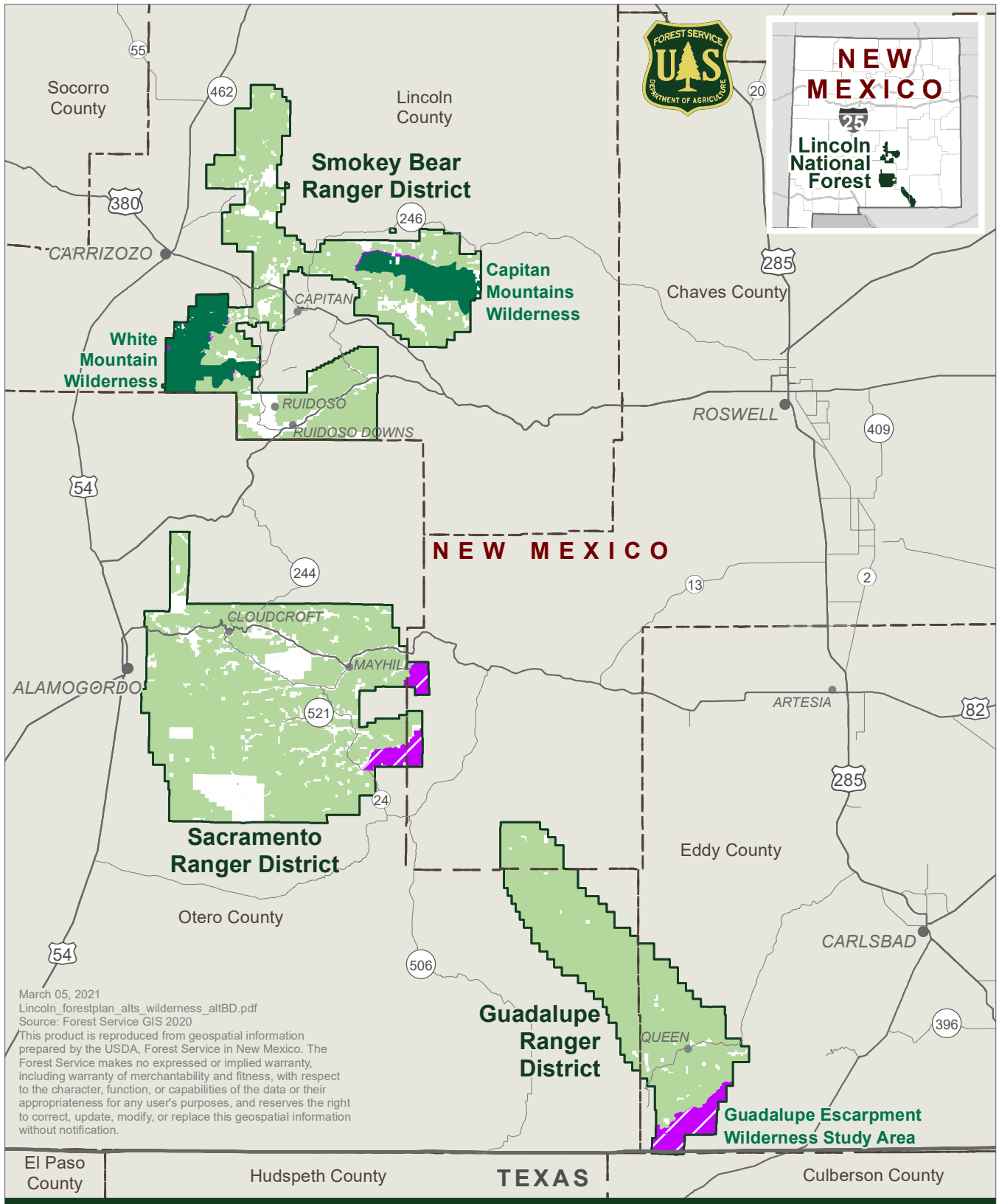
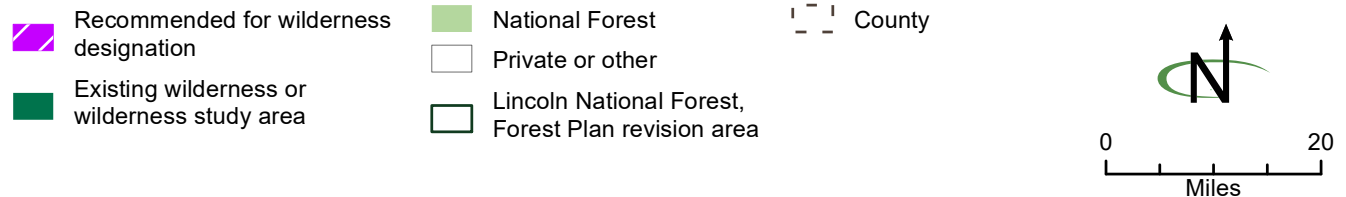
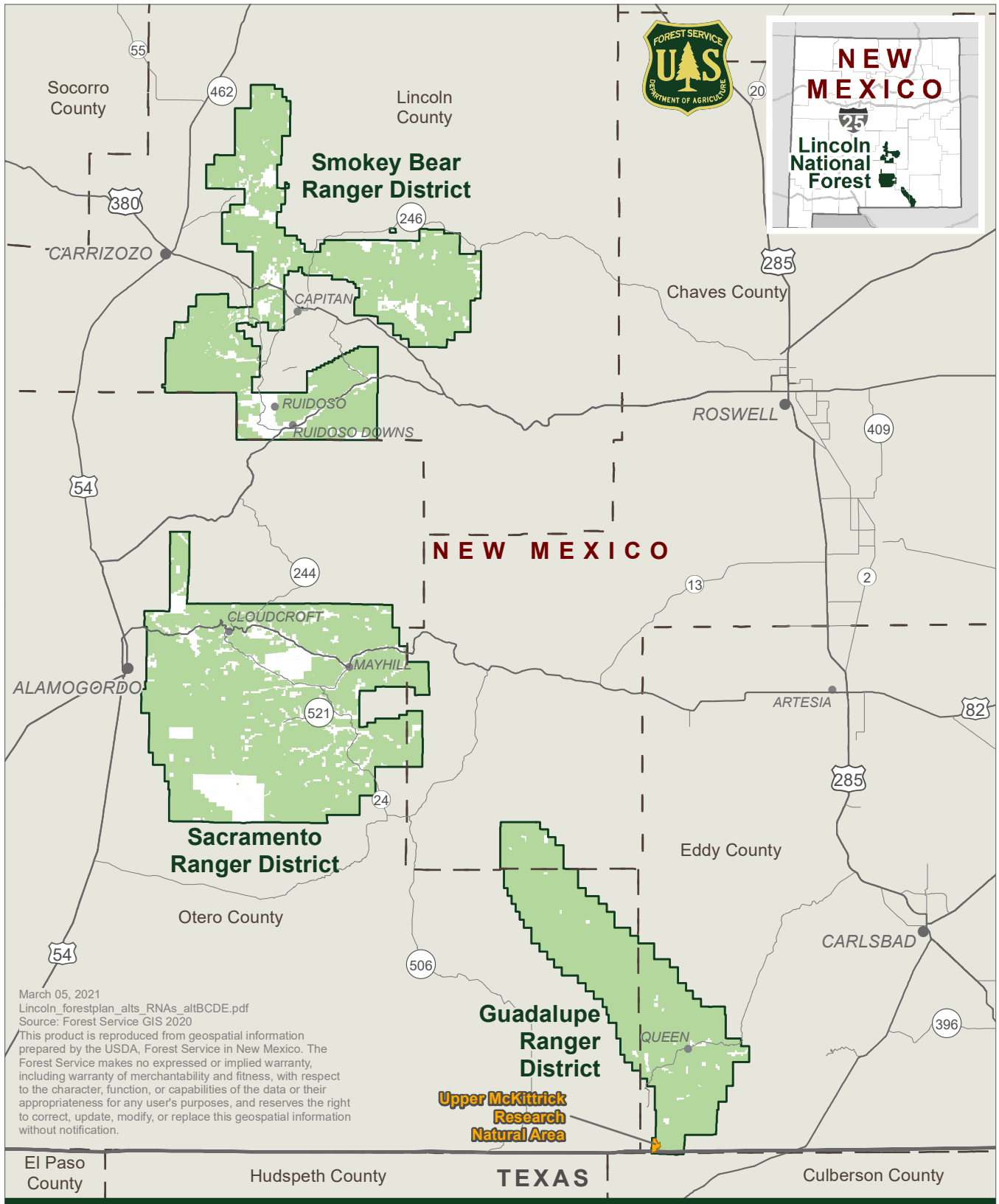


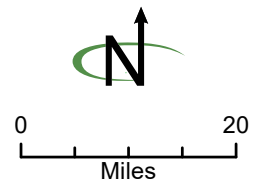
Figure 2-10 Alternatives B and D: Recommended Wilderness





**Figure 2-11 Alternatives B, C, D, and E:
 Research Natural Areas**

- Research natural area
- Lincoln National Forest, Forest Plan revision area
- County



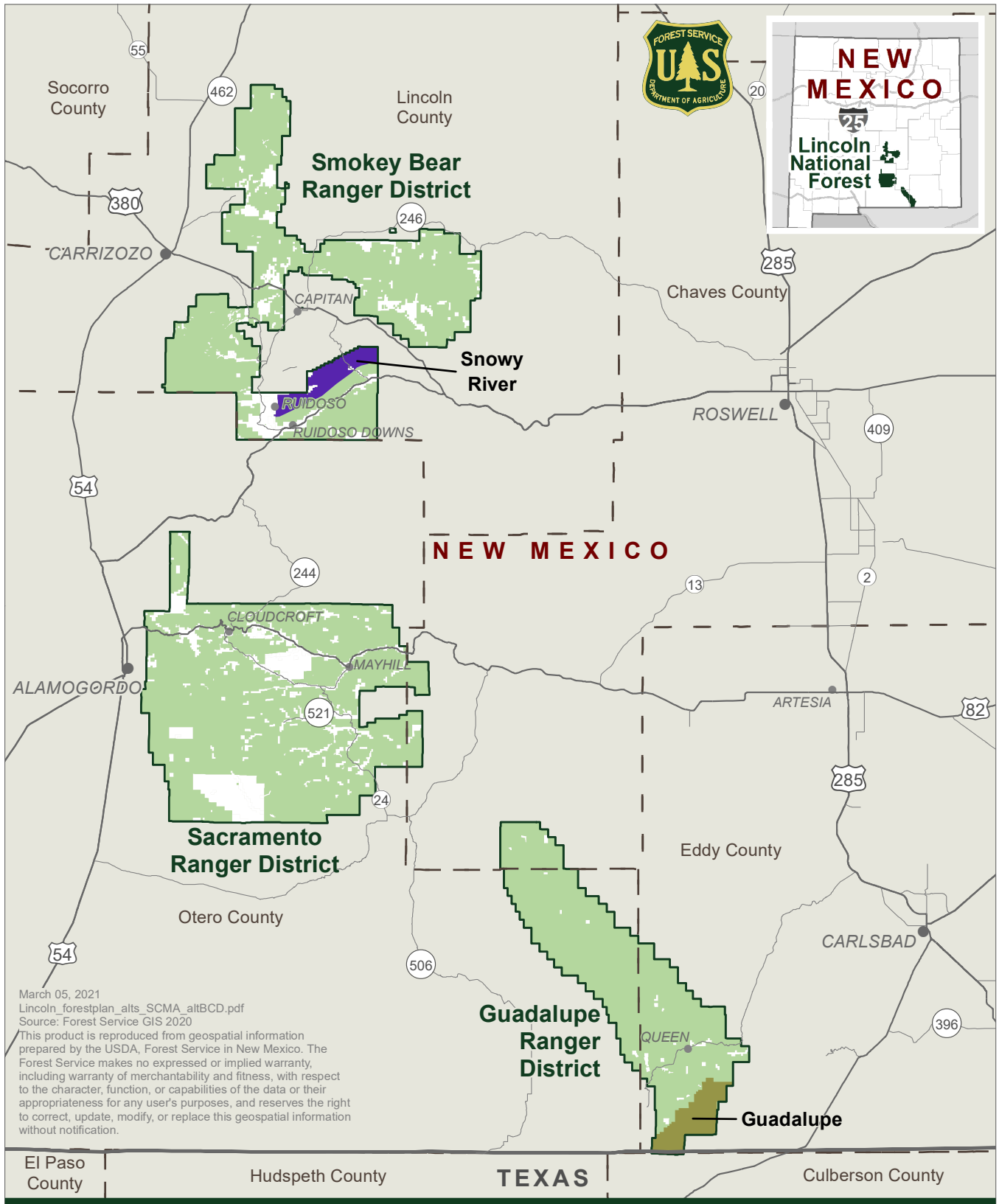
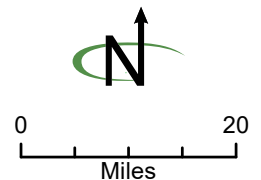


Figure 2-12 Alternatives B, C and D: Special Cave Management Areas

- Guadalupe
- National Forest
- Snowy River
- Private or other
- Lincoln National Forest, Forest Plan revision area
- County



- They would be recommended for withdrawal from minerals, geothermal, or oil and gas development.
- New major infrastructure rights-of-way will not be issued.
- New facilities construction would not introduce pollution, such as chemicals and sewage, to protect cave biotic values.
- Significant cave entrances must be located and avoided prior to mechanical vegetation treatment.

Elements Specific to Alternative C

Alternative C was developed in response to public commenters who expressed a desire to reduce human intervention on the Lincoln NF and allow natural processes to manage the natural resources. This alternative emphasizes passive vegetation management; recommends more wilderness; and de-emphasizes commercial use of timber, forest products, and motorized access to the Lincoln NF. It does this through plan components that decrease acres suitable for timber and require roads constructed for projects to be closed to public access and closed after project completion, unless required for operation and maintenance.

Access and Recreation

Alternative C would also prioritize land acquisition evaluations on lands that provide connectivity for terrestrial and riparian plants and wildlife.

Natural Resource Management

Under alternative C, vegetation management stresses wildland fire as the primary restoration tool. Mechanical thinning acreage would be reduced and only used in limited situations. As a result, fewer commercial forest products would be available, and fewer suitable timber acres would be treated.

Alternative C would have fewer acres of mechanical thinning with the following objective for mechanical treatments:

- Mechanically treat 6,500 to 12,500 acres for the forested-frequent fire ERUs (mixed conifer with aspen, mixed conifer/frequent fire, and ponderosa pine) and the piñon-juniper woodland ERU during each 10-year period following plan approval

In addition, alternative C would not use of chemicals for vegetation treatments and would prioritize land acquisitions that provide connectivity for terrestrial and riparian plants and wildlife.

Livestock Grazing and Rangeland Management

Same as alternative B.

Economics

Alternative C recommends more acres for wilderness, resulting in fewer acres suitable for timber production (145,400 acres; figure 2-13).

Wilderness and Special Management Areas

Alternative C recommends 402,000 acres for wilderness designation (figure 2-14). It recommends emphasizing naturalness and primitive recreation opportunities and includes those areas that have high or very high overall cumulative scores (cumulative scores from 7.6 to 10) from the wilderness evaluation process (see appendix B for an analysis of the individual polygons recommended for wilderness designation and a more detailed explanation of the evaluation criteria).

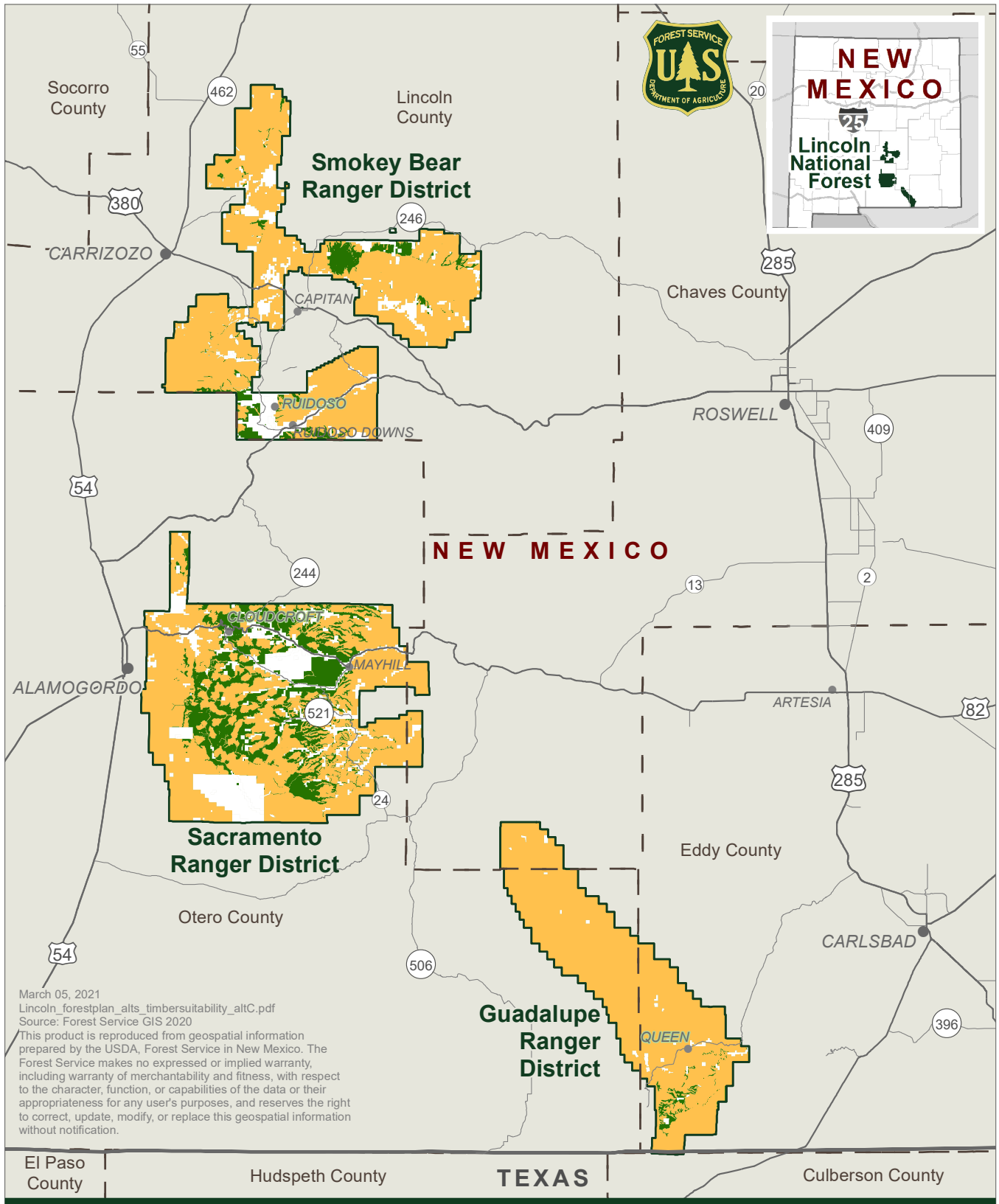


Figure 2-13 Alternative C: Timber Suitability

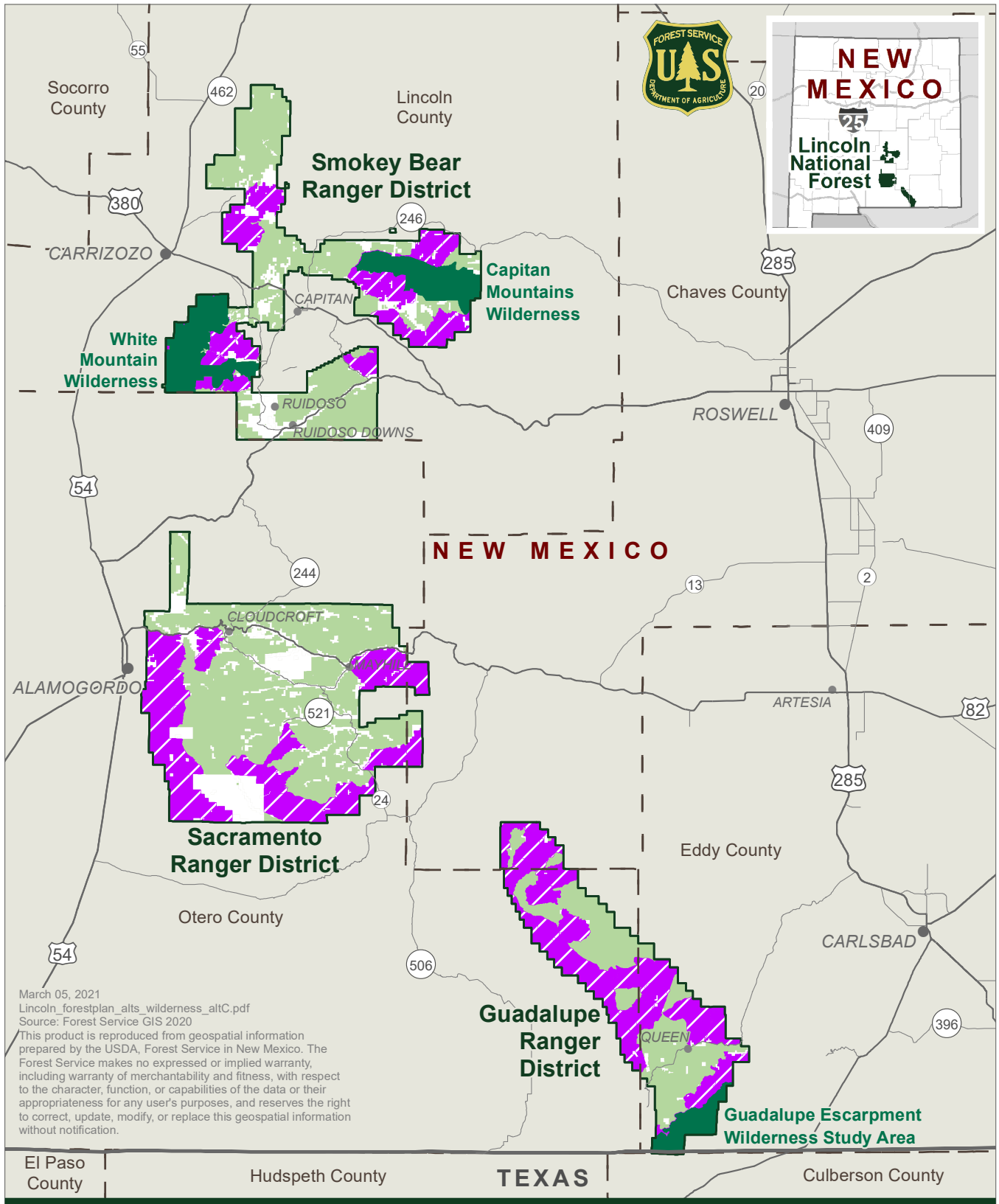
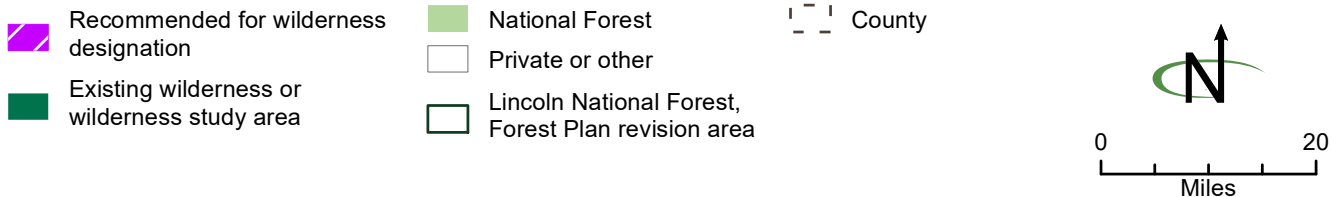


Figure 2-14 Alternative C: Recommended Wilderness



Alternative C would propose the same RNA and two special cave management areas, and it manages the same 54 wild and scenic river segments proposed under alternative B.

Elements Specific to Alternative D

Alternative D was developed in response to commenters who expressed a desire for more active management to achieve the Lincoln NF's desired conditions for natural resources. The alternative's forest plan components focus on increased restoration of riparian areas, wildlife habitat, and aquatic areas.

Access and Recreation

Similar to alternative B, alternative D would follow the travel analysis process for decommissioning administratively closed roads, but it would prioritize decommissioning roads that affect riparian areas or hinder habitat connectivity. Land acquisition evaluations would be prioritized the same as they would be under alternative C.

Natural Resource Management

Alternative D would include the same vegetation treatment and prescribed burning objectives as alternative B.

Alternative D would prioritize projects that improve terrestrial and aquatic wildlife habitat and connectivity by increasing the acreage and number of projects with the following objectives:

- Restore or enhance at least 75,000 acres of terrestrial wildlife habitat during each 10-year period following plan approval
- Reduce nonnative fish in native fish populations in at least six stream reaches during each 10-year period following plan approval
- Complete at least eight projects to improve habitat connectivity for aquatic and riparian species—for example, removing barriers, relocating and decommissioning roads, restoring dewatered stream segments, connecting fragmented habitat, and providing wildlife passage friendly fences—during the 10-year period following plan approval
- Restore or protect 10 miles of aquatic habitat over a 10-year period following plan approval
- Improve the WCF score for at least six watersheds over the life of the plan
- Restore or enhance at least 40 acres of wetlands over 10-years

Livestock Grazing and Rangeland Management

Same as alternative B.

Economics

Similar to alternative B, timber production and sales would occur where applicable to complement an emphasis on completing ERU treatments. Alternative D would have the same acres available for timber as alternative B (figure 2-8).

Wilderness and Special Management Areas

Alternative D recommends the same evaluated wilderness areas, RNA, and special cave management areas, and it manages the same 54 wild and scenic river segments areas as alternative B.

Elements Specific to Alternative E

Alternative E was developed to promote easier access and increased multiple-use opportunities on the Lincoln NF. It focuses on promoting more developed recreation opportunities with increased motorized access to developed recreation sites and having fewer restrictions on land uses, including limited recommended wilderness and no special management areas. Alternative E also emphasizes timber production for commercial sale, rather than just restoring historical fire regimes, and promotes livestock grazing.

Access and Recreation

Alternative E focuses on providing more accessible recreation opportunities. It would do this by maintaining access roads to developed recreation sites at maintenance level III⁴ or higher and prioritizing land acquisitions that improve recreational access. In addition, alternative E would focus on locating caves suitable for recreational access.

Natural Resource Management

Alternative E would include the same vegetation treatment and prescribed burning objectives as alternative B.

Alternative E would have the same management direction for riparian areas and wildlife and fish habitat as alternative B; however, it would decrease the miles of stream reaches from 12 miles in alternative B to 8 miles.

Livestock Grazing and Rangeland Management

Same as alternative B, except that alternative E would provide 10 new water sources in grazing allotments for livestock and wildlife use over 10 years, which could increase the capacity for grazing cattle on underutilized allotments.

Economics

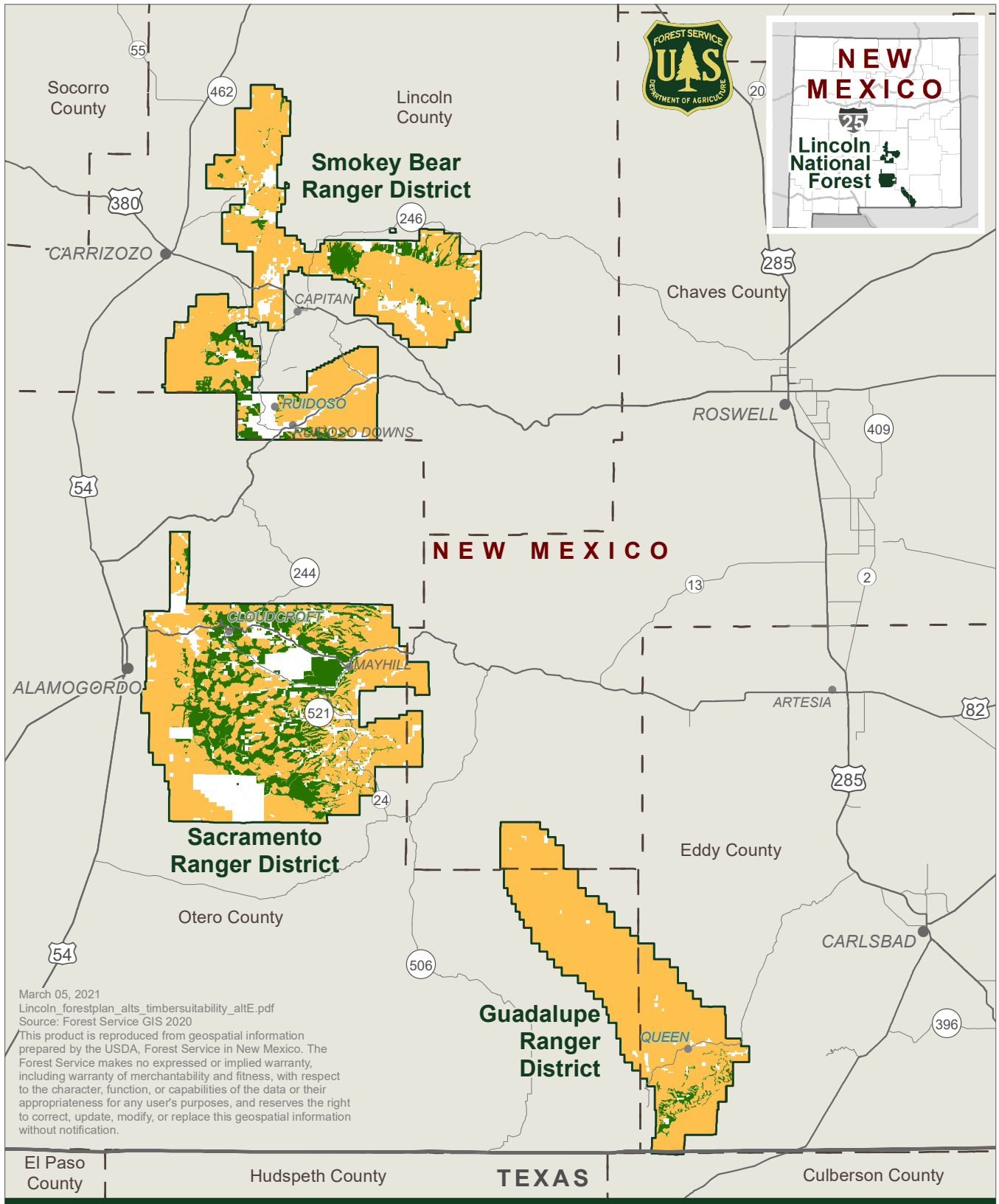
Alternative E prioritizes economic uses of the Lincoln NF. It would stress timber management on timber sales and forest products, maintain and promote increased grazing levels, and prioritize developed and accessible recreation. Alternative E would include 179,600 acres suitable for timber (figure 2-15).

Wilderness and Special Management Areas

Alternative E recommends 21,900 acres for wilderness designation (figure 2-16). Because alternative E focuses on developed recreation and motorized access, 11 wilderness areas are recommended for designation, as opposed to 21 wilderness areas recommended under alternative B. Those recommended are only those areas bounded by or adjacent to designated wilderness, which would improve its manageability (see appendix B for an analysis of the individual polygons recommended for wilderness designation and a more detailed explanation of the evaluation criteria).

Alternative E would propose the Upper McKittrick RNA, which is the same as under alternative B; it would also manage the same 54 wild and scenic river segments. It would not designate either of the special cave management areas.

⁴ Level III Forest Service roads are passable to prudent drivers in passenger cars during the normal season of use and are typically driven at low speeds, with single lanes and turnouts.



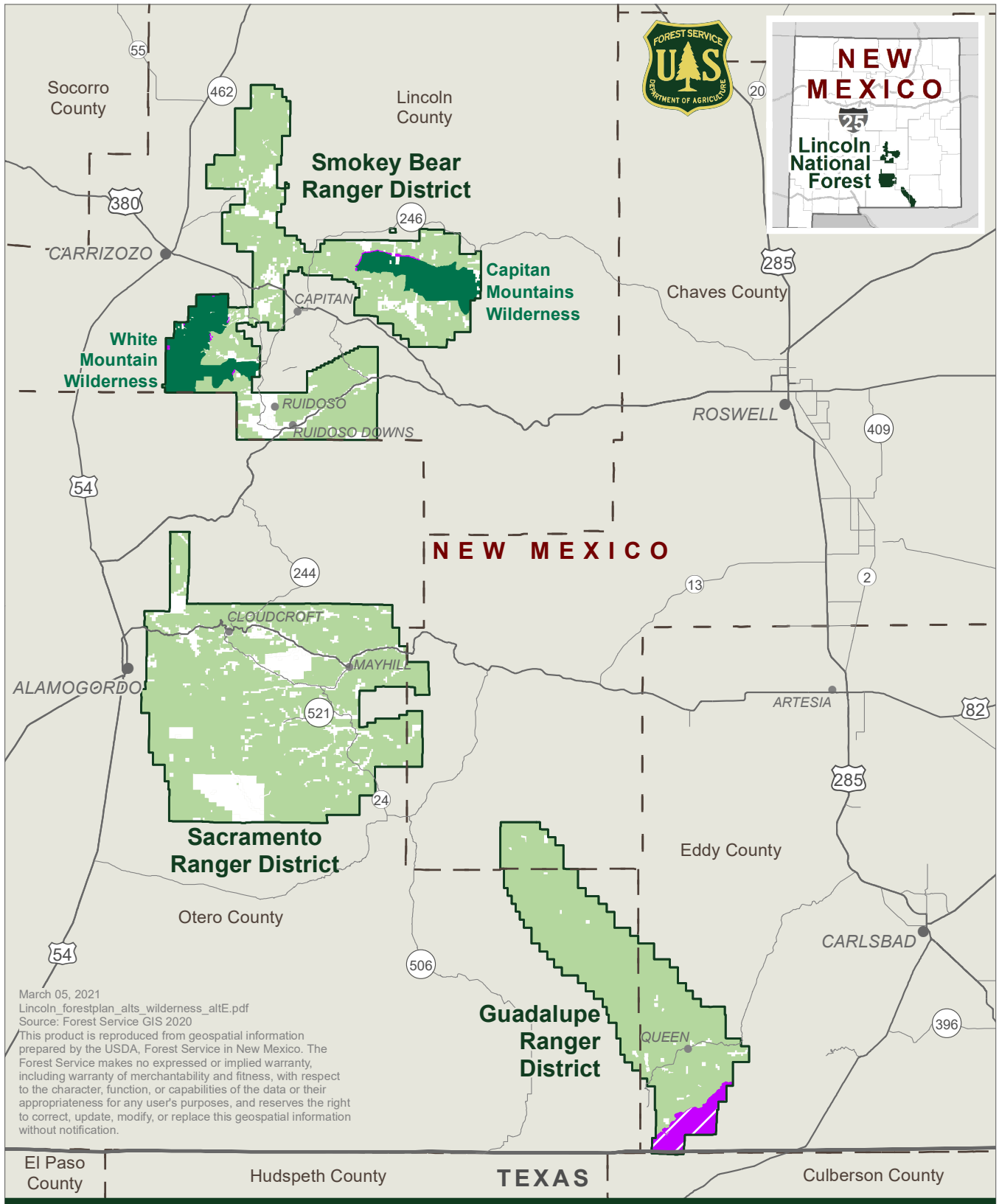
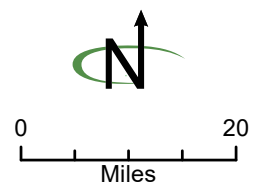


Figure 2-16 Alternative E: Recommended Wilderness

-  Recommended for wilderness designation
-  National Forest
-  Existing wilderness
-  Private or other
-  Lincoln National Forest, Forest Plan revision area
-  County



Alternatives Considered but Eliminated from Detailed Study

The National Environmental Policy Act requires Federal agencies to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the initial plan components and alternatives themes in May 2019 suggested alternative methods for achieving the purpose and need. Some of these alternatives are outside the scope of revising the forest plan; are already decided by higher law, regulation, or policy; duplicate the alternatives considered in detail; or have components that would cause unnecessary environmental harm. A number of alternatives were, therefore, considered but dismissed from detailed consideration for the reasons summarized below.

Alternative That Would Prohibit Livestock Grazing

A no-grazing alternative would not meet legal direction that forests be managed using multiple-use and sustained-yield principles, in accordance with the National Forest Management Act and the Multiple-Use Sustained Yield Act of 1960. This alternative also would not allow the attainment of the desired condition for livestock grazing to contribute to the long-term socioeconomic diversity, stability, and cultural identity of local communities; therefore, a no-grazing alternative is inconsistent with existing laws, Forest Service policy and direction, and the purpose of and need for revising the forest plan.

Under all alternatives, the rangelands management and livestock grazing program have multiple mechanisms to evaluate, review, and adapt management as needed to effectively protect resources and respond to changing conditions. Stocking decisions regarding the amount of livestock grazing authorized for each allotment are considered as part of the project-level analysis; they are beyond the scope of this programmatic analysis for the forest plan. Project-level analysis would cover changes to authorized grazing through term grazing permits (subject to Lincoln NF-wide standards and guidelines), allotment management plans, and annual operating instructions.

In addition, the alternatives include a range of options on how to contend with vacant and understocked allotments that could increase or decrease grazing numbers. Based on the above, an alternative that removes grazing on the Lincoln NF is not considered necessary.

Alternative to Conduct a Grazing Suitability Analysis

A commenter requested that the Forest Service do a grazing suitability analysis as part of the draft plan. This was considered as an alternative but was not analyzed in detail. The 2012 Planning Rule does not require that a suitability analysis be performed for grazing. Decisions related to the management of individual allotments are done at the site-specific level. Range conditions are monitored as required by the National Environmental Policy Act decision for the allotment. Where monitoring shows desired conditions are not being met, management of livestock grazing may be adjusted within the scope of the site-specific National Environmental Policy Act decision for the allotment. This allows for any needed adjustments to be made on a site-specific basis to maintain and move toward desired conditions for watersheds, wildlife habitat, and other resources.

Alternative That Removes Mining from the Entire Lincoln NF

The Forest Service received comments requesting an alternative that would remove mining from the entire Lincoln NF. An alternative that would direct management of some resources at the exclusion of others would be contrary to law and, therefore, would not be a selectable alternative.

This alternative also would not allow desired conditions for mining, minerals, and abandoned mines to contribute to the long-term socioeconomic diversity, stability, and cultural diversity of local communities;

therefore, a no-mining alternative is inconsistent with existing laws, Forest Service policy and direction, and the purpose of and need for revising the forest plan.

Under all alternatives the mining and minerals management program has multiple mechanisms to evaluate activities on the Lincoln NF as part of the project-level analysis (National Environmental Policy Act); it is beyond the scope of this programmatic analysis for the forest plan. Alternatives C and D also emphasize protecting natural resources. They would prioritize protecting natural resources over some economic development opportunities.

Alternative That Prioritizes Watershed Protection and Aquatic Habitat Improvement

Multiple commenters wanted an alternative that focused on watershed protection and improvement of aquatic habitat, particularly for reintroducing the Rio Grande cutthroat trout. The Forest Service did not outline a specific, single watershed and aquatic habitat alternative during this forest plan revision process; nevertheless, the protection of watershed resources and improving aquatic habitat is written into all alternatives, with objectives to meet desired conditions. Alternatives C and D prioritize watershed protection and improvement of aquatic habitat. Under alternative D, these objectives would come about through protective forest plan components and watershed and aquatic habitat improvement objectives that include more acreage and proposed projects.

Alternative to Include All Lands in the Wilderness Inventory as Recommended Wilderness

The Forest Service considered, but did not include, an alternative based on the comment to include all inventory areas as recommended wilderness. There is no requirement in the 2012 Planning Rule for all lands in the inventory and subsequent evaluation to be carried forward in an alternative (Forest Service Handbook 1909.12, chapter 70.73). The planning rule requires that the responsible official identify under one or more alternatives which areas, or portions thereof, to carry forward as recommended wilderness. Additionally, not all lands in the wilderness inventory have wilderness characteristics, meaning they can be excluded from further evaluation under the 2012 Planning Rule.

Alternative That Would Open or Close Roads

Decisions related to the road system and other motorized uses on the Lincoln NF are outside the scope of forest plan revision under the 2012 Planning Rule. Decisions pertaining to motorized uses on the Lincoln NF are made through a separate NEPA analysis, in accordance with the Travel Management Rule (36 CFR 212).

Site-specific decisions were made for all three districts; the decisions were to close the Lincoln NF to cross-country travel and designate an open road system, based on multiple factors, including public input. The section of the draft forest plan incorporates these decisions through a transportation standard that requires the Lincoln NF to be managed based on the current motor vehicle use map. It states that “Motor vehicle use must be managed to occur as depicted on the most recently updated motor vehicle use map, except as authorized (e.g., by law, permit, valid right, or order).” Any future transportation system changes would be covered under a separate National Environmental Policy Act analysis.

Alternative That Focuses on Wildlife Movement and Connectivity

Multiple commenters requested a greater focus on wildlife movement and connectivity. While a specific, single alternative was not outlined in this forest plan revision process, the draft forest plan and alternatives provide for a range of wildlife connectivity plan components. For example, alternative D

emphasizes terrestrial and aquatic habitat improvement through increasing objective targets for terrestrial and aquatic habitat restoration.

Alternative That Would Limit Road Density on the Lincoln NF

An alternative was suggested that would adopt road density thresholds. This alternative was considered but not in detail; this is because decisions have been made on the Lincoln NF that identified the open road system during the travel management process. Under this process, alternatives were developed and analyzed based on resource issues. Decisions were made collaboratively and scientifically, which resulted in the current road density. While it is desirable to limit new roads and decommission unneeded roads, managing toward a specific road density would be arbitrary and would not meet the purpose and need.

Alternative That Specifies How Desired Conditions Will Be Achieved

The intent of the plan is to develop a vision for the future of the resources managed by the Forest Service. It would achieve this vision by developing and implementing projects and activities that will move toward desired conditions. The plan is flexible so that, as best available science changes or is improved, new and different approaches can be developed and adopted in order to best reach desired conditions.

Alternative That Would Recommend Vacant Grazing Allotments for Closure

The Forest Service considered, but did not include, an alternative that would have recommended vacant allotments for closure. Under Forest Service policy, a decision to close or open allotments, including vacant allotments, is not a plan-level decision; those decisions are considered as part of the project-level analysis. It is beyond the scope of this programmatic analysis for the forest plan. Based on the above, an alternative that recommends vacant allotments for closure on the Lincoln NF is not feasible.

Comparison of Alternatives

Five key issues were developed during scoping to highlight the effects or unintended consequences that may occur from the proposed action or alternatives. Alternatives were developed around these significant issues that involved unresolved conflicts concerning alternative uses of available resources (40 Code of Federal Regulations 1502.14). These issues are described in more detail in chapter 1.

This section compares the alternatives and identifies the major differences between the alternatives. Table 2-3 identifies forest plan components that differ between the action alternatives, and table 2-4 includes expected outputs for each alternative. Table 2-5 includes the RNA, recommended wilderness, and special cave management areas proposed under each alternative.

Access and Recreation

Under alternative A, each management area has specific standards and guidelines for recreation that cover visual quality objectives, recreational opportunity spectrum (ROS) classes, and trail management. While management areas do not cover the whole forest and often overlap, there are no forestwide standards and guidelines or overarching recreation management, as opposed to the other alternatives. Alternative A supports a more project-by-project, commodity-based approach to recreation management.

More than the other alternatives, alternative B balances access to the Lincoln NF and recreation opportunities with natural resource protection. It would include additional guidelines for emphasizing resource protection during road construction and maintenance for riparian areas and stream crossings; it would also limit resource damage by including a guideline to prohibit public access on roads constructed for specific projects and for those roads to be reclaimed once the project is complete.

Alternative E would promote recreation at developed recreation sites by maintaining access roads to developed recreation sites at maintenance level III or higher and prioritizing land acquisitions that improve recreational access.

Natural Resource Management

Alternative A would continue to manage vegetation based on the management area emphases based on specific geographic locations (table 2-2). These require Forest Service officials to interpret the intent of the management areas as decisions arise and to determine vegetation treatments as projects arise. Conflicts have arisen when vegetation treatments have crossed management areas. Also, no forestwide desired conditions were developed to guide vegetation management across the entire Lincoln NF.

As opposed to alternative A, alternatives B, C, D, and E would designate desired conditions for all vegetation ERUs and use objectives, standards, and guidelines to guide management with the intent of moving ERUs toward desired conditions. This would include objectives that would use mechanical treatments and prescribed fire to treat ERUs. The focus would be on treating forested-frequent fire ERUs and the piñon and juniper ERUs.

Alternative C would emphasize natural processes to move ERUs toward desired conditions. The use of mechanical treatments would be limited; of all the alternatives, alternative C would use mechanical treatments to treat the least amount.

Alternative A does not include any forestwide management direction for riparian areas; however, it does include riparian forest plan components for some of the management areas. The methods and tools used for riparian restoration would be determined as projects arise.

Alternatives B and C balance the protection of riparian areas with other priorities forestwide. The methods and tools used for riparian restoration would be determined using a landscape approach. These alternatives include several guidelines for emphasizing riparian area protection when placing grazing infrastructure; managing motorized equipment in riparian areas; protecting mature, late-seral trees; and providing guidance for the establishment of riparian management zones.

Alternative D emphasizes restoration of riparian areas with a guideline that would prioritize decommissioning administratively closed roads that affect riparian habitat or affect habitat connectivity. In addition, alternative D promotes restoration of riparian areas by increasing the number of habitat connectivity projects in riparian and aquatic areas.

Management under alternative E is similar to management under alternative B with many of the same guidelines; however, commercial uses would be prioritized under alternative E, thereby reducing opportunities for riparian restoration.

Alternative A includes management direction for wildlife habitat under specific management areas, but it does not provide a framework for managing habitat forestwide. As opposed to alternative A, the other alternatives use a list of at-risk species to manage forestwide habitat. Alternatives B, C, and E would include several objectives to improve terrestrial and aquatic wildlife habitat, connectivity, and watersheds. Compared with alternatives B and C, alternative D would emphasize improving terrestrial and aquatic wildlife habitat and watershed health by increasing the objectives for terrestrial and aquatic wildlife habitat, connectivity, and watershed improvement projects. Alternative E would de-emphasize watershed improvement projects by lowering the objectives for functioning at risk and nonfunctioning watersheds in order to focus on other priorities.

Table 2-3. Comparison of Plan Components Changing by Action Alternative

Resource	Plan Component	Alternative B	Alternative C	Alternative D	Alternative E
Roads	Guideline	None	None	Road decommissioning should be prioritized in riparian areas or to improve habitat connectivity.	None
Roads	Guideline	None	None	None	Access roads to developed recreation sites should be maintained at level III or higher.
Significant Caves	Guideline	None	None	None	Surveys to locate additional caves should prioritize the location of more caves suitable for recreation purposes.
All Vegetation Types	Guideline	Chemical application techniques should be applied to reduce negative effects (e.g., chemical-free buffers and spot treatments).	Chemical treatments should not be used for vegetation treatments.	Same as alternative B	Same as alternative B
Mixed Conifer/ Frequent Fire Forest	Objective	At least 6,000–8,000 acres of mechanical thinning over 10 years	At least 3,000–4,000 acres of mechanical thinning over 10 years	Same as alternative B	Same as alternative B
Ponderosa Pine Forest	Objective	At least 2,000–3,000 acres of mechanical thinning over 10 years	At least 1,000–1,500 acres of mechanical thinning over 10 years.	Same as alternative B	Same as alternative B
Piñon-Juniper Woodland/ Grassland	Objective	At least 1,000–3,000 acres of mechanical thinning over 10 years	At least 500–1,500 acres of mechanical thinning over 10 years	Same as alternative B	Same as alternative B

Resource	Plan Component	Alternative B	Alternative C	Alternative D	Alternative E
Riparian Areas	Objective	Improve a minimum of 12 miles of riparian areas considered to be functioning at risk or nonfunctioning over a 10 year period	Same as alternative B	Same as alternative B	Improve a minimum of 8 miles of riparian areas considered to be functioning at risk or nonfunctioning over a 10 year period
Wildlife/ Fish/Plants	Objective	Restore or enhance at least 50,000 acres of terrestrial wildlife habitat during each 10-year period following plan approval	Same as alternative B	Restore or enhance at least 75,000 acres of terrestrial wildlife habitat during each 10-year period following plan approval	Same as alternative B
Wildlife/ Fish/Plants	Objective	Reduce nonnative fish in native fish populations in at least four stream reaches during each 10-year period following plan approval	Same as alternative B	Reduce nonnative fish in native fish populations in at least six stream reaches during each 10-year period following plan approval	Same as alternative B

Resource	Plan Component	Alternative B	Alternative C	Alternative D	Alternative E
Wildlife/ Fish/Plants	Objective	Complete at least five projects to improve habitat connectivity for aquatic and riparian species by, for example, removing barriers, relocating and decommissioning roads, restoring dewatered stream segments, connecting fragmented habitat, and providing wildlife passage friendly fences, during the 10 years following plan approval	Same as alternative B	Complete at least eight projects to improve habitat connectivity for aquatic and riparian species by, for example, removing barriers, relocating and decommissioning roads, restoring dewatered stream segments, connecting fragmented habitat, and providing wildlife passage friendly fences, during the 10 years following plan approval	Same as alternative B
Wildlife/ Fish/Plants	Objective	Restore or protect 5 miles of aquatic habitat over a 10-year period	Same as alternative B	Restore or protect 10 miles of aquatic habitat over a 10-year period	Same as alternative B
Water Resources	Objective	Improve the Watershed Condition Framework (WCF) score for at least two watersheds over the life of the plan	Same as alternative B	Improve the WCF score for at least six watersheds over the life of the plan	Same as alternative B
Water Resources	Objective	Restore or enhance at least 20 acres of wetlands over 10 years	Same as alternative B	Restore or enhance at least 40 acres of wetlands over 10 years	Same as alternative B

Resource	Plan Component	Alternative B	Alternative C	Alternative D	Alternative E
Lands and Access	Guideline	<p>Land exchanges should be recommended under the following conditions:</p> <ul style="list-style-type: none"> • Opportunities to acquire private land within wilderness or with access to wilderness • Community expansion needs • Disposals for isolated tracts or tracts surrounded by private land • Acquisitions of private land in areas where there is a need to block up National Forest ownership for resource management (e.g., habitat connectivity) <p>Dispose of National Forest System land with substantial improvements under special-use permit to local governments or private organizations</p>	<p>Land acquisition evaluations should prioritize lands that provide connectivity for terrestrial and riparian plants and wildlife.</p>	<p>Same as alternative C</p>	<p>Land acquisitions evaluations should prioritize recreation access.</p>

Resource	Plan Component	Alternative B	Alternative C	Alternative D	Alternative E
Range	Objective	None	None	None	Within 10 years, provide 10 new water sources in underutilized allotments for wildlife and livestock use
Renewable Energy	Objective	None	None	None	Conduct an assessment of areas appropriate for energy development within 10 years of plan approval

Livestock Grazing and Rangeland Management

Under all alternatives, stocking; grazing intensity, duration, and timing; and utilization and forage threshold decisions would be considered as part of the project-level analysis. The project-level analysis would cover changes to authorized grazing through term grazing permits, allotment management plans, and annual operating instructions.

Under alternative A, National Forest System lands would continue to be managed for each individual allotment, which fails to take a landscape-level approach to management. The current 1986 Forest Plan does not include forestwide desired conditions with objectives, standards, or guidelines for management of livestock and range infrastructure to move rangelands toward desired conditions.

The proposed plan, under alternatives B, C, D, and E, would identify forestwide desired conditions for all resources listed in the plan based on the experience of Forest Service staff, along with the best available science and current Forest Service laws and regulations. The Forest Service would then develop objectives, standards, and guidelines to assist range managers when making allotment-level decisions to ensure that range conditions are moving toward desired conditions.

As opposed to the other alternatives, alternative E would promote opportunities for additional water sources and locations in grazing allotments where a lack of water restricts grazing.

Economics

Timber production is the prominent resource use that contains varying planning components across alternatives. Alternative A manages suitable timber land to provide a sustained yield of quality timber. Under alternatives B, C, and D, timber harvests would supplement other restoration and maintenance treatments that move the landscape toward desired conditions; alternative E would focus timber harvests on creating opportunities for small and large businesses and providing the greatest dollar return or unit output of timber. Overall, alternative D would have the largest acreage available for timber harvest, and alternative C would have the least amount available due to its focus on natural processes and de-emphasis of mechanical treatments (table 2-4).

Table 2-4. Comparison of Expected Outputs by Alternative

Expected Outputs	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Suitable timber acres	166,300	179,200	145,400	179,200	179,600
Projected timber sale quantity	N/A	19 million cubic feet over the next 20 years	19 million cubic feet over the next 20 years	26 million cubic feet over the next 20 years	26 million cubic feet over the next 20 years
Projected wood sale quantity	N/A	24 million cubic feet over the next 20 years	24 million cubic feet over the next 20 years	32 million cubic feet over the next 20 years	25 million cubic feet over the next 20 years
Mechanical treatments ¹	No objectives	11,000 to 19,500 acres over 10 years	6,500 to 12,500 acres over 10 years	Same as alternative B	Same as alternative B
Prescribed fire acres	No objectives	At least 200,000 acres over 10 years	Same as alternative B	Same as alternative B	Same as alternative B

Expected Outputs	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Active grazing allotments	935,200	935,200	935,200	935,200	935,200

Source: Forest Service GIS 2020 and appendix D

¹ – All action alternatives include 1,000 to 3,000 acres of mechanical treatments for the mixed conifer with aspen ERU

Wilderness and Special Management Areas

Alternative A would maintain the current system of management areas and does not recommend any additional management areas. All the action alternatives would propose the Upper McKittrick RNA, and alternatives B, C, and D would designate the Guadalupe and Snowy River Special Cave Management Areas. Given its emphasis on passive recreation and conservation, alternative C would have the greatest acreage for recommended wilderness. Alternatives B and D call for the second most acreage for wilderness designation, while alternative E calls for just 21,900 acres (table 2-5).

Table 2-5. Comparison of Management Areas Among the Five Alternatives

Management Area Type	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Research natural areas	0 existing RNAs, 3 proposed RNAs (Upper McKittrick, Haynes Canyon, and William G. Telfer)	0 existing RNAs, 1 proposed RNA (Upper McKittrick) ¹	0 existing RNAs, 1 proposed RNA (Upper McKittrick) ¹	0 existing RNAs, 1 proposed RNA (Upper McKittrick) ¹	0 existing RNAs, 1 proposed RNA (Upper McKittrick) ¹
Recommended wilderness	No recommended wilderness in the 1986 Forest Plan	21 areas; 40,500 acres ²	51 areas; 402,000 acres ²	21 areas; 40,500 acres ²	11 areas; 21,900 acres ²
Special cave management areas	None	Guadalupe Mountains and Snowy River	Guadalupe Mountains and Snowy River	Guadalupe Mountains and Snowy River	None

Source: Forest Service 2020

¹ Appendix C includes the rationale for retaining the Upper McKittrick RNA and not including the proposed Haynes Canyon and William G. Telfer RNAs in alternatives B, C, D, and E

² Includes the Guadalupe Escarpment WSA

Comparison of Effects of Alternatives

Table 2-6 compares impacts through indicators by alternative. It also displays how effective an alternative is at achieving desired conditions for each resource identified in the proposed plan. The alternative(s) that has the best ability to achieve desired conditions is labeled the “most effective.” The alternative(s) that would achieve desired conditions, but at a potentially slower rate, is labeled “effective.” The alternative(s) that would be the slowest at achieving desired conditions is labeled “least effective.” The alternative(s) that would have the most difficulty in achieving desired conditions is labeled “ineffective.”

Table 2-6. Comparison of Effects of Alternatives

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Upland Vegetation Communities					
Miles of motorized and nonmotorized routes	Vegetation would continue to be damaged due to a lack of direction to mitigate resource damage from developed recreation sites and direction regarding dispersed camping.	Areas open to dispersed camping within 300 feet of designated routes would be the same across all action alternatives. Management actions to reduce nonnative, invasive plant spread and native vegetation degradation at developed recreation sites would reduce vegetation damage compared with alternative A.	Same as alternative B	Same as alternative B	Same as alternative B
Acres of ERUs open to mechanical thinning and prescribed and naturally ignited fire vegetation treatments	There are no objectives for using mechanical treatments and prescribed or naturally ignited fire to move vegetation toward desired conditions, so effects from these types of management would not occur.	Between approximately 11,000 and 19,500 acres of forested and woodland ERUs would be treated with mechanical thinning over a 10-year period, and approximately 200,000 acres of forested and woodland ERUs would be treated with prescribed or naturally ignited fire.	Alternative C would reduce the acres of mechanical thinning but maintain the acreage of prescribed burning and would not allow chemical treatments. Treatments would not be as effective as under alternative B, but still improve woodland ERUs compared to alternative A.	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
		<p>Fire treatments could be combined with mechanical thinning treatments, increasing effectiveness of treatments compared with alternative A. Follow-up chemical treatments may increase treatment efficacy.</p>			
<p>Acres of ERUs open or closed to livestock grazing</p>	<p>Alternative A would continue to manage individual allotments within the numerous management areas included in the 1986 Forest Plan (see table 2-2) with no desired conditions or landscape-level management approach. This would not provide range managers with a landscape-level management system that would manage rangelands as a whole across the Lincoln NF.</p>	<p>Under alternative B, the proposed plan would include desired conditions along with objectives, standards, and guidelines to assist range managers during allotment-level decisions. These plan components would provide a landscape level management approach and provide range managers with a consistent, forestwide plan. The proposed plan would move upland vegetation communities toward desired conditions.</p>	<p>Same as alternative B</p>	<p>Same as alternative B</p>	<p>Same as alternative B</p>

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Acres of ERUs for timber production (economic extraction)	Commercial timber harvest, either as specific timber sales or as a by-product of vegetation treatments, or as a combination of both, may supplement other vegetation treatments and improve vegetation communities.	Same as alternative A except that vegetation treatments would focus on moving ERUs toward desired conditions in the long term	Same as alternative B	Same as alternative B	Same as alternative B
Acres of ERUs in special designation areas	Approximately 82,900 acres would continue to be managed in designated wilderness areas. Alternative A would not recommend any additional wilderness areas. Fifty-three wild and scenic river segments would be managed as eligible for designation in the National Wild and Scenic Rivers System. Protective stipulations would generally maintain vegetation conditions; however, ecosystem resilience	There would be 39,600 additional acres of ERUs in recommended wilderness and 47,300 additional acres in special cave management areas, which would decrease direct effects on vegetation from resource uses and vegetation treatments in these areas. Effects from acres of ERUs in designated wilderness and in wild and scenic river segments would be the same as those under alternative A.	There would be 401,200 additional acres of ERUs in recommended wilderness. Effects from acres of ERUs in designated wilderness and in wild and scenic river segments would be the same as those under alternative A. Effects from acres of ERUs in special cave management areas would be the same as those under alternative B.	Same as alternative B	There would be 21,100 additional acres of ERUs in recommended wilderness. Effects from acres of ERUs in designated wilderness and in wild and scenic river segments would be the same as those under alternative A. Alternative D would not include the Special Cave Management Areas.

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	may decline over time due to the lack of vegetation restoration and enhancement.				
ERU seral state proportion	There would generally be a continuation of current trends in seral state proportion and departure described in the affected environment for each ERU.	Under alternative B, management would move ERUs toward reference conditions more effectively than under alternatives A, C, D, and E. For most ERUs, departure from reference conditions would remain moderate overall.	Management would move ERUs toward reference conditions more effectively than under alternative A. For most ERUs, departure from reference conditions would remain moderate or higher overall.	Same as alternative B	Same as alternative C
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Most effective	Effective	Most effective	Effective
Soils					
Acres of soil condition ratings for the plan area	Alternative A would not provide forestwide direction for vegetation treatments. This would worsen the soil condition (soil nutrient cycling, water infiltration, and resistance to soil loss) in 15 years. Recreation would continue to compact	All the action alternatives would include plan components that would avoid soil compaction for management activities. Alternative B would provide the greatest balance for management activities and forest uses, including	Alternative C would provide the least acreage for vegetation treatments and would prioritize wildland fire for restoration. This would increase the potential for high-severity fires and soil degradation in 15 years. However, alternative C would	Similar to alternative B. Alternative D would prioritize decommissioning roads that affect riparian areas, which would prevent soil compaction and degradation in those areas over 15 years.	Alternative E would have more areas emphasized for timber volume, which would prevent soil degradation over the life of the plan. However, the soil condition may deteriorate under alternative D. This is because it would provide more

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	soils. Alternative A would not provide plan components, other than standards and guidelines for road and trail maintenance, to reduce impacts on soils from these activities.	mechanical treatments and prescribed burning, which would prevent soil condition degradation over 15 years.	provide the most acreage for recommended wilderness, which could improve soil condition in 15 years in those areas.		opportunities for accessible motorized recreation and the least acres of recommended wilderness of all the action alternatives.
Acres of soil erosion hazard ratings for the plan area	Alternative A would not include specific plan components for avoiding soil erosion, so soil erosion susceptibility would increase in 15 years.	Alternative B would increase soil erosion susceptibility in the short term; however, soil erosion susceptibility may be reduced over the long term as vegetation desired conditions are achieved.	Alternative C would reduce soil erosion susceptibility for moderate and unstable soils in the short term. This is because it would provide the least acres for vegetation treatments, and it would include the most recommended acres of wilderness. However, it would increase the potential for high-severity fires and soil loss, due to burning, over 15 years.	Similar to alternative B. Soil erosion susceptibility would decrease in riparian areas where roads are decommissioned and travel is restricted.	Alternative E would be the most destructive to soils in the short term and increase soil erosion susceptibility. This is because it would provide more opportunities for accessible motorized recreation and recommend the fewest acres of wilderness.

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Acres of slopes for the plan area at intervals of 0–15 percent, 15–40 percent, and greater than 40 percent	Alternative A would increase impacts on steeper slopes from recreation and road maintenance. Vegetation treatments would be limited to stable and metastable (0–40 percent) slopes. Overall, this alternative would result in the most impacts on soils on metastable (15 to 40 percent) slopes to unstable slopes, which are at the most risk of soil erosion.	All action alternatives would include a guideline to limit short-term and long-term impacts on soils due to ground-disturbing activities. This would provide management for all slope intervals and decrease soil erosion susceptibility, especially for unstable slopes.	Same as alternative B	Same as alternative B	Same as alternative B
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Effective	Most effective	Effective	Least effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Riparian and Wetland Ecosystems					
Road maintenance, construction, and decommissioning	Alternative A includes an objective to decommission 100 miles of roads, prohibit road construction on unstable or steep slopes, and emphasize relocating roads out of road bottoms. Implementing this objective reduces disturbance and sediment load in riparian and wetlands.	Alternative B includes plan components that limit delivery of sediment to waterbodies and adjacent riparian areas and require new roads to mitigate or eliminate impacts in riparian management zones. It also would include objectives for decommissioning 75 miles of roads, which is similar to the 100 miles of decommissioning included in alternative A, and maintaining 20 percent of trails to national quality standards. Compared with alternative A, these forest plan components would increase protection and reduce impacts for riparian areas.	Same as alternative B	Alternative D would prioritize protection of riparian areas when decommissioning roads, which would reduce the impacts of roads compared with all the other alternatives.	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Restoration	Alternative A contains no objectives for riparian restoration and does not establish riparian management zones. Riparian areas would continue to degrade under alternative A.	Alternative B includes objectives for wetland enhancement and habitat connectivity projects and for improving stream reaches, along with establishing riparian management zones. Additional forest plan components would provide guidance for riparian habitat maintenance and conservation. These measures would improve riparian and wetland areas compared to alternative A.	Same as alternative B	Alternative D increases the riparian restoration objectives. These additional projects would improve riparian areas compared to all the other alternatives.	Alternative E would reduce the miles of restored stream reaches considered functioning at risk or nonfunctioning from 12 miles under alternative B to 8 miles. This would reduce improvements to impaired riparian areas compared with alternative B; however, it would still improve impaired riparian areas more than alternative A.

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Recreation	Alternative A would not include any additional management for dispersed camping and trails within riparian areas, which would continue to adversely impact riparian areas through soil compaction, vegetation loss, and streambank destabilization.	Alternative B includes forest plan components to rehabilitate dispersed camping sites that affect riparian areas and relocate trails that adversely affect riparian areas. These plan components would protect riparian areas from adverse impacts compared to alternative A.	Same as alternative B	Same as alternative B	Same as alternative B
Livestock grazing	Alternative A would continue to manage individual allotments within the numerous management areas included in the 1986 Forest Plan (see table 2-2) with no desired conditions or landscape-level management approach. This would not provide range managers with a landscape-level management system that would manage rangelands as a whole across the Lincoln NF.	Under alternative B, the proposed plan would include desired conditions along with objectives, standards, and guidelines to assist range managers during allotment-level decisions. These plan components would provide a landscape level management approach and provide range managers with a consistent, forestwide plan. The proposed plan would move riparian areas toward desired conditions.	Same as alternative B	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Recommended wilderness and other specially designated areas	Alternative A would not recommend any additional wilderness areas and not provide any additional protection for riparian areas from surface disturbance.	Alternative B would recommend wilderness areas, including 400 acres of riparian ERUs. This would reduce disturbance from recreation and mechanical treatments; however, it could restrict restoration treatments in those areas for riparian areas.	Alternative C would recommend the most wilderness acres, including 1,100 acres of riparian ERUs, the greatest amount of all alternatives, which would reduce surface disturbance, but could restrict restoration treatments for riparian areas.	Same as alternative B	Same as alternative B
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Effective	Effective	Most effective	Effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Watersheds and Water					
Recreation	Alternative A would continue current management of trails and dispersed camping, which would continue to adversely affect water resources.	Alternative B includes plan components to rehabilitate dispersed campsites, relocate trails that affect natural resources, and maintain 20 percent of trails to meet national quality standards. These plan components would reduce adverse impacts on water resources such as streambank destabilization and changes in water quality.	Same as alternative B	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Road maintenance, construction, decommissioning	Alternative A does not provide guidance on road construction or maintenance next to waterways, but it does emphasize relocating roads out of canyon bottoms. Impacts on water resources and watersheds would continue, including increasing water temperatures and degrading water quality through sedimentation and turbidity.	Alternative B includes plan components to protect water resources, including limiting delivery of sediment to waterbodies, minimizing damage in riparian management zones, and improved stream crossings. Compared with alternative A, these plan components would improve water resources by reducing road runoff and improving hydrologic connectivity.	Same as alternative B	Alternative D would prioritize protection of riparian areas when decommissioning roads, which would reduce the impacts of roads on water resources when compared with the other alternatives.	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Water resource improvement projects	Alternative A does not include objectives for restoring water resources and considers these projects as opportunities arise. Watershed and aquatic restoration would proceed at current levels, albeit without a coordinated focus on priority watersheds.	Alternative B would identify priority watersheds for focused restoration efforts. It would include several objectives to improve watershed condition framework scores, restore wetlands, and restore aquatic habitat. These objectives combined with focused restoration efforts in the priority watersheds would ensure that hydrologic processes exhibit improved function.	Same as alternative B	Alternative D would increase the rate and scale of restoration objectives compared with all other alternatives, which would improve hydrologic processes and watershed condition.	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Vegetation management	Alternative A would continue to manage vegetation based on management area plan components. The lack of forestwide direction would increase the threat of uncharacteristic wildfire and increase potential impacts on watersheds.	Alternative B would use mechanical treatments and prescribed burning to treat ERUs. This would reduce the likelihood of uncharacteristic wildfire and would improve watershed condition, stream flow, and water quality compared with alternative A.	Compared with alternative B, alternative C would reduce acreage treated, with an increased risk of uncharacteristic wildfire. It would increase the risk to watershed condition, stream flow, and water quality from uncharacteristic wildfire, but would still reduce the risk compared to alternative A.	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Livestock grazing	Alternative A would continue to manage individual allotments within the numerous management areas included in the 1986 Forest Plan (see table 2-2) with no desired conditions or landscape-level management approach. This would not provide range managers with a landscape-level management system that would manage rangelands as a whole across the Lincoln NF.	Under alternative B, the proposed plan would include desired conditions along with objectives, standards, and guidelines to assist range managers during allotment-level decisions. These plan components would provide a landscape level management approach and provide range managers with a consistent, forestwide plan. The proposed plan would move water resources toward desired conditions.	Same as alternative B	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Recommended wilderness and designated areas	Alternative A would not recommend any additional wilderness areas and would not offer the beneficial effects of recommended wilderness to additional lands.	Alternative B would recommend 40,500 acres of wilderness, which would reduce adverse impacts on surface water resources, compared with alternative A.	Alternative C would have the greatest acreage for recommended wilderness (402,000). Compared with the other alternatives, alternative C would provide the most benefit to surface water resources by limiting motorized access, ground disturbance, and associated impacts.	Same as alternative B	Alternative E recommends only 21,900 acres for wilderness designation. Alternative D would not provide much beneficial impacts from recommended wilderness, but it would include more protection than alternative A.
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Effective	Effective	Most effective	Effective
Wildlife, Fish, and Plants					
Acres of species' habitat (ERUs) or critical habitat that overlap with recreation management areas (dispersed versus developed)	The acres of ERUs, critical habitats, and Mexican spotted owl protected activity centers that would be in recreation opportunity spectrum (ROS) areas would be the same across all alternatives. Alternative A lacks direction to mitigate resource damage from developed recreation sites, travel	All action alternatives incorporate dispersed recreation and motorized and nonmotorized trail plan components that would reduce impacts on at-risk wildlife.	Same as alternative B	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	management system construction and use, motorized and nonmotorized trails, and dispersed camping.				
Number of caves open/closed to recreational use	There are no specific plan components that are geared to provide protections for cave-dwelling mammals.	Alternative B would designate the Guadalupe and Snowy River Special Cave Management Areas to protect sensitive cave resources. Additional standards for these areas would reduce impacts on species that rely on caves as habitats.	Same as alternative B	Same as alternative B	Neither of the special cave management areas would be designated under alternative E. Plan direction would focus on locating caves suitable for recreational access, and it could open caves to recreation disturbance and displacement of species that rely on caves, if present. A permit system for cave access could address at-risk species' presence and disease prevention on a case-by-case basis to reduce impacts.
Acres of species' habitat open to mechanical thinning or prescribed burning	There is no forestwide direction for vegetation management or for prescribed burning. Alternative A would	During each 10-year period, 11,000 to 19,500 acres would be mechanically treated; 200,000 acres of the forested-	During each 10-year period following plan approval, prescribed fire could be used to treat at least 200,000 acres, and mechanical	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	continue to maintain current rates of planned and unplanned natural ignition and mechanical vegetation treatments.	frequent fire ERUs and the piñon-juniper woodland ERU would be treated with prescribed fire. Chemical treatments would be allowed in combination with other treatments. The extent of potential habitat improvements for species associated with these ERUs would be high, relative to alternative A.	treatments could be used to treat 6,500 to 12,500 acres spread across the forested-frequent fire ERUs and the piñon-juniper woodland ERU. Chemical treatments would not be allowed. Alternative C's potential habitat improvements would be less than under alternative B, but higher than under alternative A.		
Number of habitat connectivity projects for wildlife species	The lack of ecosystem-wide habitat objectives and forestwide objectives to improve terrestrial and aquatic wildlife habitat and connectivity would slow the rate of habitat improvements.	Completing riparian ecosystem and wetland restoration projects and improving watershed conditions in discrete watersheds would improve habitat connectivity and quality for at-risk aquatic and riparian species. Alternative B proposes at least five projects.	Same as alternative B	Alternative D proposes eight habitat connectivity projects, which is greater than all other alternatives. This would improve connectivity and habitat improvement for at-risk aquatic and riparian species.	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
<p>Acres of restored or enhanced habitat (terrestrial, aquatic, riparian, or wetlands)</p>	<p>The lack of ecosystem-wide habitat objectives and forestwide objectives to improve terrestrial and aquatic wildlife habitat and connectivity would slow the rate of habitat improvements.</p>	<p>Under all action alternatives, objectives to restore and enhance terrestrial and aquatic wildlife habitat and improve habitat connectivity would improve habitat conditions for at-risk species, compared with alternative A. Alternative B proposes 50,000 acres of terrestrial wildlife habitat restoration, and it proposes to reduce nonnative fish in at least four stream reaches, complete at least five habitat connectivity projects, improve at least two watersheds, and restore or protect 5 miles of aquatic habitat. These would maintain or restore wildlife habitat more than alternative A, but less than alternative D.</p>	<p>Same as alternative B</p>	<p>Alternative D proposes 75,000 acres of terrestrial wildlife habitat restoration, and it proposes to reduce nonnative fish in at least six stream reaches, complete at least eight habitat connectivity projects, improve at least six watersheds, and restore or protect 10 miles of aquatic habitat. These would maintain or restore wildlife habitat with the greatest potential habitat improvements.</p>	<p>Same as alternative B</p>

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Acres of species' habitat and critical habitat that are open/closed to livestock grazing	Alternative A would continue to manage individual allotments within the numerous management areas included in the 1986 Forest Plan (see table 2-2) with no desired conditions or landscape-level management approach. This would not provide range managers with a landscape-level management system that would manage rangelands as a whole across the Lincoln NF.	Under alternative B, the proposed plan would include desired conditions along with objectives, standards, and guidelines to assist range managers during allotment-level decisions. These plan components would provide a landscape level management approach and provide range managers with a consistent, forestwide plan. The proposed plan would move water resources toward desired conditions. In addition, any allotment-level decisions would require consultation with the USFWS for listed species and use of the SCC crosswalk (see appendix A) for at-risk species on the Lincoln NF.	Same as alternative B	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Acres/miles of recommended wilderness and special management areas	Management direction for recommended wilderness and special management areas would generally reduce impacts on at-risk species and their habitats. There are three proposed RNAs: Upper McKittrick, Haynes Canyon, and William G. Telfer. There is no recommended wilderness or special cave management areas.	There is one proposed RNA (Upper McKittrick), 21 recommended wilderness areas, and two special cave management areas. Wildlife, including at-risk species, would be more protected compared with alternative A, but less protected than under alternative C.	There is one proposed RNA (Upper McKittrick), 51 recommended wilderness areas, and two special cave management areas. Compared with all other alternatives, wildlife, including at-risk species, would be most protected under alternative C.	Same as alternative B	There is one proposed RNA (Upper McKittrick), 11 recommended wilderness areas, and no special cave management areas. Wildlife, including at-risk species, would be more protected compared with alternative A ; however, wildlife would be less protected under alternative E than under the other action alternatives.

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Habitat (ERU) trends toward reference ecological conditions	Vegetation treatments would move most vegetation states toward desired conditions but at a slower rate than the action alternatives. This would be due to the lack of ecosystem-wide habitat objectives and forestwide objectives to improve terrestrial and aquatic wildlife habitat and connectivity.	Using a variety of vegetation treatments for natural resource management to meet plan objectives would increase the efficacy of treatments and speed movement toward desired conditions. Compared with alternative A, habitat for at-risk species would likely improve at a faster rate and become more resilient to disturbances.	Alternative C would emphasize natural processes to move ERUs toward desired conditions. Movement of ERUs toward reference conditions and habitat improvements for at-risk species would proceed at a slower rate than alternative B, but faster than alternative A.	Same as alternative B	Same as alternative B
Potential for injury, mortality, or disturbance	Management under all alternatives would allow activities that could increase the potential for injury, mortality, or disturbance of at-risk species.	Plan components to reduce impacts from management activities on at-risk species and habitat would reduce the potential for injury, mortality, or disturbance of at-risk species.	Emphasizing resource protection over other resource uses and limiting mechanical treatments and not using chemical treatments could reduce the potential for injury, mortality, or disturbance of at-risk species more than under alternatives A and B.	Same as alternative C	Emphasizing other resource uses, such as recreation, over resource protection could increase the potential for injury, mortality, or disturbance of at-risk species more than under the other alternatives.
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Most effective	Effective	Most effective	Effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Air Resources					
Changes in emissions of PM ₁₀ and PM _{2.5}	There are no objectives for mechanical treatment or for prescribed burning, though these activities do occur. Acres of prescribed burning can vary from year to year, depending on conditions. There could be fewer days with smoke impacts and fewer burned acres in the short term. Long-term impacts could be greater than other alternatives because untreated areas could lead to more uncharacteristic fires, which produce more smoke in a short time period. These greater amounts may exceed air quality standards and affect visibility in Class I areas.	Management under all action alternatives includes a combination of mechanical and prescribed fire treatments on vegetation, which would have short-term smoke and dust impacts but would leave the Lincoln NF more resilient in the long term against fire-related impacts on air quality and visibility in Class I areas.	Short-term impacts would be less than under alternative B because of fewer mechanical treatments; while alternative C would decrease the risk of uncharacteristic fire over the long term compared with alternative A, this decrease would be less than under alternatives B, D, and E.	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Changes in emissions of other criteria pollutants	Emissions from vehicles and equipment for administrative, consumptive, and recreational purposes and fugitive dust produced from use of roads and trails and other surface-disturbing activities would not vary substantially across alternatives. Air quality would continue to be managed for compliance with national and State air quality standards and to meet visibility objectives in Class I areas.	Same as alternative A	Same as alternative A	Same as alternative A	Same as alternative A
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Most effective	Effective	Most effective	Most effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Fire and Fuels					
Ability to manage fire for ecological benefit	Alternative A does not provide forestwide directives for prescribed burning and mechanical treatments, which would increase the risk of uncharacteristic wildfire.	Alternative B includes a combination of prescribed burning and mechanical treatments. This would move more acres to a lower fire hazard and decrease the risk of uncharacteristic wildfire. It also would increase the ecological benefit for vegetation communities.	Alternative C would decrease the intensity of restoration treatments with the lowest acreage of mechanical treatments of all the action alternatives. It would decrease the risk of uncharacteristic wildfire events compared with alternative A, but it would increase the risk compared with alternative B. It would still increase the ecological benefit for vegetation communities compared with alternative A.	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Ability to manage fire to protect life, property, and other values at risk and the ability to manage fire safely	Alternative A continues use of fire suppression zones, which decreases the ability of fire managers to adaptively manage fires and increases the risk of uncharacteristic wildfire. The increased risk of uncharacteristic wildfire decreases the ability to protect property and other values at risk.	All action alternatives would implement the wildland fire decision support system, which provides fire managers flexibility when managing wildland forest fires. This would move ERUs toward desired conditions while protecting life, infrastructure, and values at risk.	Same as alternative B	Same as alternative B	Same as alternative B
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Most effective	Effective	Most effective	Most effective
Scenery					
Changes in scenic character and scenic integrity	Alternative A would not incorporate ecosystem management concepts into scenery management, making it difficult for managers to plan projects and work toward an improved scenic resource condition. Continued management under	Management under all action alternatives would include incorporation of guidance for considering best environmental design practices to advance environmentally sustainable design solutions, such as those in the Sustainable	Same as alternative B	Same as alternative B	Same as alternative B, except that increased human presence under this alternative could result in diminished high-quality scenery at recreation sites and, occasionally, along road and trail vistas. This is because this alternative would allow for increasing evidence of human

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	<p>the 1986 Forest Plan (as amended) would not allow for management that incorporates the current scenic management objectives. It would not provide guidance to address dispersed recreation, there would be no objectives for a specific amount of mechanical treatments and prescribed fire per year, and there would be no direction to address vacant allotments or specify any move toward desired conditions.</p>	<p>Recreation Site Design Guide. Additionally, facilities would adhere to scenic integrity objectives and not be located in areas of very high and high scenic integrity, unless they are designed to blend with the general landscape.</p>			<p>alteration, such as vegetation trampling and removal.</p>
<p><i>How the Alternatives Meet Desired Conditions</i></p>	<p>Least effective</p>	<p>Effective</p>	<p>Effective</p>	<p>Effective</p>	<p>Least effective</p>

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Cultural and Historic Resources					
Extent of potential ground disturbance, facility development, and use due to changes in recreation and access	Under all alternatives, the section 106 process would be completed for all undertakings to resolve adverse effects. There would be no change from current disturbances from dispersed camping, facility development, and recreational use.	There would be similar impacts as under alternative A; there would be no new facilities, but there would be promotion of sustainable recreation and a reduction of ecological damage, which could reduce the potential for impacts on cultural resources.	Alternative C would be similar to alternative B, but with more emphasis on natural processes for restoration, reducing the potential for impact from development.	Same as alternative B	Alternative E would be similar to alternative B, but with a greater emphasis on economic and recreational development; therefore, there would be more potential for direct and indirect impacts on cultural resources.
Extent of ground and site disturbance and changes in character or setting due to vegetation treatments or lack of treatment	Under all alternatives, the section 106 process would be completed for all undertakings to resolve adverse effects. There would be no objectives for vegetation management, which could lead to the loss of resources due to uncharacteristic wildfire or nonnative, invasive species.	Alternative B would include vegetation management using mechanical treatments and wildland fire, which could directly affect cultural resources. There would be long-term reduced fuel loads and a reduction in the potential of loss due to uncharacteristic wildfires.	Same as alternative B	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Extent of surface disturbance associated with livestock grazing, concentration, and associated structures	Under all alternatives, the section 106 process would be completed for all undertakings to resolve adverse effects. Alternative A would have potential ongoing, incremental surface impacts from grazing, livestock concentration, and livestock facilities.	Alternative B would be similar to alternative A. Measures to achieve desired conditions for rangelands would reduce the potential for impacts on cultural resources.	Same as alternative B	Same as alternative B	Same as alternative B
Extent of land available and effects from ground disturbance and alteration of settings from economic development activity	Under all alternatives, the section 106 process would be completed for all undertakings to resolve adverse effects. There would be no change from current practices and resulting surface disturbance associated with development of roads, infrastructure, utility corridors, and cleanup of legacy mining sites.	Same as alternative A	Same as alternative A	Same as alternative A	Same as alternative A

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Extent of land in wilderness and special management areas	Alternative A would not recommend additional wilderness areas, potentially exposing cultural resources to damage.	Alternative B would recommend 40,500 acres for wilderness, potentially providing additional incidental protection for cultural resources in these areas.	Alternative C would recommend 402,000 acres for wilderness, the greatest of all alternatives. This would provide the greatest potential protection for cultural resources.	Same as alternative B	Alternative E would recommend 21,900 acres for wilderness, the least amount of all action alternatives. It would provide the least protection for cultural resources of all the action alternatives, but more than alternative A.
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Effective	Effective	Effective	Effective
Areas of Tribal Importance and Tribal Uses					
Changes that would affect access to traditional cultural places and traditionally used resources	Under all alternatives, tribal consultation would continue to be used to identify access concerns. There would be no changes to current access for cultural uses.	Compared with alternative A, there would be a greater emphasis on partnerships with tribal groups.	Same as alternative B	Same as alternative B	An emphasis on recreational access could lead to conflicts with cultural uses, or provide better access for tribal users with mobility problems.
Availability, abundance, and sustainability of traditionally used locations and resources	Under all alternatives, tribal consultation would continue to be used to identify concerns with traditionally used locations and resources. There would be no objectives for	Alternative B would include vegetation management through a balance of mechanical treatments and wildland fire. There would be a potential loss of species' locations used for	Same as alternative B	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	vegetation management, which could lead to a loss of resources due to uncharacteristic wildfire or nonnative, invasive species infestation.	traditional tribal uses from treatment and temporary loss of access. There would be long-term reduced fuel loads and decreased potential loss of species' locations due to high-intensity fires.			
Opportunities for solitude and privacy for traditional and cultural activities	There would be no change in opportunities for solitude and privacy. Currently, alternative A provides very little protection for tribal solitude, resources, and access. Alternative A would have no recommended wilderness, but designated wilderness areas may provide opportunities for solitude and privacy for traditional and cultural activities.	Alternative B has components for protection, including making traditional cultural properties, sacred sites, and other locations of traditional and cultural use identified as important to the tribes unimpaired. Forest resources that are important for cultural and traditional needs, as well as for subsistence practices and economic support of rural historic and tribal communities, are available and sustainable. Tribes have access to sacred sites, traditional	With an emphasis on allowing natural processes, there could be more opportunities for solitude and privacy. Alternative C recommends 402,000 acres for wilderness designation.	Same as alternative B. Alternative D recommends 40,500 acres for wilderness designations, which is the same as under alternative B.	With a management emphasis on economic values and recreational uses, there could be decreased opportunities for those seeking solitude and privacy. Alternative E recommends 21,900 acres for wilderness designation.

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
		cultural properties, and collection areas for traditional and ceremonial use. Alternative B also recommends 40,500 acres for wilderness designations.			
<i>How the Alternatives Meet Desired Conditions</i>	Effective	Effective	Most effective	Effective	Least effective
Sustainable Forestry and Forest Products					
Acres suitable for timber production	Alternative A includes 166,700 acres suitable for timber production.	Compared with alternative A, alternative B would increase the acreage suitable for timber production by 8 percent (179,600 acres).	Alternative C de-emphasizes timber production with 13 percent less acres available for timber production, compared with alternative A (145,800 acres).	Same as alternative B	Alternative E would include 300 more acres suitable for timber production than alternative B.
Projected wood sale quantity	Alternative A would retain forest product availability and use at roughly the same levels they have been since the implementation of the 1986 Forest Plan. The emergence of new timber markets or any significant growth of existing markets would be least likely under this alternative.	Compared with alternative A, alternative B would provide additional timber for sale that would provide a stable source of forest products.	Same as alternative B	Alternative D emphasizes active management of ERUs. Compared with alternative B, this would increase timber production by 25 percent for timber sales.	Alternative E emphasizes timber sales with projected timber and wood sale quantities similar to alternative D.

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Effective	Effective	Most effective	Most effective
Sustainable Rangelands and Livestock Grazing					
Allotment availability	Under alternative A, there would be 104 allotments available for grazing.	Same as alternative A	Same as alternative A	Same as alternative A	Same as alternative A
Forage availability	Alternative A would continue to support ranching operations, and forage availability would persist under historical trends.	Alternative B would emphasize vegetation treatments, moving rangelands toward desired conditions and increasing forage. Returning allotments to active status could lead to an increase in forage availability.	Alternative C would emphasize natural processes and limit the use of mechanical treatments, increasing forage at a slower rate. Decreasing the availability of allotments could lead to a reduction in forage availability.	Alternative D would emphasize vegetation treatments similar to alternative B, but it would decrease availability of allotments, which could lead to a reduction in forage availability.	Same as alternative B
AUMs authorized	AUMs authorized under alternative A would continue, as forage availability allows.	AUMs authorized under alternative B could increase, as forage availability allows.	Same as alternative B	Same as alternative B	Same as alternative B
<i>How the Alternatives Meet Desired Conditions</i>	Effective	Most effective	Least effective	Least effective	Most effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Recreation					
Quality and availability of recreation opportunities	The Lincoln NF would continue to use the recreation opportunity spectrum outlined in the existing condition, and current management practices would continue as they are outlined in the 1986 Forest Plan.	Increases in recommended wilderness under alternative B, by classifying the Guadalupe WSA as recommended wilderness, would expand these forms of recreation opportunities compared with alternative A. Such protections would be compatible with the amount of acreage currently classified as semiprimitive nonmotorized in the Guadalupe Ranger District.	Alternative C would be the same as alternative B, except that increased acreage recommended for wilderness would limit special events that are motorized to designated locations.	Same as alternative B	Alternative E would be the same as alternative B, except that recreational uses at developed recreation sites would be actively promoted. While certain forms of recreational use, such as special events, could benefit from these provisions, the active promotion of mechanized and developed forms of recreation could result in user conflicts from decreased opportunities for those seeking primitive recreation and opportunities for solitude.
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Effective	Effective	Effective	Effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Transportation and Forest Access					
Miles of system roads available for designated use	Managing motor vehicle use consistent with the motor vehicle use maps and the travel analysis process would result in incremental changes to the travel system over time to decommission roads, while contributing to social and economic sustainability. The 1986 Forest Plan includes plan components to decommission 100 miles of administrative roads, but actual decommissioning has not met that objective. Miles of level 2 and 3 roads maintained annually would be based on resource-specific direction in existing plans.	Decommissioning 75 miles of administratively closed roads over 15 years would result in fewer decommissioned roads compared with alternative A. Maintaining 112 miles of level 3 passenger car roads and 60 miles of level 2 high-clearance roads per year would retain access to multiple-use opportunities via those roadways. Permitted projects could result in unauthorized routes; however, these routes would not be available for designated use. Designating 40,500 acres of additional wilderness would reduce the portion of the Lincoln NF available for motorized use.	Impacts from decommissioning roads would be the same as those under alternative B. Designating 402,000 additional wilderness acres would reduce the portion of the Lincoln NF available for motorized use, compared with alternative A.	Impacts from decommissioning roads would be the same as those under alternative B. Impacts from designated wilderness would be the same as those under alternative B.	Impacts from decommissioning roads would be the same as those under alternative B. Designating 21,900 acres of additional wilderness areas would reduce the portion of the Lincoln NF available for motorized use, compared with alternative A.

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Access for various types of transportation modes	Continuing to authorize motorized and nonmotorized access in all areas where they are currently authorized, alternative A would maintain current levels and types of access, including permitted access.	Same as alternative A, except avoiding impacts in watercourses and riparian areas could decrease access in those areas compared with alternative A. Fuels treatment activities could result in temporary road closures and delays; heavy equipment could also deteriorate road surfaces, which would reduce access for certain vehicles.	Same as alternative A, except a reduction in mechanical treatments could result in less temporary road closures and delays.	Same as alternative B	Same as alternative A, except an emphasis on maintaining access roads to developed recreation sites under alternative E would improve motorized access to developed recreation areas, compared with alternative A.
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Effective	Effective	Effective	Effective
Facilities and Infrastructure					
Minimum design standards and siting criteria for facilities infrastructure	Continuing to maintain facilities in accordance with the 1986 Forest Plan and current Forest Service standards would not specifically address the desired conditions, especially related to protections from hazards, such as uncharacteristic wildfire.	Maintaining and retrofitting facilities would minimize negative impacts on natural resources, especially in riparian and high scenic integrity areas, and protect infrastructure from hazards, particularly uncharacteristic wildfire.	Same as alternative B	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Effective	Effective	Effective	Effective
Lands					
Acres identified for conveyance in or out of Federal ownership	None of the alternatives provides specific direction that would change the current management objectives of land adjustments beyond the guidance provided in the 1986 Forest Plan.	Same as alternative A	Same as alternative A	Same as alternative A	Same as alternative A
<i>How the Alternatives Meet Desired Conditions</i>	Effective	Effective	Effective	Effective	Effective
Land Special Uses					
Acres of land available for special-use authorizations	Under alternative A, constraints on special-use authorizations are anticipated to be low since only a small percentage of Lincoln NF land has restrictions for special-use authorizations.	Limitations from special designations would close or limit development within 68,300 acres (6 percent of the total Lincoln NF acreage).	Limitations from special designations would close or limit development within 450,800 acres (41 percent of the Lincoln NF lands).	Same as alternative B	Limitations under alternative E would include 21,900 acres of special designations (2 percent of the Lincoln NF lands).

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Acres of land available for future development, such as utility corridors, renewable energy, and fluid and solid minerals	Under alternative A, constraints on special-use authorizations are anticipated to be low since only a small percentage of Lincoln NF land has restrictions for utility corridors, renewable energy development, or other special uses.	Limitations from special designations would close or limit development in 68,300 acres (6 percent of the total Lincoln NF acreage).	Limitations from special designations would close or limit development in 450,800 acres (41 percent of the Lincoln NF lands).	Limitations would be the same as those described for alternative B.	Limitations under alternative E would include 21,900 acres of recommended wilderness (2 percent of the Lincoln NF lands).
<i>How the Alternatives Meet Desired Conditions</i>	Effective	Effective	Least effective	Effective	Most effective
Minerals and Mining					
Locatable minerals: Impacts on locatable minerals under each alternative would depend on acres of lands that could be withdrawn from mineral entry if the Secretary of the Interior or Congress were to follow recommendations for withdrawal. Withdrawn lands would affect future locatable mineral activities only, not existing mineral claims.	Guadalupe Escarpment WSA would be recommended for withdrawal from mineral leasing and development.	Guadalupe Escarpment WSA and the Guadalupe and Snowy River Special Cave Management Areas would be recommended for withdrawal from all mineral leasing and development.	Same as alternative B	Same as alternative B	Same as alternative A

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Salable minerals: The acres available for minerals, given limitations from different surface use restrictions under each alternative	The Forest Service would manage mineral material disposal at the discretion of the authorized officer in compliance with 36 CFR 228, the General Mining Act of 1872, and other applicable laws and regulations.	Same as alternative A	Same as alternative A	Same as alternative A	Same as alternative A
Leasable minerals: Acres of lands available for mineral leasing	Guadalupe Escarpment WSA would be recommended for withdrawal from mineral leasing and development.	Guadalupe Escarpment WSA and the Guadalupe and Snowy River Special Cave Management Areas would be recommended for withdrawal from all mineral leasing and development.	Same as alternative B	Same as alternative B	Same as alternative A
<i>How the Alternatives Meet Desired Conditions</i>	Effective	Effective	Effective	Effective	Effective
Cave Resources					
Protections extended to features, characteristics, values, or opportunities for which caves have been designated or nominated as “significant”	Caves will continue to be made available for public use under a permit system. Caves will be gated according to their unique content and hazard to cavers. The requirement that	The Forest Service would evaluate caves for significance and implement protections for significant cave resources, including gates, access permits, and other restrictions	Same as alternative B	Same as alternative B	Cave management would be similar to that under alternative B. The Forest Service would evaluate caves for significance and implement protections for significant cave resources, including

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	users obtain a permit for cave entry and a policy of installing cave gates across the plan area would help maintain important cave values by reducing and controlling cave use.	as needed. The Guadalupe and Snowy River Special Cave Management Areas would provide additional protection against some impacts from infrastructure, facilities, sources of pollution, and vegetation treatments.			gates, access permits, and other restrictions as needed. However, no special cave management areas would be designated.
Protection of cave resources from mineral development	The Guadalupe Escarpment WSA would continue to be recommended for mineral withdrawal. A recommendation for withdrawal does not provide protection from locatable or leasable mineral development; however, the Forest Service would likely discourage or not allow salable mineral development in the area.	Guadalupe and Snowy River Special Cave Management Areas would be recommended for mineral withdrawal. A recommendation for withdrawal does not provide protection from locatable or leasable mineral development; however, the Forest Service would likely discourage or not allow salable mineral development in the area.	Same as alternative B	Same as alternative B	Same as alternative A

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Protection of cave resources from contamination or damage due to infrastructure, facilities, sources of pollution, and vegetation treatments	Alternative A has no cave resource protections from these sources.	Guadalupe and Snowy River Special Cave Management Areas would provide protection against some impacts from infrastructure, facilities, sources of pollution, and vegetation treatments within those areas.	Same as alternative B	Same as alternative B	Same as alternative A
<i>How the Alternatives Meet Desired Conditions</i>	Effective	Most effective	Most effective	Most effective	Effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Wilderness and Wilderness Study Areas (WSAs)					
Acres of designated wilderness and WSA	<p>Capitan Mountains Wilderness: 35,100 acres</p> <p>White Mountain Wilderness: 46,900 acres</p> <p>Guadalupe Escarpment WSA: 21,300 acres</p> <p>Under alternative A, the Guadalupe Escarpment WSA was not recommended for wilderness designation in the 1986 Forest Plan. Its forest plan components are included in Management Area 3A, South Guadalupe, but the 1986 Forest Plan does not include wilderness-specific plan components.</p>	<p>Alternative B includes the same designated wilderness areas as alternative A. It would recommend the Guadalupe Escarpment WSA as wilderness and include wilderness-specific plan components.</p>	Same as alternative B	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Naturalness	Alternative A offers the least protection of naturalness to areas recommended as potential wilderness since there would be no recommended wilderness. The primary activities that could alter the wilderness character of these areas include motorized use, unauthorized motorized use, and dispersed camping activities.	There would be 39,300 acres available for livestock grazing activities and related range improvements. These areas would continue to be maintained even though continued maintenance and the presence of structures could affect the areas' apparent naturalness.	This alternative includes a standard that currently vacant allotments would be recommended for closure to future livestock grazing and further evaluated for the best use of the land. This could enhance wilderness character by increasing the apparent naturalness of the areas by reducing the need to maintain range improvements on the 395,000 acres available for livestock grazing activities.	Same as alternative B	Under this alternative, there would be 20,800 acres available for livestock grazing activities and related range improvements. Impacts would be similar to those described under alternative B, but slightly greater on active allotments due to the placement of additional upland water sources, making it possible for additional cattle grazing on underutilized allotments.

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Opportunities for solitude or primitive and unconfined recreation	Alternative A offers the least protection of opportunities for solitude or primitive and unconfined recreation to areas recommended as potential wilderness. This is because there would be no recommended wilderness.	Recreation infrastructure would likely not be established under this alternative, thereby preserving opportunities for solitude or primitive and unconfined recreation. Administratively closed roads would be decommissioned or eliminated as opportunities and funding become available.	Same as alternative B	Same as alternative B	Alternative E would promote recreation and access, which would result in new recreation infrastructure. Similar to alternative B, alternative E would follow the travel analysis process for decommissioning administratively closed roads; however, it would emphasize maintaining access to recreation sites, thereby impacting opportunities for solitude and unconfined recreation.
<i>How the Alternatives Meet Desired Conditions</i>	Ineffective	Effective	Most effective	Effective	Least effective
Recommended Wilderness					
Roadless areas of sufficient size	0 acres	40,500 acres	402,000 acres	40,500 acres	21,900 acres
<i>How the Alternatives Meet Desired Conditions</i>	Ineffective	Effective	Most effective	Effective	Least effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Inventoried Roadless Areas					
Acres of IRAs	<p>The Forest Service currently manages 12 IRAs on the Lincoln NF, totaling about 176,900 acres. Under alternative A, there would be no change to current management, which is based on the 2001 Roadless Area Conservation Rule. This would result in less specific management direction for individual IRAs than under the other alternatives.</p> <p>No new IRAs are proposed under any alternative. Under all alternatives, IRAs would be managed in accordance with current Forest Service regulation and policy.</p>	<p>Impacts on IRAs would be similar to those described under alternative A. This alternative includes a mix of developed and dispersed recreation forest plan components that are similar to what currently occur on the Lincoln NF, although desired conditions and guidelines specific to IRAs in the proposed plan would ensure IRA characteristics are protected. This is more than what would occur under alternative A.</p>	Same as alternative B	<p>This alternative would prioritize decommissioning administrative roads that affect riparian areas or hinder habitat connectivity, thereby protecting habitat for at-risk species where these occur within IRAs. This is more than what would occur under alternative A.</p>	<p>This alternative would focus on providing more accessible recreation opportunities by maintaining access roads; therefore, it would not contain the same level of protection for IRA characteristics as the other alternatives.</p>
<i>How the Alternatives Meet Desired Conditions</i>	Effective	Effective	Most effective	Most effective	Least effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
National Scenic, Historic, and Recreation Trails					
Meeting the nature and purpose of the trail through consistent management and plan direction	Under alternative A, there would be no change in current direction for any designated trail and some trails not specifically mentioned in the 1986 Forest Plan (such as the Guadalupe Ridge Trail). There would continue to be limited management direction for individual designated trails, including plan components for wildland fire, the treatment of nonnative, invasive species, and mechanical treatments that contribute to trail values.	All action alternatives contain components to address or align with the framework for sustainable recreation. All action alternatives would use a scenery management system to define scenic integrity objectives. When compared with alternative A, there would be more active vegetation and fire management near the trails. Management could be designed to enhance the emphasis areas for each designated trail.	Same as alternative B	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Scenic integrity objectives for designated trails	Under alternative A, the Forest Service would continue to manage national scenic, historic, and recreation trails for moderate to high scenery integrity objectives.	All action alternatives provide plan components that emphasize natural-appearing scenery and provide opportunities to protect and enhance trail qualities with beneficial effects of connecting people with nature and enhancing natural settings. When compared with alternative A, the potential for a greater amount of beneficial effects would occur in the action alternatives due to the comprehensive plan direction.	Same as alternative B	Same as alternative B	Same as alternative B
Miles of designated trails	Under all alternatives, miles of designated trails do not vary.	Same as alternative A	Same as alternative A	Same as alternative A	Same as alternative A
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Effective	Effective	Effective	Effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
National Scenic Byways					
Intrinsic qualities of scenic byways as described in the designation and plan direction	Alternative A does not include specific plan components for scenic byways or specific vegetation treatment objectives. Effects would vary depending on the levels of treatment in a given year.	Alternative B includes plan components for scenic byways to protect their intrinsic qualities.	Same as alternative B	Same as alternative B	Same as alternative B
Scenic integrity objective allocations within each scenic byway corridor	Alternative A does not include specific plan components for scenic byways or specific vegetation treatment objectives. Effects would vary depending on the levels of treatment in a given year.	Alternative B includes plan components that emphasize the natural-appearing scenery, manage for the high scenic integrity objective, and meet scenery objectives.	Same as alternative B	Same as alternative B	Same as alternative B
A qualitative discussion of the potential effects on scenic resources from vegetation management activities	Alternative A does not include specific plan components for scenic byways or specific vegetation treatment objectives. Effects would vary depending on the levels of treatment in a given year.	Alternative B includes objectives for mechanical thinning and prescribed burning. These treatments would have short-term impacts on scenic resources due to burn scars, but they would benefit the scenic resources in the long term.	Alternative C would propose the least amount of mechanical thinning and prescribed burning treatments and would have the least amount of short-term impacts. However, the lower amount of treatment would slow the time for areas adjacent to	Same as alternative B	Same as alternative C

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
			scenic byways to reach their desired conditions.		
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Effective	Effective	Effective	Effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Wild and Scenic Rivers					
Miles of rivers determined to be eligible for inclusion in the National Wild and Scenic Rivers System	Alternative A would carry forward 55 eligible segments (17 rivers) identified in the 2002 amendment to the 1986 Forest Plan. The 1986 Forest Plan does not include many plan components for management of eligible river sections. It relies on the Wild and Scenic Rivers Act and Forest Service Handbook 1909.12, section 82.5 for management direction.	All action alternatives would carry forward 54 eligible segments (16 rivers). Under all action alternatives, there would be minimal impacts due to protective forest plan components that maintain river corridor conditions. Under alternative B, the proposed plan includes plan components that provide management guidance for the eligible river segments. These plan components include restrictions on vegetation treatments and new road and trail construction, which provide additional protection for these river segments, compared with management under alternative A.	Same as alternative B	Same as alternative B	Same as alternative B
<i>How the Alternatives Meet Desired Conditions</i>	Effective	Effective	Effective	Effective	Effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Research Natural Areas					
Number and acres of proposed RNAs by alternative	<p>Alternative A proposes three RNAs that were first brought forward in the 1986 Forest Plan (Upper McKittrick, Haynes Canyon, and William G. Telfer). While alternative A contains the most acres of proposed RNAs (2,000 acres), due to changing conditions in the Haynes Canyon and William G. Telfer sites, alternative A would not contribute more to any additional ecological representation than alternatives B, C, D, and E. This is due to two of the sites no longer containing the ecological components for which they were initially proposed due to wildfires.</p>	<p>All action alternatives would recommend one proposed RNA (Upper McKittrick), totaling approximately 800 acres. Under all action alternatives, there would be minimal impacts on the proposed Upper McKittrick RNA due to restrictive RNA plan components. The action alternatives would not propose the Haynes Canyon and William G. Telfer areas for RNA designation. Appendix C includes the rationale for retaining the Upper McKittrick RNA in the proposed plan and not retaining the other two proposed RNAs from the 1986 Forest Plan.</p>	Same as alternative B	Same as alternative B	Same as alternative B

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Alteration of natural conditions and biological diversity	There would be minimal effects on the Upper McKittrick RNA due to RNA restrictions. Alternative A also carries forward the proposals for Haynes Canyon and William G. Telfer RNAs, even though the updated evaluation found them ineligible for designation (see table 3-79). Since these areas no longer possess the conditions for which they were proposed, effects on these areas would be similar to those under the action alternatives.	There would be minimal effects on the Upper McKittrick RNA due to RNA restrictions. The Haynes Canyon and William G. Telfer sites would not be proposed and managed for natural conditions. Since these areas would no longer be eligible for RNA designation and would not be proposed, the RNA restrictions would not apply. Therefore, these areas could face impacts from timber harvesting, road and trail construction, and increased recreational use.	Same as alternative B	Same as alternative B	Same as alternative B
<i>How the Alternatives Meet Desired Conditions</i>	Least effective	Effective	Effective	Effective	Effective

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Socioeconomics ¹					
Jobs and income	Under all alternatives, employment and labor income supported by activities on the Lincoln NF would account for less than 1 percent of regional totals; however, impacts at the individual community level economy may be more significant. Under alternative A, an estimated total of 1,478 jobs and \$55.41 million in labor income would be supported in the region by activities on the Lincoln NF.	Same as alternative A	An estimated total of 1,477 jobs and \$55.26 million in labor income would be supported in the region by activities on the Lincoln NF.	An estimated total of 1,488 jobs and \$56.27 million in labor income would be supported in the region by activities on the Lincoln NF. The minor change from alternative A would be due to a higher level of forest product harvest due to increased vegetation treatment.	An estimated total of 1,495 jobs and \$57.01 million in labor income would be supported in the region by activities on the Lincoln NF. The minor change from alternative A would be due to a higher level of forest product harvest due to increased vegetation treatment.
Quality of life, including (1) well-being, (2) health and safety, and (3) traditional, cultural, and spiritual practices	Under alternative A, jobs and income supported by forest resources would provide continued support of well-being from access to these sources of employment; but, alternative A would	Jobs and income associated with traditional forest resources use (i.e., timber and grazing) would be supported under all action alternatives. There would only be a minor variation in the	The emphasis on natural restoration processes under alternative C would result in a minor decrease in forest project harvest and related jobs and income. Reduced motorized access to	Alternative D would promote active vegetation management, resulting in additional forest product harvest and increasing jobs and income from the timber industry, as compared with	Jobs and income associated with traditional forest resources use (i.e., timber and grazing) would be supported under all alternatives. There would be only a minor variation in the level of permitted

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	<p>provide limited opportunities for long-term improvement. This alternative would provide the least benefits to quality of life in terms of solitude and opportunities for quiet recreation due to a lack of additional areas recommend for wilderness management.</p> <p>Alternative A would maintain current management of water resources based on current standards, resulting in the lowest opportunity for improvement in watershed health, with the highest potential for related health impacts. Of all alternatives, the risk of uncharacteristic fires would be reduced the least under this alternative. The potential for health impacts from</p>	<p>level of permitted grazing possible following opening of currently vacant allotments under alternative B. All action alternatives would enhance recreation opportunities by providing for improved access to visitors, due to standards and guidelines for road maintenance. Under alternative B, the increase in special areas managed for undeveloped, passive recreational use (i.e., recommended wilderness) would support an increased emphasis on services related to this setting, including solitude and quiet recreation experiences. The potential for a long-term improvement of wildlife habitat under all action alternatives would support</p>	<p>forest resources would occur due to motorized travel restrictions in designated areas. Possible effects include resource acquisition and site accessibility difficulties for those who require motorized transportation, but also an increased possibility of privacy for ceremonies or sacred sites. Alternative C would support increased habitat connectivity and support for wildlife and the ecosystem services they provide to communities.</p> <p>The increase in special areas managed for undeveloped, passive recreational use would have impacts as discussed under alternative B, but at an increased level</p>	<p>alternative A.</p> <p>Impacts from recommended wilderness would be similar to those described under alternative B.</p> <p>Impacts from use of prescribed fire and vegetation treatment would be the same as those described under alternative B.</p> <p>Site-specific impacts on the ability to access forest resources for traditional, cultural, and spiritual uses would occur under alternative D due to the increase in recommended wilderness. However, the long-term availability of these resources would be supported by this management.</p>	<p>grazing that's possible following opening of currently vacant allotments under alternative E.</p> <p>Alternative E would provide the highest level of support for access to developed recreation sites, supporting benefits associated with developed recreation areas and contributions from commercial filming and outfitter guiding. Alternative E would call for just 21,900 acres for wilderness recommendation and would have impacts similar to those described under alternative A. Alternative E would provide the least emphasis on habitat support for species, but it would support maintenance for viewing and hunting wildlife.</p>

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	<p>fire and the associated smoke would remain.</p> <p>Under alternative A, current levels of traditional uses would continue in the short term; however, a lack of specific objectives for improving vegetation or treating fuels could affect long-term availability of resources with related impacts on the ability to access resources for uses with traditional or cultural importance. Access to forest resources with traditional importance for Native Americans would also be affected by a lack of vegetation objectives. A lack of forestwide standards or guidelines addressing traditional or cultural uses could lead to negative impacts on the sites, such as looting,</p>	<p>benefits associated with these species, including hunting and wildlife viewing.</p> <p>Under all action alternatives, mechanical forest thinning and prescribed burning should reduce the likelihood of uncharacteristic wildfire, which would benefit the municipal water supply and habitat for aquatic species with economic and cultural importance. Prescribed fire use of 200,000 acres would result in short-term impacts on local air quality for communities. Adherence to State and Federal air quality standards would reduce impacts. Use of prescribed fire with vegetation treatment (11,000–19,500 acres under alternative B)</p>	<p>due to additional acres of recommended wilderness.</p> <p>Prescribed fire treatments would have impacts as described under alternative B. Under alternative C, mechanical treatment (6,500–12,500 acres) would be reduced compared with other action alternatives; however, the opportunity to reduce risks from uncharacteristic fire for area communities would remain greater than under alternative A.</p> <p>Given its emphasis on passive recreation and conservation, alternative C would have the greatest acreage for wilderness (402,000 acres); therefore, services supported by undeveloped areas</p>		<p>Prescribed fire and vegetation treatments would have impacts as described under alternative B.</p> <p>Traditional communities that rely on forest resources, such as forage or forest products, would have their values and traditions supported the most under alternative E in the short term. This is due to this alternative’s high degree of access and resource output. However, over the long term, forest resource availability could decline should conflicts with other resources affect the ability to meet desired conditions.</p>

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	<p>damage, or loss of privacy, which could result in impacts on the quality of life.</p>	<p>would support a long-term reduction in fire risks.</p> <p>Long-term social benefits related to traditional cultural or spiritual practices would be supported under this alternative. This is due to plan components ensuring access to resources and practices, and vegetation management direction supporting the long-term availability of forest products.</p>	<p>would be highest under this alternative. Secondary impacts, including the ability to attract retirees and second homeowners, would be highest under this alternative.</p>		
Environmental Justice ¹					
<p>Disproportionately high or adverse impacts</p>	<p>Lack of forestwide standards or guidelines to direct recreational use would result in the potential for site-specific impacts on access for forest resources and recreation for environmental justice communities.</p>	<p>Management would support collaboration with local communities to ensure plan implementation would account for environmental justice community consideration, and provide for continued traditional and cultural uses. This would minimize the</p>	<p>Impacts from collaboration and support for traditional uses would be the same as those discussed under alternative B.</p> <p>Recommending 402,000 acres for wilderness (the highest of all the alternatives) could result in impacts on</p>	<p>Impacts from collaboration and support for traditional uses would be the same as those discussed under alternative B. Impacts from wilderness recommendation would also be the same as those under alternative B.</p>	<p>Impacts from collaboration and support for traditional uses would be the same as those discussed under alternative B. Increased maintenance for routes under alternative E would help maintain access for environmental justice communities for recreation and</p>

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	<p>A lack of objectives for vegetation could result in the potential for long-term impacts on the availability of forest resources with traditional cultural and medical uses for environmental justice communities.</p> <p>There would be minimal impacts on environmental justice communities related to wilderness management due to a lack of additional areas recommend for wilderness management.</p>	<p>potential for disproportionate adverse impacts.</p> <p>Objectives for route maintenance would provide improved access to resources, decreasing the potential for adverse impacts on environmental justice communities.</p> <p>Recommending 40,500 acres for wilderness could result in impacts on the access for recreation and the type of recreational uses available, which could disproportionately affect environmental justice communities. Communities valuing solitude for cultural uses would have conditions improved.</p>	<p>the access for recreation and the type of recreational uses available, which could disproportionately affect environmental justice communities. Communities valuing solitude for cultural uses would have conditions improved.</p>		<p>resources.</p> <p>Managing 21,900 acres of recommended wilderness (the least of all action alternatives) would have the potential for site-specific impacts on resource and recreation access, but impacts would be reduced due to the limited acres affected.</p>

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Exposure pathways	A lack of forestwide directive for fuels treatments would affect the magnitude of fire resilience in the long term, which could differentially affect the long-term quality of life of forest beneficiaries and identified environmental justice communities.	<p>Treatment of up to 200,000 acres with prescribed fire over 10 years could result in increased emissions and more short-term quality of life impacts for local communities, including those identified as environmental justice communities.</p> <p>Proposing 11,000–19,500 acres of mechanical treatment would contribute to the safety of community homes and infrastructure, thereby increasing the quality of life in the long term for communities adjacent to the Lincoln NF.</p>	Impacts from prescribed fire treatment would be the same as those described under alternative B. Alternative C would have the lowest level of proposed vegetation treatment (6,500–12,500 acres). This is due to reliance on natural processes, which would reduce the potential for the long-term improvement of safety and the quality of life.	Impacts from prescribed fire and vegetation treatment would be the same as those described under alternative B.	Prescribed fire and vegetation treatment would have impacts as discussed under alternative B.

Resource and Indicator of Effect	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Community ability to participate in NEPA process	The Forest Service has provided opportunities for public involvement and input by all groups, including environmental justice communities. Efforts include holding meetings through the study area, inclusion of a variety of methods of public notification and for comment and review opportunities, and a coordination with local stakeholders to ensure representation in the planning process.	Same as alternative A	Same as alternative A	Same as alternative A	Same as alternative A

¹ Although social and economic concerns are identified as a topic area under the need for changes, desired conditions for social and economic concerns are addressed under specific resource topics rather than under the social and economic topic area.

Chapter 3. Affected Environment and Environmental Consequences

This chapter summarizes the physical, biological, social, and economic environments of the plan area and the environmental consequences that may occur by implementing each alternative in that environment. It also presents the scientific and analytical basis for comparing the alternatives presented in chapter 2.

The forest plan provides a programmatic framework that guides site-specific actions, but it does not authorize, fund, or carry out any project or activity. The long-term environmental consequences of managing the Lincoln NF under this programmatic framework are described in this chapter. Consequences are based on predicted implementing activities and are meant to compare alternatives on a programmatic level, rather than provide the exact measurements of the effects.

Assumptions Common to All Resources

The Forest Service made the following assumptions for this analysis:

- Land management plans do not have direct effects. They do not authorize or mandate any site-specific projects or activities, including ground-disturbing actions; however, there may be indirect effects, or longer term environmental consequences, of managing the Lincoln NF under this programmatic framework.
- Plan decisions (desired conditions, objectives, standards, and guidelines) and other plan direction (management areas and monitoring) will be followed when planning or implementing site-specific projects and activities.
- Laws, policies, and regulations will be followed when planning or implementing site-specific projects and activities.
- Funding levels will be similar to those of the past 5 years.
- The planning time frame for the effects analysis is 10 to 15 years; other time frames may be specifically analyzed, depending on the resource and potential consequences.
- The spatial extent for the majority of resources is the decision area as defined in chapter 1. Resources may use different spatial extents and define them in their section.
- Monitoring identified in the monitoring chapter of the proposed plan will occur.
- The land management plan will be amended, as needed, during the life of the plan.
- Recommended wilderness acres for alternatives B, C, D, and E include 21,300 acres for the Guadalupe Escarpment WSA and the alternatives include other recommended wilderness areas as described in chapter 2.

Incomplete or Unavailable Information

The Council on Environmental Quality established implementing regulations for NEPA requiring that a Federal agency identify relevant information that may be incomplete or unavailable for an evaluation of reasonably foreseeable significant adverse effects in an EIS (40 CFR 1502.22). If the information is essential to a reasoned choice among alternatives, it must be included or addressed in an EIS. Knowledge and information is and would always be incomplete, particularly with infinitely complex ecosystems considered at various scales.

The best available information pertinent to the decisions to be made was used in developing the Lincoln NF proposed plan. Considerable effort has been taken to acquire and convert resource data into digital format for use in the plan—both from Forest Service sources and from outside sources.

Certain site-specific information was unavailable for use in developing this plan, usually because inventories have either not been conducted or are not complete. Some of the major types of data that are incomplete or unavailable include the following:

- Forestwide field inventory of cultural resources
- Forestwide field inventory of paleontological resources
- Forestwide field inventory of vegetation composition
- Forestwide field inventory of soils and water conditions
- Forestwide field inventory of wildlife and special status species occurrence and condition
- Forestwide field inventories for riparian areas and wetlands
- Forestwide field inventories for nonnative invasive plants

The Forest Service has information to support planning-level decisions, although the data are incomplete for specific areas. For these resources, estimates were made concerning the number, type, and significance of these resources based on previous surveys and existing knowledge. In addition, some effects cannot be quantified given the proposed planning components. Where this gap occurs, effects are projected in qualitative terms or, in some instances, are described as unknown. Subsequent project-level analysis would provide the opportunity to collect and examine site-specific inventory data required to determine appropriate application of planning-level guidance. In addition, ongoing inventory efforts by the Forest Service and other agencies in the plan area continue to update and refine information used to implement this plan.

This forest plan is also based on the concept of adaptive management, so it is dynamic enough to account for changes in resource conditions, such as changes due to climate change or large-scale wildfire; new information and science; and changes in regulation and policies. The plan may be amended to respond to these factors. No incomplete or unavailable information was deemed essential to a reasoned choice among the alternatives portrayed in this EIS.

Upland Vegetation Communities

Affected Environment

The discussions below focus on upland vegetation communities on the Lincoln NF (the plan area). A detailed description of upland vegetation in the larger ecoregional context area, including the plan area's contribution to that area, is included in the Lincoln NF Assessment Report for Ecological Resources (Forest Service 2019a).

The Lincoln NF Assessment Report for Ecological Resources describes upland vegetation communities using the ecological response unit (ERU) classification system. This is a grouping of vegetation communities with similar plant species composition, succession patterns, and disturbance patterns (Forest Service 2015a), as described in further detail below.

ERUs describe, at a relatively coarse scale, the major ecosystem types found in the plan area. Methods for delineating the ERUs are described in detail in the ecological assessment (Forest Service 2019a). In

summary, upland ERUs are derived from the terrestrial ecosystems survey of the Smokey Bear Ranger District of the Lincoln NF and other uncorrelated surveys for the Sacramento and Guadalupe Districts.

ERUs are a vegetation classification based on characteristic vegetation, soil properties, and fire and climate. Through succession or disturbance, each ERU can exhibit a range of potential overstory vegetation conditions, each representing a unique phase in the overall ecology of the system (Weisz et al. 2009; Weaver 2014, 1967). By grouping these phases into seral states with unique vegetation characteristics (such as overstory composition, structure, and cover as described below), the current structure of the ERU can be described and compared with a reference or desired condition and models can be developed that define transitions between phases.

Seral state proportion¹ is the percentage of an ERU in each seral state, or stage of successional development. Seral states describe the ecological process of progressive change in a plant community after a stand-initiating disturbance (Hall et al. 1995). Seral state proportion is indicative of the sustainability or integrity of an ecosystem. An ecosystem with characteristic disturbance regimes in a characteristic climatic regime would have characteristic seral state proportions, in the absence of human use. The assumption is that ecosystems maintaining characteristic structure under characteristic disturbance and climate regimes are sustainable. This can be considered the reference condition, departure from which indicates risk to ecosystem integrity.

Reference conditions are the environmental conditions that infer ecological sustainability. Reference conditions are based on a review of the relevant best available scientific information according to LANDFIRE, The Nature Conservancy, and the Forest Service Southwestern Regional Office (Forest Service 2015a). The reference period is best characterized as being before the late 1880s and Euro-American settlement and under similar climate (Forest Service 2019a).

Departure measures the degree to which the current condition of a key ecosystem characteristic is unlike the reference condition. When an ERU is departed from reference, or desired, conditions, it may be at risk of losing ecological integrity. Departure is measured for a number of ecosystem characteristics, though departure of seral state proportion is the primary indicator of overall departure. Departure classes are provided in the Lincoln NF Assessment Report for Ecological Resources (Forest Service 2019a) as a qualitative measure for each ERU from the pre-settlement reference period; moderate and high values are considered significantly departed:

- low (0 to 33 percent departed)
- moderate (34 to 66 percent departed)
- high (67 to 100 percent departed).

Table 3-1 shows each ERU, total acreage on the Lincoln NF, and their departure conditions. Reasons for departure are described in the narrative for each ERU following the table.

¹ The Lincoln NF Assessment Report for Ecological Resources uses several ecosystem characteristics to describe upland vegetation in the plan area. Ecosystem characteristics are specific components of ecological conditions that sustain ecological integrity (Forest Service Handbook 1909.12, Chapter 10). Seral state is a key ecosystem characteristic and is a focus of the upland vegetation community analysis in this chapter. Other ecosystem characteristics described in the assessment report include, but are not limited to, fire interval and severity, fire regime condition class, snags and coarse woody debris, and ground cover.

Ecological Response Unit

The Lincoln NF contains 15 upland ERUs (riparian and wetland ERUs are described in the Riparian and Wetland Ecosystems section). Table 3-1 shows each upland ERU, total acreage on the Lincoln NF, and their qualitative departure class. Reasons for departure are described in the narrative for each ERU following the table. ERUs are also shown in figure 3-1.

Table 3-1. Ecological Response Units

ERU Type	ERU	Departure Class ¹	Acres ³	Percent
Forest	Spruce-fir forest	Moderate	11,000	1
	Wet mixed conifer forest (mixed conifer with aspen forest)	Moderate	35,500	3
	Dry mixed conifer (mixed conifer-frequent fire)	Moderate	163,500	13
	Ponderosa pine forest	High	123,000	10
	Ponderosa pine-evergreen oak forest ²	Moderate	8,700	1
Woodland	Piñon-juniper evergreen shrub	Moderate	53,800	4
	Juniper grass ²	Moderate	9,800	1
	Piñon-juniper woodland	Moderate	319,100	25
	Piñon-juniper grass	Moderate	165,500	13
Shrubland	Gambel oak shrubland ²	High	3,600	<1
	Mountain mahogany mixed shrubland	Moderate	52,100	4
	Chihuahuan desert scrub	Low	19,500	2
Grassland	Montane/subalpine grassland	High	11,300	1
	Semi-desert grassland	High	66,000	5
	Colorado plateau/great basin grassland ²	High	400	<1
ERU Total			1,042,900	100

Sources: Forest Service 2019a; Forest Service GIS 2020

¹ Departure classes: low (0 to 33 percent departed), moderate (34 to 66 percent departed), and high (67 to 100 percent departed). Moderate and high values are considered significantly departed.

² Rare ERU in the plan area; contributes 1 percent or less to the plan area acreage.

³ Rounded to the nearest 100 acres. Acres will not sum to the plan area total (1,260,900) because this table does not include wetland or riparian ERUs or private lands.

Spruce-Fir Forest

General description

Also known as subalpine conifer forests, the spruce-fir forest ERU ranges in elevation from 9,000 to 10,500 feet along a variety of gradients, including gentle to very steep mountain slopes. This ERU is composed almost entirely of a combination of Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*), associations dominated by corkbark fir (*A. lasiocarpa* var. *arizonica*), or both. Common understory species may include red baneberry (*Actaea rubra*), spruce fir fleabane (*Erigeron eximius*), strawberryleaf raspberry (*Rubus pedatus*), whortleberry (*Vaccinium myrtillus*), and twinflower (*Linnaea borealis*).

Spruce-fir forests are disturbance forests, with climax (late) seral states being less common than early seral communities (Peet 1988). Natural system drivers and stressors in this ERU are blowdown, insect outbreaks, climate change, and stand-replacing fires.

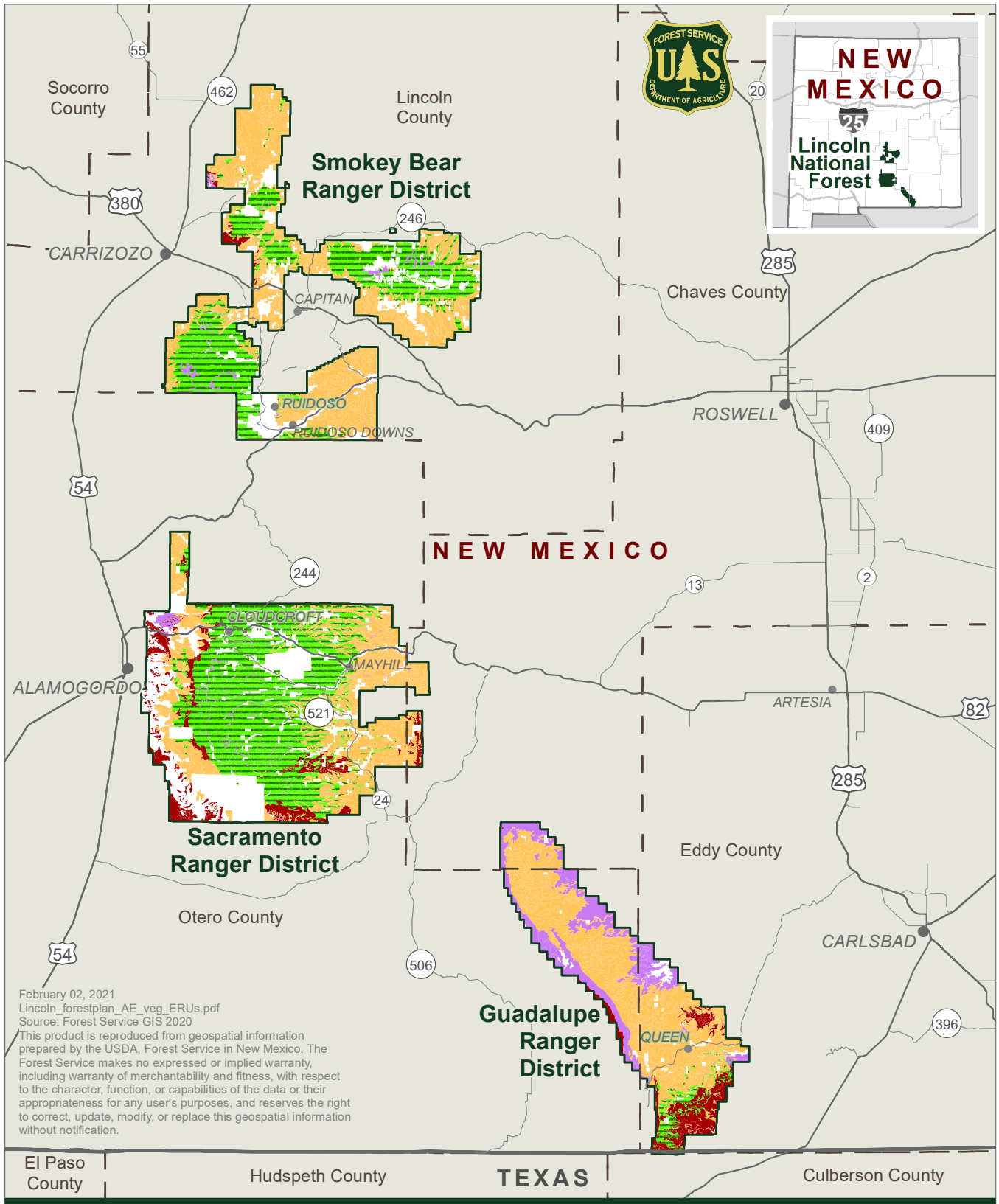


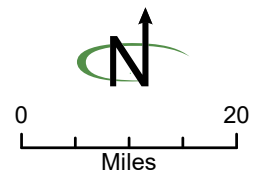


Figure 3-1 Upland Ecological Response Units

-  Forest: mixed Conifer - frequent fire; mixed Conifer w/ Aspen; Ponderosa Pine - Evergreen Oak; Ponderosa Pine forest; Spruce-Fir forest
-  Grassland: Colorado Plateau/Great Basin grassland; Montane/Subalpine grassland; Semi-Desert grassland

-  Shrubland: Chihuahuan desert scrub; Gambel Oak shrubland; interior chaparral; Mountain Mahogany mixed shrubland
-  Woodland: Juniper grass; PJ Evergreen shrub; PJ grass; PJ woodland



Spatial distribution

The spruce-fir forest ERU comprises approximately 11,000 acres, or 1 percent, of the plan area (table 3-1). This unit is in the Smokey Bear Ranger District only. Over 6,700 acres are in the wilderness areas in the district.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-2. Seral state departure is the difference between the current and reference seral state proportion values.

Total seral state departure is moderate for this ERU for the plan area (table 3-1). Departure from reference conditions is primarily due to overrepresentation of early seral herbaceous, shrub, and small tree states (A, B, C, and G) and forested states dominated by larger trees 10 to 20 inches (D, H), and underrepresentation of late-seral, large and closed forest (greater than 20 inches, greater than 30 percent canopy) (see table 3-2).

Approximately 39 percent of this ERU in the plan area is in combined early seral states A, B, C, and G, compared with 21 percent for reference condition. Over-representation of the early seral states likely reflects multiple recent past disturbances, such as stand-replacement fires, part of natural fire conditions. Mid-seral states D and H make up 61 percent of the ERU and are likely from earlier stand-replacement fires (Dyer and Moffett 1999). The Lincoln NF has virtually no forest in the late seral, large closed forest, compared with a reference condition of 46 percent.

Table 3-2. Spruce-Fir Forest ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early	A, B, C, and G	Grass, forb, sparsely vegetated or recently burned areas, with very open tree canopy cover (less than 10%), shrubs with open canopy cover (between 10 and 30%) or closed canopy cover (30% and greater), and seedling/sapling (less than 5 inches) and small trees (between 5 and 10 inches) with open (between 10 and 30%) or closed (greater than 30%) canopy cover	21	39
Mid	D, H	Medium to large trees (between 10 and 30 inches), with open to closed canopy cover	33	61
Late	E, F	Very large trees (greater than 30 inches) with closed canopy cover	46	0
Late	I, J	Very large trees with open canopy cover ¹	0	0

Source: Forest Service 2019a

¹ Occurs on contemporary, historically rare, or localized landscapes.

Wet Mixed Conifer Forest (Mixed Conifer with Aspen Forest)

General description

The mixed conifer with aspen forest, or wet mixed conifer, ERU hosts a variety of dominant and codominant species spanning mesic environments in the Rocky Mountain and Madrean Provinces. Wet mixed conifer forests range in elevation from approximately 9,000 to 10,500 feet along a variety of gradients, including gentle to very steep mountain slopes, situated between ponderosa pine (*Pinus*

ponderosa) and dry mixed conifer forests at lower elevations and spruce-fir forest ERU at higher elevations.

Dominant and codominant vegetation varies in elevation and moisture availability. Ponderosa pine occurs incidentally or is absent, while Douglas-fir (*Pseudotsuga menziesii*), white pine (*Pinus strobiformis*), and white fir (*Abies concolor*) occur as dominant or codominant conifer species. Understory vegetation is composed of a variety of shrubs, grasses, and forbs, depending on soil type, aspect, elevation, disturbance history, and other factors. Historically this ERU had over 10 percent tree canopy cover, with the exception of early, postfire plant communities.

Quaking aspen (*Populus tremuloides*) stands are a component of the mixed conifer with aspen forest ERU. This component is dominated by quaking aspen and may or may not have a significant conifer component, depending on successional status. The understory structure may have shrubs and an herbaceous layer, or just an herbaceous layer. Common shrubs are oceanspray (*Holodiscus dumosus*), thimbleberry (*Rubus parviflorus*), fivepetal cliffbush (*Jamesia americana*), and mountain ninebark (*Physocarpus monogynus*). The herbaceous layer may be dense or sparse and dominated by graminoids or forbs.

Distribution of aspen in this ERU is limited by several factors, including adequate soil moisture required to meet its high evapotranspiration demand, the length of the growing season or low temperatures, and major disturbances that clear areas of vegetation and stimulate root sprouting and colonization.

Spatial distribution

This ERU comprises approximately 35,500 acres (3 percent) of the plan area (table 3-1). Mixed conifer with aspen forest is found only in the Sacramento Ranger District.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-3. Seral state departure is the difference between the current and reference seral state proportion values.

Seral or structural state departure from reference conditions is moderate for the plan area (table 3-1). Departure arises in part from an overrepresentation of early to mid-seral tree dominated sites in under 20-inch size classes (states C, D, G, and H) and underrepresentation of very large, closed late-seral forest (greater than 20 inches, greater than 30 percent canopy, states E and F) (see table 3-3).

Aspen is an early to mid-successional species. Successful regeneration of aspen stands may reduce departure in the future. Aspen is not considered to be reproducing successfully on parts of the Lincoln NF due to excessive damage from elk browsing (Forest Service 2019a). Departure from the pre-settlement reference condition also is attributable to the Lincoln NF lacking in the mixed deciduous and aspen (state B). The Lincoln NF has 18 percent of this ERU in state B, while reference conditions call for 21 percent, as shown in table 3-3.

Wildfire suppression may also play a role in the departed condition, in that few stand-replacement fires have occurred to provide opportunities for aspen regeneration. The 2000 Scott Able Fire was one of the most significant natural events in recent decades that shaped conditions in this ERU. No postfire planting has occurred in this ERU, although 582 acres of seedlings, saplings, and small trees under 10 inches diameter are growing where the Scott Able Fire burned through natural regeneration. Trees larger than 5 inches diameter were probably established before the fire; trees established since the fire were naturally regenerated.

Table 3-3. Mixed Conifer with Aspen ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early	A	Grass, forb, sparsely- vegetated or recently burned areas, with very open canopy cover (less than 10%), and shrubs with open canopy cover (between 10 and 30%) or closed canopy cover (30% and greater)	1	0
Early to Late	B	Aspen and mixed deciduous trees of all sizes, with open or closed canopy cover	21	18
Early to Mid	C, D, G, and H	Seedling/saplings (less than 5 inches), small trees (between 5 and 10 inches), medium trees (between 10 and 20 inches), and large trees (between 20 and 30 inches), with open or closed canopy cover	29	81
Late	E, F	Very large trees (greater than 30 inch), with closed canopy cover	49	1
Late	I, J	Very large trees, with open canopy cover ¹	0	0

Source: Forest Service 2019a

¹ Occur on contemporary, historically rare, or localized landscapes.

Dry Mixed Conifer (Mixed Conifer-Frequent Fire)

General description

The mixed conifer-frequent fire ERU spans a variety of moderately moist environments in the Rocky Mountain and Madrean Provinces. In the southwestern United States, mixed conifer forests may be found at elevations of between 6,000 and 10,000 feet, situated between ponderosa pine, pine-oak, or piñon-juniper woodlands below and spruce-fir forests above.

Typically these types were dominated by ponderosa pine in an open forest structure (less than 30 percent tree canopy cover), with minor occurrence of quaking aspen, Douglas-fir, white fir, and white pine. On contemporary landscapes, more shade-tolerant conifers, such as Douglas-fir and white fir, tend to increase in cover in late succession, contrary to conditions under characteristic fire regimes; however, historically, these species could have achieved dominance in localized settings, where aspect, soils, and other factors limited the spread of surface fire. Currently, much of this type is dominated by closed structure (greater than 30 percent tree canopy cover) and climax species as a result of wildfire suppression.

Spatial distribution

This ERU comprises approximately 163,500 acres (13 percent) of the plan area (table 3-1). It occurs in all ranger districts, though it is mostly in the Sacramento Ranger District (116,000 acres). Approximately 1,800 acres are in the Guadalupe Ranger District, and approximately 45,800 acres are in the Smokey Bear Ranger District.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-4. Seral state departure is the difference between the current and reference seral state proportion values.

Seral state departure for the Lincoln NF is moderate (table 3-1). Current conditions differ from reference conditions primarily in the late-seral, large tree-dominated size classes. Closed canopy is about 60

percent, compared with a reference condition of 5 percent; open multistoried canopy is only 2 percent, compared with a reference condition of 60 percent. Early seral states were similar to reference conditions for the plan area (see table 3-4).

A history of wildfire, insect infestations, and past management practices of clear-cutting contributed to current departure by facilitating development of the dense, closed canopy conditions that are now present, while contemporary wildfire suppression and management requirements for wildlife habitat keep the ERU in departure by maintaining these conditions. For example, amendments to the 1986 Forest Plan restrict the ability to treat forest areas within Mexican spotted owl (*Strix occidentalis lucida*) protected activity centers, which has contributed to some of the departure and perpetuates this trend (Forest Service 2019a). Recent wildfires and insect mortality contribute to the current high percentage in the early seral state, as shrubs and seedlings/saplings become established in openings created by these disturbances.

Table 3-4. Mixed Conifer-Frequent Fire ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early	A, B, F, and N	Grass, forb, sparsely vegetated or recently burned areas, with very open canopy cover (less than 10%) and shrubs and seedling/saplings (less than 5 inches), with open canopy cover (between 10 and 30%) or closed canopy cover (greater than 30%)	20	19
Mid	C	Small trees (between 5 and 10 inches), with open canopy cover	10	9
Late	D, E	Medium to very large trees (greater than 10 inches), single storied, with open canopy cover ¹	0	6
Mid	G	Small trees, with closed canopy cover	5	3
Late	H, I, L, and M	Medium to very large trees, multistoried, with closed canopy cover	5	60
Late	J, K	Medium to very large trees, multistoried, with open canopy cover	60	2

Source: Forest Service 2019a

¹ Occurs on contemporary, historically rare, or localized landscapes.

Ponderosa Pine Forest

General description

The ponderosa pine forest ERU generally occurs on loose, well-drained soils derived from igneous, metamorphic, and sedimentary parent material at elevations ranging from 6,000 to 10,000 feet. Ponderosa pine forest is typically bounded at the upper elevation by mixed conifer forest and at the lower elevation by grasslands or piñon-juniper woodlands; however, these communities may mix extensively at community boundaries. The extent of mixing is influenced by changes in slope, elevation, aspect, and moisture (Moir 1993).

The dominant species in this system is ponderosa pine. Other trees may be present, such as Gambel oak (*Quercus gambelii*), Douglas-fir, two-needle piñon pine (*Pinus edulis*), and junipers. There is typically a shrubby understory, such as currants and gooseberries (*Ribes* spp.) and buckbrush (*Ceanothus* spp.); these are mixed with a variety of grasses and forbs, such as Arizona fescue (*Festuca arizonica*), mountain

muhly (*Muhlenbergia montana*), pine dropseed (*Blepharoneuron tricholepis*), blue grama (*Bouteloua gracilis*), fleabanes (*Erigeron* spp.), and pussytoes (*Antennaria* spp.).

This ERU sometimes occurs as savannah, with extensive grasslands interspersed between widely spaced clumps or individual trees. This system is adapted to drought during the growing season and has evolved several mechanisms to tolerate frequent, low-intensity surface fires.

Spatial distribution

This ERU comprises approximately 123,000 acres (10 percent) of the plan area (table 3-1) in the Smokey Bear (69,500 acres) and Sacramento (53,500 acres) Ranger Districts.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-5. Seral state departure is the difference between the current and reference seral state proportion values.

Table 3-5. Ponderosa Pine Forest ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early	A, B, F, and N	Grass, forb, sparsely vegetated, or recently burned areas, with very open canopy cover (less than 10%), and shrubs and seedling/saplings (less than 5 inches), with open canopy cover (between 10 and 30%) or closed canopy cover (greater than 30%) ¹	0	17
Mid	C	Small trees (between 5 and 10 inches), with open canopy cover ¹	0	28
Late	D, E	Medium to very large trees (greater than 10 inches), single storied, with open canopy cover ¹	0	9
Mid	G	Small trees with closed canopy cover ¹	0	5
Late	H, I, L, and M	Medium to very large trees, multistoried with closed canopy cover ¹	0	39
Late	J, K	Medium to very large trees, multistoried with open canopy cover	100	1

Source: Forest Service 2019a

¹ Occurs on contemporary, historically rare, or localized landscapes.

Seral state in the plan area is highly departed (table 3-1). This is primarily due to a natural condition where 100 percent of the ponderosa pine forest landscape was in an open-canopied, multistoried state (J and K combined). These states are dominated by trees that are greater than 10 inches in diameter. Regeneration was limited to dispersed groups or individuals of smaller trees in various size classes maintained by frequent fires. With wildfire suppression and grazing limiting the ability of understories to carry fire, the open canopied mature state shared the landscape with open and closed stands of smaller trees. Where mature trees were still dominant, with time they became closed stands containing various sized trees in the understory.

The Lincoln NF currently has approximately 1 percent in the open reference state (J and K combined). The Lincoln NF has 17 percent in early seral herbaceous and shrub combined states A, B, F, N. These states are the result of fires, some very large and high severity (see table 3-5).

The ponderosa pine forest can regenerate naturally if the fire is not too severe and seeds are available for establishment; however, severely damaged land may not naturally regenerate into forest and often will become persistent oak fields. Unsuccessful natural regeneration suggests a need for planting desired tree species, but the Lincoln NF has only recently started planting in disturbed areas. Rocky terrain and dangerous snags limit extensive planting.

Previous disturbances, such as fire and overgrazing, could lead to conditions favoring extensive shrub, seedling, and sapling growth, with subsequent wildfire suppression allowing the growth of dense stands of small trees. These can grow into more dense stands of mid- and late-seral trees, including favoring a shift to more shade-tolerant species, fire-intolerant species, or both. Evidence for this may be seen in the mid-seral states C and G. The Lincoln NF has 28 percent in small tree, open canopy state C and about 5 percent in closed canopy state G. These states are management opportunities to reduce departure through thinning and enhanced use of fire.

Late-seral states (H, I, L, and M) of large tree stands with closed canopies are much different from the reference state. These states may provide a more immediate opportunity to reverse departure by opening the canopy and restoring the open understory structure to allow low-severity fire as a maintenance tool.

Ponderosa Pine-Evergreen Oak Forest

General description

The ponderosa pine-evergreen oak ERU occurs in the mild climate gradients of central and southern Arizona and in southern New Mexico, particularly below the Mogollon Rim, where warm summer seasons and winter-summer precipitation are characteristic. This ecological type occurs at elevations ranging from 5,500 to 7,200 feet.

This system is dominated by ponderosa pine and can be distinguished from the ponderosa pine forest ERU by well-represented evergreen oaks (for example, Emory oak [*Quercus emoryi*], Arizona white oak [*Q. arizonica*], silverleaf oak [*Q. hypoleucooides*], and gray oak [*Q. grisea*]), alligator juniper (*J. deppeana*), and piñon pine. Though not an indicator in the ponderosa pine zone, border piñon (*P. discolor*), along with oneseed juniper (*J. monosperma*), can occur as a dominant or codominant component of the ponderosa pine-evergreen oak ERU. Understory shrubs are manzanita (*Arctostaphylos* spp.), Sonoran scrub oak (*Q. turbinella*), skunkbush sumac (*Rhus trilobata*), and mountain mahogany (*Cercocarpus montanus*).

Spatial distribution

This ERU comprises approximately 8,700 acres (1 percent) of the plan area (table 3-1) in the Sacramento (less than 100 acres) and Guadalupe (8,700 acres) Ranger Districts.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-6. Seral state departure is the difference between the current and reference seral state proportion values.

Seral state distribution on the Lincoln NF is moderately departed (table 3-1). Departure is most related to underrepresentation of open canopied large trees (greater than 10 inches) in state D and overrepresentation of small trees (5 to 10 inches) in open state C. The forest has a combined 92 percent in small tree open and closed states (B and C), compared with a reference condition of 27 percent. Areas in the seedling or sapling state F are likely a result of relatively recent fires. No acres on the Lincoln NF are mapped in state E (see table 3-6).

Table 3-6. Ponderosa Pine-Evergreen Oak ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early	A	Grass, forb, sparsely vegetated or recently burned areas, with very open canopy cover (less than 10%) and shrubs, with open canopy cover (between 10 and 30%) or closed canopy cover (greater than 30%)	4	2
Mid	B	Small trees (between 5 and 10 inches), with closed canopy cover	3	27
Mid	C	Small trees with open canopy cover	24	65
Late	D	Medium to very large trees (greater than 10 inches, single-storied or uneven-aged (multistoried), with open canopy cover	60	2
Late	E	Medium to very large trees, single-storied or uneven-aged (multistoried), with closed canopy cover	4	0
Early	F	Seedling/saplings (less than 5 inches), with open or closed canopy cover	5	3

Source: Forest Service 2019a

Piñon-Juniper Evergreen Shrub

General description

The piñon-juniper evergreen shrub ERU is typically found on lower slopes in transition zones, often between interior chaparral and montane forests. It is most extensive in areas dominated by mild climate gradients and winter-summer precipitation. It is found on well-drained soils, frequently with coarse-textured or gravelly, sometimes stony, soil.

This ERU is a broad grouping of different plant associations, with tree and shrub species composition varying throughout the region. Historically this ERU had greater than 10 percent tree canopy cover in later successional stages, with two-needle piñon, single-leaf piñon, Utah juniper, oneseed juniper, or alligator juniper. Piñon is occasionally absent, but one or more juniper species are always present. Oak trees (Arizona white oak, gray oak, Emory oak) are subordinate. Trees occur as individuals or in smaller groups and range from young to old; however, typically and historically, small stands or clumps are even-aged, due to mixed severity fire.

The understory is dominated by low to moderate density shrubs, with herbaceous plants in the interspaces. Shrub species are manzanita, mountain mahogany, antelope bitterbrush (*Purshia tridentata*), silktassles (*Garrya* spp.), Stansbury cliffrose (*Purshia stansburiana*), Sonoran scrub oak, and sumacs (*Rhus* spp.). Understory plants consisting of perennial native grasses and both annuals and perennial forbs comprise the remainder of the inter-canopy.

Typical drivers and stressors, such as fire, insects, and diseases, are moderate and of mixed severity, although some evergreen shrub woodland types exhibit infrequent fire and high severity effects. These disturbance patterns create and maintain tree-age diversity and low to moderately closed canopy typical of this type.

Spatial distribution

This ERU comprises approximately 53,800 acres (4 percent) of the plan area (table 3-1) in the Sacramento (23,900 acres) and Guadalupe (29,900 acres) Ranger Districts.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-7. Seral state departure is the difference between the current and reference seral state proportion values.

Juniper evergreen shrub can be differentiated from interior chaparral by longer fire intervals and less severe fires. Due to the effects of long-term wildfire suppression, in many locations the current condition is departed from reference conditions. Typically these changes include in-filling of the canopy gaps, increased density of tree groups, and reduced composition, density, and vigor of the herbaceous understory plants. Many of these sites currently are closed-canopy woodlands, with insufficient understory vegetation to support surface fires.

Table 3-7. Piñon-Juniper Evergreen Shrub ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early	A	Grass, forb, sparsely vegetated, or recently burned areas, with very open canopy cover (less than 10%), and shrubs with open canopy cover (between 10 and 30%) or closed canopy cover (greater than 30%)	5	7
Mid	B, C, E	Seedling/saplings (less than 5 inches), with open or closed canopy cover, and small trees (between 5 and 10 inches), with open canopy cover	55	79
Late	D	Medium to very large trees (greater than 10 inches), with open canopy cover	40	3
Mid	F	Small trees, with closed canopy cover	0	11
Late	G	Medium to very large trees, with closed canopy cover	0	0

Source: Forest Service 2019a

The seral state departure of piñon-juniper evergreen shrub is moderate for the plan area (table 3-1). Seral states in this ERU are summarized in table 3-7. The plan area has a larger proportion of the early and mid-seral combined states B, C, and E than reference conditions, and smaller proportion of the late seral state D. This may be partially explained by recent fires, primarily the Last Chance and Dinner Fires in the Guadalupe District.

Juniper Grass

General description

The juniper grass ERU is typically found on warmer and drier settings beyond the environmental limits of piñon and just below and often intergrading with the piñon-juniper zone. The juniper grass ERU is generally uneven aged and very open in appearance (savanna-like), primarily on Mollisol soils. Trees occur as individuals or in smaller groups and range from young to old. A dense herbaceous matrix of native grasses and forbs characterize this type.

The juniper grass ERU is typically found on sites with well-developed, loamy soil characteristics, generally at the drier edge of the woodland climatic zone. Generally these types are most extensive in geographic areas dominated by warm (summer) season or winter-summer precipitation. It is mostly found on lower slopes of mountains and in rolling hills, at approximately 4,500 to 7,500 feet in elevation.

The tree and grass species composition varies throughout the region, consisting of a mix of one or more juniper species. Typically, native understory grasses are perennial species, while forbs consist of both annuals and perennials. Shrubs are characteristically absent or scattered. Common grass species are blue grama and other species of grama grass (sideoats [*B. curtipendula*], hairy [*B. hirsuta*], black [*B. eriopoda*], New Mexico muhly [*Muhlenbergia pauciflora*], curlyleaf muhly [*M. setifolia*], western wheatgrass [*Pascopyrum smithii*], and needle and thread grasses [*Hesperostipa* spp.]).

Typical drivers and stressors of fire, insects, and diseases are low severity and high frequency. These disturbance patterns create and maintain the uneven-aged, open-canopy nature of this ERU. Frequent, low-intensity surface fires may be responsible for maintaining the open stand structure and dense herbaceous growth of piñon-juniper savanna. Overall, these sites are less productive for tree growth than the piñon-juniper woodland type.

Spatial distribution

This ERU comprises approximately 9,800 acres (1 percent) of the plan area (table 3-1) in the Smokey Bear (3,700 acres) and Guadalupe (6,000 acres) Ranger Districts.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-8. Seral state departure is the difference between the current and reference seral state proportion values.

Table 3-8. Juniper Grass ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early	A	Grass, forb, sparsely vegetated, or recently burned areas, with very open canopy cover (less than 10%), and shrubs with open canopy cover (between 10 and 30%) or closed canopy cover (greater than 30%)	5	43
Mid	B, C, E	Seedling/saplings (less than 5 inches), with open or closed canopy cover, and small trees (between 5 and 10 inches), with open canopy cover	25	50
Late	D	Medium to very large trees (greater than 10 inches), with open canopy cover	50	2
Mid	F	Small trees, with closed canopy cover	10	4
Late	G	Medium to very large trees, with closed canopy cover	10	0

Source: Forest Service 2019a

Seral state departure of the juniper grass ERU is moderate (table 3-1). Current conditions show much earlier seral herbaceous and small tree dominated states A, B, C, and E than reference conditions and much less late-seral open woodlands (state D) (see table 3-8).

The high proportion in the herbaceous, shrub, and sparsely vegetated state A, far above the reference condition value of 5 percent, is likely due to so much juniper grass in the fire scars of the Last Chance (2011), Horse Canyon (2011), and Dinner (2012) fires on the Guadalupe Ranger District.

Piñon-Juniper Woodland

General description

The piñon-juniper woodland ERU is a broad grouping of different plant associations. Trees may occur as individuals or in smaller groups and range from young to old, but more typically they are large even-aged structured patches. The site is characteristically dominated by moderate to high-density tree canopy, and understory herbaceous plants and shrubs are limited or scarce. This ERU is mostly found on lower slopes of mountains and in upland rolling hills, at approximately 4,500 to 7,500 feet in elevation.

Tree and shrub species composition varies throughout the Southwest; common trees are two-needle piñon, single-leaf piñon (*P. monophylla*), Utah juniper (*J. osteosperma*), oneseed juniper, and alligator juniper. Typically, sparse native understory grasses are perennial species, such as several species of grama (*Bouteloua* spp.), common wolftail (*Lycurus phleoides*), and threeawns (*Aristida* spp.), while forbs consist of both annuals and perennials. Shrubs are characteristically sparse to moderately distributed.

This type is typically found on sites with rocky soil characteristics. Wildfire suppression has not exhibited the far-reaching effects on this ERU, as has been the case in other woodland types (Forest Service 2019a). Vegetation maturation, decadence, and overall readiness for ignition are some of the key characteristics that influence fire disturbances in this ERU.

Typical stressors and drivers, such as fire, insects, and diseases, are high severity and occur infrequently. These disturbance patterns create and maintain the even-aged nature of this vegetation type. Woodland development occurs in distinctive phases, ranging from open grass-forbs, to mid-aged open canopy, to mature closed canopy woodland. Where fire is very infrequent, it is usually attributed to local edaphically influenced fire affects, such as rocky scarps. On these sites, such factors as insects and diseases may be the only disturbance agents that affect woodland development.

Spatial distribution

This ERU comprises approximately 319,100 acres (25 percent) of the plan area (table 3-1) in the Smokey Bear (190,300 acres) and Sacramento (128,800 acres) Ranger Districts.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-9. Seral state departure is the difference between the current and reference seral state proportion values.

The Lincoln NF is moderately departed for seral state distribution (table 3-1). Departure for the Lincoln NF arises from a high percentage (70 percent) in early seral seedling and sapling trees and small diameter trees with open canopy cover (states B, C, E) and a low percentage (9 percent) in larger, late-seral, closed-canopy, tree-dominated state G. Reference conditions, in contrast, are 5 percent for states B, C, and E, and 60 percent for state G (see table 3-9).

The large values for seral states B, C, and E may be attributable to fires, including the Peppin Fire (2004), Cree (2000), White (2011), Donaldson (2011), Scott Able (2000), and Mayhill (2011) fires (Forest Service 2019a). As seedlings and saplings become established in openings created by these disturbances, there have been corresponding increases in early seral conditions dominated by small-diameter seedlings and saplings with open canopy conditions.

Table 3-9. Piñon-Juniper Woodland ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early	A	Grass, forb, sparsely vegetated, or recently burned areas, with very open canopy cover (less than 10%), and shrubs with open canopy cover (between 10 and 30%) or closed canopy cover (greater than 30%)	10	4
Mid	B, C, E	Seedling/saplings (less than 5 inches), with open or closed canopy cover, and small trees (between 5 and 10 inches), with open canopy cover	5	70
Late	D	Medium to very large trees (greater than 10 inches), with open canopy cover	10	8
Mid	F	Small trees, with closed canopy cover	15	10
Late	G	Medium to very large trees, with closed canopy cover	60	9

Source: Forest Service 2019a

Piñon-Juniper Grass

General description

The piñon-juniper grass ERU occurs across Arizona and New Mexico, in what were historically more open woodlands with grassy understories. It is mostly found on lower slopes of mountains and in upland rolling hills, at approximately 4,500 to 7,500 feet in elevation. It occurs on deep, fine-textured soils (usually mollisols) in valley bottoms and on gentle plains with few barriers to fire spread, in areas of warm summers and winter-summer precipitation.

Tree species include oneseed juniper, Utah juniper, Rocky Mountain juniper (*J. scopulorum*), alligator juniper, and two-needle piñon. Scattered shrubs and a dense herbaceous understory of native grasses and forbs characterize this type. Native understories were made up of perennial grasses, with both annual and perennial forbs, and shrubs that were absent or scattered. Contemporary understories often include invasive grasses and uncharacteristically high shrub cover.

According to Wahlberg and others (2014), empirical information on the historical condition of this type is lacking; however, site productivity provides inference for the development of a grass and fine fuels layer, in turn, providing inference of frequent fire and open, uneven-aged forest dynamics. At least one study, substantiating multiple tree cohorts in similar plant communities, corroborates these assumptions (Gottfried 2003). There is photo documentation of various piñon and juniper landscapes of this and similar ERUs that show historically more open canopies and grasslands (see Fuchs 2002 *in* Forest Service 2019a). As such, there would have been individual trees or those in smaller clumps and they would range from young to old.

Typical drivers and stressors, such as fire, insects, and diseases, are low severity and high frequency. These disturbance patterns would have created and maintained uneven-aged and open-canopied conditions. The tree and grass species composition varies throughout the region, consisting of a mix of one species of piñon (ranges are typically distinct) and one or more species of juniper. Typically, native understory grasses are perennial species, while forbs consist of both annuals and perennials. Shrubs are characteristically absent or scattered.

Spatial distribution

This ERU comprises approximately 165,500 acres (13 percent) of the plan area (table 3-1) in all ranger districts, although it is most widespread in the Guadalupe Ranger District (137,500 acres). Approximately 19,500 acres are in the Smokey Bear Ranger District and 8,600 acres are in the Sacramento Ranger District.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-10. Seral state departure is the difference between the current and reference seral state proportion values.

Table 3-10. Piñon-Juniper Grass ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early	A	Grass, forb, sparsely vegetated, or recently burned areas, with very open canopy cover (less than 10%), and shrubs, with open canopy cover (between 10 and 30%) or closed canopy cover (greater than 30%)	5	13
Mid	B, C, E	Seedling/saplings (less than 5 inches), with open or closed canopy cover, and small trees (between 5 and 10 inches), with open canopy cover	25	74
Late	D	Medium to very large trees (greater than 10 inches), with open canopy cover	50	2
Mid	F	Small trees, with closed canopy cover	10	8
Late	G	Medium to very large trees, with closed canopy cover	10	2

Source: Forest Service 2019a

Due to the effects of long-term wildfire suppression and grazing in this ERU, in many locations the current condition is severely departed from reference conditions. Typically, these changes include infilling the canopy gaps, increasing the density of tree groups, and reducing composition, density, and vigor of the herbaceous understory plants. Many of these sites are closed-canopy woodlands, with insufficient understory vegetation to support surface fires.

The piñon-juniper grass ERU was moderately departed for seral state proportion in the plan area (table 3-1). The plan area has much greater percentages in small tree-dominated states B, C, and E, than reference conditions and much less percentage in the late-seral medium/large tree, open canopy state D. Small mid-seral trees in closed canopy (state F) and late-seral closed canopy (state G) were also less than reference conditions (see table 3-10).

This indicates that all areas of this ERU are departed, with more closed canopy than under reference conditions. This ERU should typically have larger trees in an open canopy, but, due to legacy grazing and wildfire suppression, vegetation structure has shifted to more closed states. The difference in tree sizes may be a reflection of time since last large disturbance.

Gambel Oak Shrubland

General description

Gambel oak shrubland is dominated by long-lived Gambel oak clones that form largely monotypic overstories (Simonin 2000). It occurs at between 6,500 and 9,500 feet on all aspects; at higher elevations it occurs more predominantly on southern exposures. Gambel oak occurs as the dominant species, ranging from dense thickets to clumps associated with other shrub species, such as serviceberry or sagebrush. Older, more developed Gambel oaks can have a well-developed understory of snowberry (*Symphoricarpos* spp.), elk sedge (*Carex geyeri*), Letterman's needlegrass (*Achnatherum lettermanii*), yarrow (*Achillea millefolium*), lupine (*Lupinus* spp.), and goldenrod (*Solidago* spp.). Depending on site potential, ponderosa pine, juniper, and piñon can encroach on older plant communities.

The primary disturbance mechanism is mixed-severity to stand replacement fire, resulting in top-kill and rare mortality. Gambel oak responds to fire with vigorous sprouting from the root crown. Larger forms may survive low intensity surface fire. On contemporary landscapes, in the absence of recurring mixed to stand-replacing fire, coniferous tree species may be codominant to dominant.

Spatial distribution

This ERU comprises approximately 3,600 acres (less than 1 percent) of the plan area (table 3-1) in the Sacramento Ranger District.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-11. Seral state departure is the difference between the current and reference seral state proportion values.

This ERU is highly departed in the plan area (table 3-1), having little if any area in early seral herbaceous and shrub states. Historically, the Gambel oak shrubland ERU would have only 30 percent of the tree-dominated state D, but the Lincoln NF has 100 percent in state D (see table 3-11).

Table 3-11. Gambel Oak Shrubland ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early	A	Grass, forb, sparsely vegetated, or recently burned areas, with very open canopy cover (less than 10%)	5	0
Mid	B	All size shrubs, with open (between 10 and 30%) canopy cover	50	0
Late	C	All size shrubs, with closed canopy cover (greater than 30%)	15	0
Late	D	All size shrubs, with open or closed canopy cover	30	100

Source: Forest Service 2019a

State D includes all size classes of trees, so it is unclear what the distribution of sizes or ages is; however, as trees become dominant in this state as a result of succession without disturbance, it is likely that the absence of fire is the largest contributor to departure, whether through suppression or lack of ignition.

This ERU is often intermixed with the mixed conifer-frequent fire or ponderosa pine forest ERUs and may be managed similarly, especially in suppressed fire conditions, where trees can gain dominance over shrubs.

Mountain Mahogany Mixed Shrubland

General description

The mountain mahogany mixed shrubland ERU occurs in the foothills, canyon slopes, and lower slopes of the Rocky Mountains. It also is found on outcrops and canyon slopes in the western Great Plains, from southern New Mexico extending north into Colorado. These shrublands are often associated with exposed sites, rocky substrates, dry conditions, and recurrent historical fire that limited tree growth. Scattered trees or inclusions of grassland patches or steppe may be present, but the vegetation is typically dominated by a variety of shrubs, including mountain mahogany and skunkbush sumac. Historically this ERU had less than 30 percent tree canopy cover.

Spatial distribution

This ERU comprises approximately 52,100 acres (4 percent) of the plan area (table 3-1) in all ranger districts. Acres of the ERU on the ranger districts are as follows: 27,500 acres are in the Guadalupe; 21,100 acres are in the Sacramento; and 3,500 acres are in the Smokey Bear.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-12. Seral state departure is the difference between the current and reference seral state proportion values.

The mountain mahogany mixed shrubland ERU is moderately departed for the Lincoln NF (table 3-1). As noted for the Gambel oak shrubland ERU above, tree encroachment is the primary reason for departure. For Lincoln NF, the tree-dominated state D far exceeds the reference conditions, while the open shrub state B is far less (see table 3-12).

Typically, there is little active management in this ERU except where livestock grazing or incidental vegetation treatments in adjacent ERUs, such as juniper or piñon woodlands, occur. Fires are generally suppressed as they occur. Increasing vegetation treatment, including prescribed wildfire or intentionally un-suppressed naturally ignited fire, may accelerate a trend toward reference conditions.

Table 3-12. Mountain Mahogany Mixed Shrubland ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early	A	Grass, forb, sparsely vegetated, or recently burned areas with very open canopy cover (less than 10%)	5	3
Mid	B	All size shrubs, with open canopy cover (between 10 and 30%)	5	18
Late	C	All size shrubs, with closed canopy cover (greater than 30%)	15	0
Late	D	All size shrubs, with open or closed canopy cover	3	79

Source: Forest Service 2019a

Chihuahuan Desert Scrub

General description

The Chihuahuan Desert Scrub ERU ranges from the edges of basin floors, up alluvial fan piedmonts, to the foothills of desert mountains and mesas. The major dominant species is creosote bush (*Larrea tridentata*), often mixed with tarbush (*Flourensia cernua*). Other sites may be dominated by whitethorn acacia (*Acacia constricta*), viscid acacia (*A. neovernicosa*), Rio Grande saddlebush (*Mortonia scabrella*), and ocotillo (*Fouquieria splendens*). Herbaceous cover can be sparse or grassy, with fluffgrass (*Dasyochloa pulchella*) and bush muhly (*M. porteri*) as key indicators (Oregon State University 2012).

Spatial distribution

This ERU comprises approximately 19,500 acres (2 percent) of the plan area (table 3-1). It is found at the lower elevations of the western escarpment of the Sacramento Mountains in the Sacramento Ranger District (16,400 acres) and around the base of the Guadalupe Mountains in the Guadalupe Ranger District (3,100 acres).

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-13. Seral state departure is the difference between the current and reference seral state proportion values.

Seral state departure is low for Chihuahuan Desert Scrub (table 3-1). Departure is due to sparsely vegetated ground being underrepresented, which implies a lack of disturbance; however, grazing has indirectly increased the amount of shrubs, with mesquite (*Prosopis* spp.) growth following cattle trails (Dick-Peddie 1993). Although fire seldom occurs, in generally small patches of mixed severity, suppression and lack of continuous fuels to carry fire into shrubs may keep sparsely vegetated areas in lower than reference abundance. Seral state proportion and departure is summarized in table 3-13.

Table 3-13. Chihuahuan Desert Scrub ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
N/A	A	Sparsely vegetated or recently burned areas, less than 10% shrub or tree cover	5	0
N/A	B, C, D, G	Native herbs, shrubs, or trees dominant	95	100
N/A	E, F	Exotic annual or perennial herbaceous vegetation, with or without tree or shrub cover	0	0

Source: Forest Service 2019a

Montane/Subalpine Grassland

General description

Also referred to as montane grasslands, this system occurs at elevations ranging from 8,000 to 10,900 feet. Size of montane/subalpine grasslands range from small park-like openings to extensive landscapes covering several thousand acres.

This ERU contains a mix of dominant and codominant species in both dry and moister environments. It often harbors several plant associations, with varying prominent grasses and herbaceous species, which may include Parry's oatgrass (*Danthonia parryi*), Arizona fescue, Thurber's fescue (*Festuca thurberi*),

pine dropseed, nonnative bluegrasses (*Poa pratensis* and *P. compressa*), mountain muhly, various sedges, shooting star (*Dodecatheon jeffreyi*), fowl mannagrass (*Glyceria striata*), Sierra rush (*Juncus nevadensis*), Rocky Mountain iris (*Iris missouriensis*), Parry's bellflower (*Campanula parryi*), California false hellebore (*Veratrum californicum*), and species of bulrushes (*Scirpus* spp. and *Schoenoplectus* spp.).

Historically the montane/subalpine grassland ERU had less than 10 percent tree canopy cover and less than 10 percent shrub cover; however, trees may encroach along the periphery of the grasslands. Depending on elevation and adjacent forest ERUs, these trees may include Engelmann, Rocky Mountain Douglas-fir, white and subalpine fir, ponderosa and limber pine. Some shrubs may also be present.

Some portions of the montane/subalpine grassland are seasonally wet, which is closely tied to snowmelt, though they typically do not experience flooding. The montane/subalpine grassland is often interspersed with the herbaceous riparian ERU (see Riparian and Wetland Ecosystems section).

Because of the broad nature of this ERU, future work may split out montane grassland subclasses from the subalpine grassland.

Spatial distribution

This ERU comprises approximately 11,300 acres (1 percent) of the plan area (table 3-1) in the Smokey Bear (6,500 acres) and Sacramento (4,800 acres) Ranger Districts.

Seral state proportion and departure

Montane/subalpine grassland ERU seral state proportion and departure

Seral state departure is the difference between the current and reference seral state proportion values.

Seral state distribution in the plan area is highly departed (table 3-1). Departure is due to tree encroachment and the dominance of nonnative, naturalized species, such as Kentucky bluegrass (*P. pratensis*). Departure will remain high because it is unlikely that native or late-seral herbaceous species will replace naturalized species, such as bluegrass. Seral state proportion and departure is summarized in table 3-14.

Table 3-14. Montane/Subalpine Grassland ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early to Mid	A, C	Early seral: Recently burned, sparsely vegetated, high species diversity and high condition, less than 10% each of tree and shrub cover Early to mid-seral: Recently burned, sparsely vegetated, low to moderate species diversity and less than 10% each of tree and shrub cover	20	0
Late	B	Herb-dominated, with high species diversity and condition, less than 10% each of tree and shrub cover	45	0
Early to Mid	D	Herb-dominated, with low to moderate diversity and condition, and less than 10% each of tree and shrub cover	36	6

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early to Mid (Woody Encroachment)	E, F, G	Herb-dominated, low-moderate species diversity and condition, at least 10% shrub cover and less than 10% tree cover; and early-to mid-seral, tree-dominated, low to moderate species diversity and condition, and less than 10% shrub cover and at least 10% tree cover ¹	0	94

Source: Forest Service 2019a

¹ Occurs on contemporary, historically rare, or localized landscapes

Semi-Desert Grassland

General description

The semi-desert grassland ERU occurs throughout southeastern Arizona and southern New Mexico, at elevations ranging from 3,000 to 4,500 feet. These grasslands are bounded by the Sonoran or Chihuahuan Desert at the lowest elevations and woodlands or chaparral at the higher elevations.

Species composition and dominance varies across the broad range of soils and topography in Arizona and New Mexico. Dominant grassland associations and types are black grama grassland, blue grama grassland, curly mesquite (*Hilaria belangeri*) grassland, tobosagrass (*Pleuraphis mutica*) grassland, big sacaton (*Sporobolus wrightii*) grassland, mixed native perennial grassland, and nonnative perennial grassland. Such shrubs as mesquite (*Prosopis* spp.), catclaw acacia (*Senegalia greggii*), and catclaw mimosa (*Mimosa aculeaticarpa*) also occupy these grasslands, and their abundance and species composition varies.

As described, this ERU may have had over 10 percent shrub cover historically, but it had less than 10 percent tree cover. Semi-desert grassland tends to occur next to and above desert communities and below interior chaparral and woodlands. The boundary between semi-desert grassland and desert communities is sometimes hard to distinguish; this is because desert shrub species can be common in this ERU (Girard et al. 2008) because they share similar overarching ecosystem properties (Forest Service 2015a).

Spatial distribution

This ERU comprises approximately 66,000 acres (5 percent) of the plan area (table 3-1). It is in all ranger districts, although most widespread in the Guadalupe Ranger District (62,600 acres). Approximately 2,600 acres are in the Sacramento Ranger District, and 800 acres are in the Smokey Bear Ranger District.

Seral state proportion and departure

Current Lincoln NF and reference seral state proportions for this ERU are summarized in table 3-15. Seral state departure is the difference between the current and reference seral state proportion values.

Seral state composition on the Lincoln NF is highly departed (table 3-1). This is primarily due to the shift from grassland state B, with high ecological status plants, to states C and D, grassland with low to moderate ecological status, and encroachment of woody species. Seral state proportion and departure is summarized in table 3-15.

Table 3-15. Semi-Desert Grassland ERU Seral State Proportion and Departure

Seral State	States	Description	Reference Seral State Proportion (%)	Current Lincoln NF Seral State Proportion (%)
Early to Mid	A	Sparsely vegetated or recently burned, with very open, woody canopy cover (less than 10%)	20	4
Late	B	Herbaceous layer, dominated by late successional perennial grasses, with very open, woody canopy cover	75	0
Early to Mid (Woody Encroachment)	C, D	Shrub and tree dominated, with open, woody canopy cover (between 10 and 30%), low species diversity	5	94
Early to Mid (Woody Encroachment)	E, F, G, H	Shrub and tree dominated with closed, woody canopy cover (greater than 30%), low species diversity herbaceous layer, with exotic species ¹	0	1

Source: Forest Service 2019a

¹ Occurs on contemporary landscapes, historically rare or localized

In the case of semi-desert grassland, encroachment includes greater than 10 percent tree, shrub, and cactus species, with no discrimination among species. Reference conditions include a fair amount of shrubs, sometimes locally abundant, although trees are fairly scarce. Semi-desert grassland is transitional between more xeric desert communities and piñon or juniper woodlands at the upper elevation range, so it could include species from those communities.

Colorado Plateau/Great Basin Grassland

General description

The Colorado Plateau/Great Basin grassland ERU is typically found along elevational and temperature gradients above semi-desert grasslands and below montane-subalpine grasslands. It occupies cooler and wetter sites than semi-desert grasslands and is common above the Mogollon Rim. This ERU is typically associated with piñon-juniper grass along the grassland-woodland ecotone in cool climates. Vegetation coverage consists of mostly grasses and interspersed shrubs. Grass species may include Indian ricegrass (*Achnatherum hymenoides*), threeawns, blue grama, fescues, needle and thread grass (*Hesperostipa comata*), spike fescue (*Leucopoa kingii*), James's galleta (*Pleuraphis jamesii*), and Sandberg bluegrass (*Poa secunda*). Shrub species may include sagebrush (*Artemisia tridentata*) and saltbush (*Atriplex* spp.). This ERU may have had over 10 percent shrub cover historically, but it had less than 10 percent tree cover.

Spatial distribution

This ERU comprises approximately 400 acres (less than 1 percent) of the plan area (table 3-1) in the Sacramento Ranger District.

Seral state proportion and departure

Seral state proportion and departure from reference conditions were not modeled for this ERU (Forest Service 2019a).

Environmental Consequences for Vegetation Communities

Methodology and Analysis Process

The assessment area for upland vegetation is the plan area; this is the area within the administrative boundaries of the Lincoln NF. This assessment area was chosen because it contains the areas that could be affected by the alternatives.

Upland vegetation condition is stratified using the ERU classification system, which is a grouping of sites similar in plant species composition, succession patterns, and disturbance regimes. ERUs provide the foundational unit for the analysis of vegetation attributes and associated ecosystem services at the landscape and planning scales (Forest Service 2019a).

The effects of the alternatives on the ERUs are analyzed for a 20-year period. This duration was chosen because effects from plan implementation would take approximately this amount of time to become evident. Further, modeling the effects of management on seral state departure in ERUs for 20 years is consistent with wood product sales analyses' required values at 10 and 20 years.

Potential effects of decisions and management actions were identified by reviewing the best available science and using qualitative and quantitative data related to impact indicators. A metric of acres or miles was selected whenever possible to best reflect the scale and magnitude of these effects. A Forest Service GIS dataset and overlays of resources and resource uses were used to quantify effects, when available.

Reference conditions have been inferred from historical records and descriptions of ecosystems before intensive land use by humans, generally assumed to be the late 1800s (Schussman and Smith 2006). Instances where desired conditions differ from reference conditions are noted in the analysis.

The section is organized by the issue topics identified during scoping and subsequent alternatives development in addition to specific analysis related to seral state proportion.

Seral State Proportion

Vegetation specialists modeled the transitions across seral states in individual ERUs over time, to obtain a measure of seral state departure from reference conditions. Seral state departure is the degree to which the current conditions and stages of ecosystem development differ from the historical or desired condition. Many ERUs on the Lincoln NF currently have moderate to high seral state departure. Forested ERUs typically have a greater stem density and higher canopy closure than was characteristic in historical forests. Both forested and non-forested ERUs have compromised understory structures and often support plant species compositions that were not characteristic of historical conditions. The addition of nonnative, invasive plants has compounded this issue. Non-forest ERUs, particularly grasslands, have departed structures, due to encroachment of tree and shrub species, resulting in seral state conditions that were not present historically (see Description of Affected Environment).

Current departure from reference conditions for the seral state proportion was calculated, and future departure was modeled (Forest Service 2019a). Model results provide the basis for the seral state analysis, below. A description of the modeling process is included in Appendix E. As described above, modeled effects on the seral state proportion from proposed management are described at the 20-year timestep from plan implementation. Effects from plan implementation would take approximately this amount of time to become evident, though effects may continue to become more evident when modeled out over longer time periods (Forest Service 2019a).

Assumptions

The various management activities described in the plan will occur to the extent necessary to achieve the objectives described under each alternative. The specific locations and designs of these activities are not known at this time; therefore, this analysis refers to the potential of the effect to occur, realizing that in many cases, these are only estimates.

The Colorado Plateau/Great Basin grassland ERU is limited in distribution in the plan area, and consists of small inclusions widely distributed through a matrix of the piñon-juniper woodland ERU. Desired conditions and specific management actions have not been developed for this ERU. Specific management is unlikely to be developed for this ERU in the future. Where it occurs, this ERU would be managed as an inclusion in the adjacent ERU; thus, it is not discussed in detail in the analysis.

Indicators

- Acres of ERUs open to mechanical thinning and prescribed burning vegetation treatments
- Acres of ERUs open or closed to livestock grazing
- Acres of ERUs in special designation areas
- ERU seral state proportion

Environmental Consequences for Upland Vegetation Communities Common to All Alternatives

Effects from Access and Recreation

Developed and dispersed recreation, as well as administrative functions to maintain access and recreation, can affect vegetation in a variety of ways, as described below. Construction of new motorized and nonmotorized trails and developed recreation facilities, such as recreation sites and campgrounds, would directly affect vegetation in ERUs by disturbing the surface and removing vegetation. Such developments would create discrete footprints, clear of vegetation.

Forest Service staff remove vegetation during trail maintenance, in designated campsites, and around administrative structures. Vegetation removal during maintenance typically is limited to removing brush and limbs that grow into the trail or to clear larger trees that have fallen and block access. This is done to provide clear and safe routes for travel. Vegetation may also be removed at campsites, trailheads, and other developed recreation facilities. This would be done to clear safe routes for travel and to remove hazard trees or limbs.

Vegetation can be mechanically damaged when it is trampled by recreationists engaging in motorized and nonmotorized activities, such as hiking, riding horses or using pack stock, and riding or driving mountain bikes, dirt bikes, all-terrain vehicles, or other types of off-highway vehicles in areas where vegetation is rooted or growing. These impacts tend to be concentrated along trails and around campsites, and where animals are grazed in sensitive areas. Where there are established trails, trampling rarely affects vegetation more than 6.5 feet from the trail edge (Dale and Weaver 1974). Mechanical damage can reduce leaf area, plant height, and reproductive output. Ultimately, such impacts can alter plant vigor, decrease individual plant survival, alter species composition, and reduce overall vegetation cover.

Vegetation types differ in their ability to resist and recover from trampling. Grass-like plant characteristics generally make them more resistant to trampling than forbs and woody plants, such as shrubs and young trees (Cole 1993, 1995); thus, grassland and meadow vegetation may tolerate trampling better than the understory of wooded areas (Cole 1987).

Ground disturbance and vegetation removal can increase the potential for nonnative, invasive plant establishment and spread. Surface disturbance reduces native plant cover and creates bare soils. Nonnative, invasive plant materials can also be introduced by recreationists' boots, gear, or clothing; pets; pack stock fur, hooves, or manure; or through importing materials, such as stock feed, gravel, supplies, tools, and equipment. Nonnative, invasive plant seeds can be transported on vehicle tires or undercarriages or on the footwear or clothing of vehicle passengers (Lonsdale and Lane 1994; Greenberg et al. 1997). These risks are highest around developed campgrounds, in heavily used dispersed areas, and along trails and trailheads.

The probability that nonnative plants will successfully establish depends primarily on several factors, including nonnative, invasive plant propagule pressure and surface disturbance. The more propagules that are introduced, the more likely that nonnative plants will eventually become established (Von Holle and Simberloff 2005).

Effects from Natural Resource Management

Natural resource management, including pre- or non-commercial vegetation management and prescribed wildfire, would affect upland vegetation ERUs. The type and intensity of effects would depend on management objectives and methods and would generally be relatively greater than the impacts discussed above for Access and Recreation. They would also tend to affect larger areas of vegetation, as the scale of natural resource management projects would be relatively large—on the order of thousands to tens of thousands of acres per year (see, for example, table 3-17 and table 3-18, which show acres of proposed mechanical thinning and prescribed wildfire treatments, respectively).

Generally, vegetation management projects, including mechanical thinning and prescribed wildfire, would have short-term, direct effects on upland vegetation ERUs where the projects were carried out. Treatments would reduce the biomass, cover, and continuity of vegetation by removing woody and herbaceous vegetation, thus altering the seral state proportion of these areas. Where naturally ignited fires are left to burn, effects would be similar to those from prescribed wildfire. In the short term, seral state proportion would shift to earlier seral states; as time since treatment elapses, mid- and late seral states would increase in proportion with a corresponding decrease in early seral states.

Mechanical thinning would disturb the soil surface because it would be generally done by tracked or wheeled heavy machinery. Soil disturbance during mechanical treatments would generate airborne dust. Dust settling on nearby vegetation could suppress plant physiological processes (Kameswaran et al. 2019). This, in turn, could suppress pollinator efficiency and thus plant vigor, indicated by reproduction, as described by Waser et al. (2017) in a study of the effects of road dust on nearby wildflower pollination and reproduction. This effect would be most intense on early seral herbaceous vegetation close to soil disturbance during treatments, when dust would be generated. The magnitude of intensity would decrease with increasing distance from the soil disturbance and would typically cease over time as wind blows and rain washes dust off vegetation. In cases where dust deposition is especially heavy or persistent, effects from suppressed reproduction could last for the duration of that year's growing season.

Surface-disturbing activities, including those associated with vegetation treatments, would disturb soils. This would indirectly promote nonnative, invasive plant introduction and spread (Mack et al. 2000), potentially leading to increases in cover of these species. Nonnative, invasive plants and seeds may be transported on equipment and machinery used during treatments. Treatments would alter light, moisture, and nutrient availability, and provide roughened surfaces where weed seeds may germinate.

Thinning may also increase the potential for the release of early seral herbaceous vegetation (Monsen et al. 2004) that is present in the shrub understory. This could occur as such resources as light, moisture, and nutrients, previously captured by overstory vegetation, become available to herbaceous ground cover.

Prescribed wildfire and naturally ignited fire would similarly remove woody and herbaceous vegetation, altering the seral state proportion of these areas. Heat generated during prescribed wildfire treatments can damage or kill vegetation. The amount of damage would depend on the species, its ability to withstand fire or regrow following fire, and fire timing. Nonnative, invasive plant cover has been found to increase in burned ponderosa pine forests in the southwest (Crawford et al. 2001). Nonnative, invasive plant cover was highest where fire severity was greatest, indicating that relatively low-severity fires would have less potential to result in nonnative, invasive plant spread.

Heat generated by fire may alter the physical, chemical, and biological properties of the soil. This would be more likely to occur during burning of relatively large piles or piles containing large pieces of wood (Busse et al. 2010; Rhoades et al. 2015), such as piles that may be generated during mechanical thinning treatments or after economic timber extraction. Such heat may also kill seeds in the soil. In this case, long-lasting alterations in soil nutrient availability and porosity can suppress future vegetation or influence species composition (Busse et al. 2010), while a lack of native seed may delay site recolonization.

Mechanical thinning and fire treatments could remove fallen, large woody debris from the ground. Removing large woody debris can affect surrounding vegetation. This would come about by reducing site productivity, particularly on drought-prone and infertile soils, and having a variety of ecological impacts (Cole 2002). Decaying wood has a relatively high water-holding capacity. It accumulates nitrogen, phosphorus, and sometimes calcium and magnesium and is a significant site for nitrogen-fixing microorganisms. Mycorrhizal fungi, which improve plants' ability to extract water, nitrogen, and phosphate from less fertile soils, are concentrated in decayed wood. Decayed wood provides a substrate for plant germination and establishment and subsequent growth of certain species (Cole 2002).

In the long term, vegetation treatments to restore desired or reference vegetation conditions would move vegetation seral state proportion toward reference conditions. Treatments ultimately would increase resiliency against potential climate changes by promoting early seral tree species regeneration and improving vegetation diversity.

Potential management restrictions in sensitive natural resource areas may prevent certain types of management activities from being carried out. Examples of such areas are steep slopes, in impaired or unsatisfactory soils, in at-risk species habitat, or in cultural resource areas; thus, where restrictions are in place, direct effects on vegetation would not occur, and seral state proportion would not change.

Vegetation could be removed directly, by the public gathering fuelwood, and from administrative activities, such as vegetation management projects. Collecting fuelwood can affect surrounding vegetation by removing woody debris from the ground and from trampling vegetation during wood foraging (Cole 2002; Davilla 1979). Saunders (1979) documented shifts in understory species composition attributed to disturbance from fuelwood collection. A study in the Sierra Nevada of California (Davilla 1979) showed that campers generally travel up to 200 feet from campsites to collect fuelwood, indicating that these types of impacts would tend to be concentrated around campsites.

Effects from Livestock Grazing and Rangeland Management

Livestock grazing effects would depend on level of use. This is determined by such factors as stocking rate, class and kind of livestock, season and duration of use, fences, water developments, other rangeland

infrastructure, soil moisture, plant palatability, the amount and timing of annual precipitation, and temperature.

Direct impacts on vegetation from livestock grazing include trampling, removal of herbaceous biomass, reduced plant cover and height, reduced litter amount, increased soil compaction, increased amounts of bare ground, and the potential for nonnative, invasive plant seed dispersal.

In the long term, livestock grazing may shift vegetation composition toward a community in which unpalatable or grazing-tolerant plant species are overrepresented.

Livestock may contribute to nonnative, invasive plant establishment and spread. Ungulates can promote seed dispersal via dung, fur, and hoofs (Collins and Uno 1985). Grazing may increase the available sites for colonization by creating openings in the grassland canopy (Fahnestock and Knapp 1994) and inhibiting the accumulation of litter (Grace 2001). Other authors have identified similar indirect impacts, such as livestock transporting nonnative, invasive plant seeds through the digestive systems or transporting seeds attached to hair (DiTomaso 2000).

Livestock grazing management can have potential positive impacts on the landscape, mitigating the disturbance effects of grazing. Grazing can reduce invasive plant infestations, and infrastructure maintenance, such as fencing and riparian exclosures, can help protect rangeland from impacts by nonnative species, such as feral horses and pigs, and native species, such as elk.

Effects from Economic Extraction

Each alternative would allow for varying amounts of timber harvest, either as specific timber sales or as a by-product of vegetation treatments, or as a combination of both (see table 2-3, Comparison of Expected Outputs by Alternative).

Depending on the harvest method and objectives, these activities may supplement other vegetation treatments at a scale that moves the ERUs toward desired conditions in the long term. In the short term, direct effects would occur from harvesting trees. This would affect seral state proportion by lowering the proportion of later seral states and correspondingly increasing the proportion of earlier seral states.

Timber harvest would also disturb the ground surface, having similar effects as vegetation treatments in this regard. These effects are described under Effects from Natural Resource Management, above. Timber harvests may also generate slash piles; burning piles would have effects as described under Effects from Natural Resource Management, above.

Effects from timber harvest would not occur in non-forested ERUs. This is because they are not suitable for timber harvest and, thus, these activities would not occur in these areas; however, in some woodland ERU types, economic extraction of forest products would occur. For example, poles, commercial fuelwood, or other special forest product extraction would occur in piñon-juniper ERUs. Effects would be similar to those described for forested ERUs.

Effects from Wilderness and Special Management Areas

The acres of ERUs in designated wilderness areas, including the White Mountain and Capitan Mountains Wilderness Areas, would be the same under all alternatives; this is shown in table 3-16. Wilderness management would generally reduce the intensity and extent of direct impacts on ERUs. This would come about because surface-disturbing activities would be reduced; however, ecosystem resilience may decline over time due to the lack of vegetation restoration and enhancement.

Table 3-16. Acres of ERUs in Designated Wilderness

ERU	Acres
Spruce-fir forest	0
Wet mixed conifer forest (mixed conifer with aspen forest)	0
Dry mixed conifer (mixed conifer-frequent fire)	1,500
Ponderosa pine forest	0
Ponderosa pine-evergreen oak forest	1,700
Piñon-juniper evergreen shrub	1,300
Juniper grass	<100
Piñon-juniper woodland	0
Piñon-juniper grass	0
Gambel oak shrubland	0
Mountain mahogany mixed shrubland	15,400
Chihuahuan desert scrub	0
Montane/subalpine grassland	0
Semi-desert grassland	<1

Source: Forest Service 2019a

Effects from Wild and Scenic Rivers

Fifty-five Wild and Scenic River (WSR) segments would be managed as eligible for designation in the National Wild and Scenic Rivers System under alternative A, and 54 river segments would be managed as eligible under alternatives B, C, D, and E. Protective stipulations within the corridor may preclude certain surface-disturbing activities, as described above, indirectly helping to maintain vegetation conditions in these areas. The number of protections afforded would depend on the classification: recreational, scenic, or wild. Rivers classified as recreational would generally have more allowable uses within the corridor than scenic or wild rivers, so corresponding effects on vegetation in these ERUs would be greater.

Seral State Proportion

Desired conditions and management emphases in the forest plan aim to restore and maintain a range of vegetation ages and size classes in a mosaic of habitats across the plan area. Vegetation seral states will naturally shift in all ERUs and under all alternatives without any influence from treatments identified in the forest plan objectives; however, this natural shift in seral state, in the absence of predominant historical disturbances, such as those from fire and humans, often leads to densely stocked conditions in forests and woodlands and tree encroachment in grasslands. These conditions are not representative of the desired mosaic of seral states typical of pre-settlement conditions that is targeted in the forest plan.

Stands that are densely stocked create shaded understory conditions that do not support ground cover diversity and abundance. Such conditions often increase the risk of uncharacteristic wildfire by providing ladder fuels (vegetation connectivity) from the ground to the canopy. Areas with tree encroachment alter species compositions, increase canopy closure, and lessen grass and forb productivity. Restoring seral state distributions to reference conditions restores stand structure, composition, and function to ERUs over time, increasing the resiliency of ecosystems to disturbance and creating greater habitat diversity.

Environmental Consequences for Upland Vegetation Communities Under Alternative A

Effects from Access and Recreation

Alternative A does not balance changing trends in services, activities, and types of facilities desired by the public with other resource management, such as for vegetation, water, and soils. For example, alternative A does not provide direction to mitigate resource damage from developed recreation sites nor direction regarding dispersed camping, such as whether to close, rehabilitate, or mitigate dispersed sites where resources are being damaged. Without plan components to address these problems, vegetation would continue to be affected by these uses, as described in Environmental Consequences for Upland Vegetation Communities Common to all Alternatives.

Effects from Natural Resource Management

Vegetation standards and guidelines under alternative A focus on habitat and increasing forage production and do not provide forest-wide objectives for each ERU. They emphasize timber management as a tool for providing forest products, while meeting wildlife habitat needs. There are no objectives for using mechanical treatments and prescribed wildfire to treat vegetation and move it toward desired conditions, so effects from these types of management would not occur. Instead, mechanical timber harvest and wildfire suppression are emphasized. This would continue the threat of uncharacteristic wildfire, which would move vegetation farther from reference conditions.

There are no forest plan objectives for closing and restoring temporary roads created or used during mechanical timber harvest; however, closing or restoring these roads may occur on a project-by-project basis. Where not closed and restored, temporary access roads may be accessed by motorized recreationists, causing further surface disturbance; facilitating nonnative, invasive plant spread; and slowing natural restoration of these areas.

Vegetation conditions have substantially changed since the 1986 Forest Plan, such that standards and guidelines in that plan are not sufficient to address the stressors and threats, such as wildland fire, insects and pathogens, invasive plant and animal species, and climate change, as described in Chapter 3 of the Forest Plan Assessment Report for Ecological Resources (Forest Service 2019a). Structure, composition, and function are departed from reference conditions. There is a substantial departure from the natural wildfire regime, and there are emerging issues not addressed by the 1986 Forest Plan, including nonnative, invasive plant invasions and climate change.

Alternative A does not define or promote a characteristic diversity of vegetation seral states and species composition. It also does not emphasize landscape-scale ecosystem restoration and resiliency through adaptive management strategies to changing environmental conditions and stressors. Without such management, existing conditions and trends in vegetation structure, composition, and function departure, as described in Description of Affected Environment, would continue. As a result, resiliency to such stressors as climate change would remain low, and departure from reference conditions would continue.

Effects from Livestock Grazing and Rangeland Management

Alternative A would continue to manage individual allotments in the numerous management areas in the 1986 Forest Plan (see table 2-2); there would be no ecosystem desired conditions or landscape-level management approach. Managing for grazing at the management area level does not provide for efficient and consistent direction for resources across the Lincoln NF and could lead to conflicting management. For example, some allotments span multiple management areas with different prioritized resource management.

Effects from Economic Extraction

See effects from Economic extraction above under Environmental Consequences for Upland Vegetation Communities Common to All Alternatives.

Effects from Wilderness and Special Management Areas

Effects on ERUs in designated wilderness and special management areas would be as described under Environmental Consequences for Upland Vegetation Communities Common to All Alternatives. There are no recommended wilderness areas under alternative A, meaning no additional acres of ERUs would be affected by management in recommended wilderness areas.

Seral State Proportion

Managing the effects on seral state proportion would be the same as in the 1986 Forest Plan. These effects would generally be a continuation of current trends in seral state proportion and departure described under the affected environment for each ERU.

Environmental Consequences for Upland Vegetation Communities Common to Alternatives B, C, D, and E

Effects from Access and Recreation

All action alternatives include a plan component to mitigate or rehabilitate dispersed camping sites if they are causing resource damage such as vegetation removal. Implementing management to protect resources from dispersed camping would reduce effect intensity, compared with alternative A. Examples of such management are minimizing nonnative, invasive plant establishment and spread and vegetation degradation at developed recreational areas and trailheads. This would protect overlapping upland vegetation ERUs to a greater degree than under alternative A.

Effects from Natural Resource Management

Desired conditions for all upland vegetation types common to alternatives B, C, D, and E were established under the proposed plan and maintain essential ecosystem components, processes, and functions. This would result in ecosystems that are resilient or adaptive to such stressors as fire, insects, pathogens, and climate variability. Under the action alternatives, the proposed plan includes objectives, standards and guidelines that would move upland vegetation ERUs toward desired conditions. This was not included in the 1986 Forest Plan under alternative A.

All action alternatives include vegetation treatment objectives that would be done over a 10-year period following plan implementation to move vegetation toward desired conditions, which would be greater than under alternative A. This is because treatment techniques would be chosen based on best available science depending on the specific ERU in which treatments were proposed.

Mechanical thinning projects under all action alternatives would affect the upland vegetation ERUs in which they were carried out; these effects would be the same as those described in Environmental Consequences for Upland Vegetation Communities Common to All Alternatives. Generally, and as described in that section, these effects include short-term, direct vegetation removal, followed by long-term movement toward the reference conditions. The approximate acres of mechanical thinning treatments that would be carried out in each ERU over the 10-year period are summarized in table 3-17.

As described in Environmental Consequences for Upland Vegetation Common to All Alternatives, burning slash piles can alter soil conditions and affect future revegetation. Since piles would be burned in

locations and at times that would facilitate managing forest vegetation toward desired conditions, detrimental effects on upland vegetation are not anticipated to result from this activity.

Table 3-17. Proposed Mechanical Thinning Treatments

ERU	Proposed Acres Treated
Spruce-fir forest	0
Wet mixed conifer forest (mixed conifer with aspen forest)	1,000 to 3,000
Dry mixed conifer (mixed conifer-frequent fire)	6,000 to 8,000
Ponderosa pine forest	2,000 to 3,000
Ponderosa pine-evergreen oak forest	0
Piñon-juniper evergreen shrub	0
Juniper grass	0
Piñon-juniper woodland ¹	1,000 to 3,000
Piñon-juniper grass ¹	1,000 to 2,500
Gambel oak shrubland	0
Mountain mahogany mixed shrubland	0
Chihuahuan desert scrub	0
Montane/subalpine grassland	0
Semi-desert grassland	0

Source: Forest Service 2019a

¹ Proposed acres of mechanical thinning treatments in the piñon-juniper evergreen shrub ERU are included in these ERUs.

Prescribed wildfire and naturally ignited fire would treat the piñon-juniper grass, piñon-juniper evergreen shrub, piñon-juniper woodland, ponderosa pine forest, mixed-conifer frequent fire, and mixed conifer with aspen ERUs under all action alternatives. Heat generated during fire treatments can damage or kill existing desired vegetation; the amount of damage would depend on the species, its ability to withstand fire or regrow following fire, and fire timing. Prescribed wildfire would be most likely to occur outside most species' active growth period, when low biomass moisture levels would facilitate prescribed wildfire objectives. The potential that higher heat from fire in ERUs with large woody fuels would alter the physical, chemical, and biological properties of the soil would be relatively low when burning small piles and potentially higher when burning larger piles or piles containing large pieces of wood (Busse et al. 2010; Rhoades et al. 2015). In the latter case, long-lasting alterations in soil nutrient availability and porosity can suppress future vegetation or influence species composition. This effect is unlikely to occur during broadcast burning but is more likely during pile burning.

Prescribed wildfire and naturally ignited fire treatment objectives would move ERUs toward more natural fire regimes, which would result in greater movement toward reference conditions, compared with alternative A. The potential treatment areas would vary between the ERUs, but they would be the same for each ERU across all action alternatives over a 10-year period. The approximate acres by ERU for potential treatment areas are summarized in table 3-18.

Under all action alternatives, temporary roads that support ecosystem restoration, fuels management, or other short-term projects would be restored to more natural vegetation conditions on project completion. This would prevent or reduce unauthorized motorized use and the establishment and spread of nonnative, invasive plants in these areas, to a greater degree than under alternative A.

Under all action alternatives, between 400 and 1,000 acres of combined vegetation treatments, such as mechanical, prescribed or naturally ignited fire, and seeding, would treat highly departed non-forested ERUs over a 10-year period. This would move vegetation toward desired conditions because treatments would be tailored to the specific ERU as determined by best available science. This management would

be most likely to affect the Gambel oak shrubland, semi-desert grassland, and montane-subalpine

Table 3-18. Proposed Prescribed and Naturally Ignited Fire Treatments for All Action Alternatives

ERU	Proposed Acres Treated
Spruce-fir forest	0
Wet mixed conifer forest (mixed conifer with aspen forest)	40,000
Dry mixed conifer (mixed conifer-frequent fire)	40,000
Ponderosa pine forest	40,000
Ponderosa pine-evergreen oak forest	0
Piñon-juniper evergreen shrub	20,000
Juniper grass	0
Piñon-juniper woodland	40,000
Piñon-juniper grass	20,000
Gambel oak shrubland	0
Mountain mahogany mixed shrubland	0
Chihuahuan desert scrub	0
Montane/subalpine grassland	0
Semi-desert grassland	0

Source: Forest Service 2019a

grassland ERUs, as these are highly departed, as outlined in the Affected Environment (see seral state proportion and departure discussion for each ERU).

As described in Environmental Consequences for Upland Vegetation Communities Common to All Alternatives, habitat restoration and enhancement objectives for terrestrial wildlife species would generally improve ERU vegetation condition, where ERUs comprise species habitat. All action alternatives include objectives that would restore and enhance terrestrial wildlife habitat on at least 50,000 acres. The amount of acres of each ERU that would receive habitat restoration and enhancement treatments is not known at this time.

Similarly, improving overall watershed condition would generally improve the ERU vegetation condition. Objectives under all action alternatives would improve the watershed condition score in discrete 6th-level hydrological unit code watersheds over the plan lifetime; however, the number of proposed watersheds for improvement would differ by alternative, from two watersheds under alternatives B, C, and E to six under alternative D. The amount of acres of ERUs in these watersheds is not known at this time.

Effects from Livestock Grazing and Rangeland Management

All action alternatives maintain the same level of livestock grazing as the 1986 Forest Plan (alternative A), as amended (Forest Service 1986). Alternatives B, C, D, and E include ecosystem desired conditions and objectives, standards, and guidelines to move rangelands toward desired conditions. These plan components provide range managers with a consistent, landscape-level management approach for allotment-level decisions, more than under alternative A. The proposed plan is anticipated to improve grazing management and would move upland vegetation communities toward more desired conditions than under alternative A.

Effects from Economic Extraction

Where commercial timber harvest occurs, this type of management would affect ERUs as described in Environmental Consequences for Upland Vegetation Communities Common to All Alternatives. Commercial timber harvest would include objectives to supplement other restoration treatments, to facilitate vegetation movement toward reference conditions. Under alternative E, there would be fewer options to reach restoration treatment objectives, potentially slowing movement toward desired conditions where treatments were carried out.

Effects from Wilderness and Special Management Areas

The acres of ERUs that would be in recommended wilderness areas are shown in table 3-19. Where ERUs overlap with wilderness areas, management would affect ERUs, as described in Environmental Consequences for Upland Vegetation Communities Common to All Alternatives. These effects would be more widespread under the action alternatives, compared with alternative A; This is because alternative A does not recommend any wilderness areas and only manages the two designated wilderness areas.

Table 3-19. Acres of ERUs in Wilderness

ERU	Alternative B	Alternative C	Alternative D	Alternative E
Spruce-fir forest	0	3,600	0	0
Wet mixed conifer forest (mixed conifer with aspen forest)	0	1,500	0	0
Dry mixed conifer (mixed conifer-frequent fire)	1,700	38,700	1,700	1,600
Ponderosa pine forest	400	28,000	400	200
Ponderosa pine-evergreen oak forest	1,900	4,000	1,900	1,700
Piñon-juniper evergreen shrub	8,500	18,300	8,500	1,300
Juniper grass	<100	7,200	<100	<100
Piñon-juniper woodland	7,600	88,600	7,600	200
Piñon-juniper grass	1,200	70,800	1,200	100
Gambel oak shrubland	0	<100	0	0
Mountain mahogany mixed shrubland	17,900	38,000	17,900	15,400
Chihuahuan desert scrub	0	17,600	0	0
Montane/subalpine grassland	<100	1,900	<100	<100
Semi-desert grassland	0	44,000	0	0
Total	39,600	401,200	39,600	21,100

Source: Forest Service 2019a

Compared with alternative A, management for the Guadalupe and Snowy River Special Cave Management Areas would decrease direct effects on vegetation from resource uses, such as minerals, oil and gas, and infrastructure development. Vegetation treatments would avoid significant cave entrances, potentially limiting movement toward desired conditions for ERUs in these areas, compared with alternative A. Acres of the ERUs that are in cave management areas under the action alternatives are summarized in table 3-20.

Table 3-20. Acres of ERUs in Cave Management Areas

ERU	Active
Spruce-fir forest	0
Wet mixed conifer forest (mixed conifer with aspen forest)	0
Dry mixed conifer (mixed conifer-frequent fire)	1,800
Ponderosa pine forest	1,100
Ponderosa pine-evergreen oak forest	2,700
Piñon-juniper evergreen shrub	1,600
Juniper grass	1,600
Piñon-juniper woodland	18,900
Piñon-juniper grass	700
Gambel oak shrubland	0
Mountain mahogany mixed shrubland	18,800
Chihuahuan desert scrub	0
Montane/subalpine grassland	100
Semi-desert grassland	0
Total	47,300

Source: Forest Service 2019a

Seral State Proportion

Environmental consequences common to alternatives B, C, D, and E that would apply to each ERU are described below. The analysis focuses on how management would affect seral state distribution and departure.

Spruce-Fir Forest

As discussed in the affected environment, departure in this ERU is due to an overrepresentation of early seral states because of multiple recent disturbances, including stand-replacing fires. Resulting seral state proportion at the 20-year timestep under the action alternatives was not modeled for this ERU. This is because this ERU comprises a relatively small proportion of the plan area, and because relatively little management would occur in this ERU; however, for all action alternatives, it is likely that, under future growth and succession of mid-seral states to late seral states, this ERU would trend toward reference conditions.

Wet Mixed Conifer Forest (Mixed Conifer with Aspen Forest)

As discussed in the affected environment, departure in this ERU is due to an overrepresentation of early to mid-seral states and underrepresentation of late seral states, which may be attributable to past logging impacts. Further, the mixed deciduous conifer and aspen state B is underrepresented due to damage from excessive elk browse and wildfire suppression.

The effects of management under all action alternatives on seral state proportion at the 20-year timestep, notably mechanical thinning and prescribed wildfire, was modeled for this ERU (see table 3-21). Modeling shows the mixed deciduous conifer and aspen state B continue to move farther from reference conditions, while the early to mid-seral states C, D, G, and H would move closer to, but still well above, reference conditions. Late seral states E and F would continue to be underrepresented, though they would move closer to reference conditions; however, departure from reference conditions would remain moderate overall.

Table 3-21. Mixed Conifer with Aspen Forest ERU Seral State Proportion and Departure

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Early	A	1	0	3	2	21	3
Early to Late	B	21	18	7	8	8	9
Early to Mid	C, D, G, H	29	81	74	74	17	73
Late	E, F	49	1	10	11	37	12
Late	I, J	0	0	6	4	29	4
Departure Total	N/A	0	52	53	51	37	49

Source: Forest Service 2019a

Dry Mixed Conifer (Mixed Conifer-Frequent Fire)

As discussed in the affected environment, departure in this ERU is due to an overrepresentation of closed-canopy late seral states (H, I, L, and M) and an underrepresentation of open-canopy late seral states (J and K). This would be due primarily to historical timber harvest and wildfire suppression, which led to overrepresentation of shade-tolerant tree species compared with reference conditions.

The effects of management on seral state proportion at the 20-year timestep under all action alternatives, notably mechanical thinning and prescribed wildfire, was modeled for this ERU (see table 3-22). Modeling shows that these seral state departures would be improved from existing conditions; however, movement toward desired conditions would be limited, particularly movement toward the open canopy late seral state. Early grass-, forb-, and shrub-dominated seral states A, B, F, and N, which are currently near reference conditions, would increase substantially following thinning and prescribed wildfire treatments. Departure from reference conditions would remain moderate overall.

Table 3-22. Mixed Conifer-Frequent Fire ERU Seral State Proportion and Departure

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Early	A, B, F, N	20	19	35	31	34	32
Mid (open canopy)	C	10	9	0	0	1	0
Mid (closed canopy)	G	5	3	8	9	8	9
Late (single-storied, open canopy)	D, E	0	6	10	8	11	6

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Late (single-storied or uneven-aged, closed canopy)	H, I, L, M	5	60	43	48	42	49
Late (uneven-aged, open canopy)	J, K	60	2	4	4	4	3
Departure Total	N/A	0	62	66	66	65	67

Source: Forest Service 2019a

Ponderosa Pine Forest

As discussed in the affected environment, departure in this ERU is primarily due to an underrepresentation of open-canopy late seral states (J and K), which were historically maintained by frequent low-severity fire. Historical timber harvest and wildfire suppression led to overrepresentation of shade-tolerant tree species and overrepresentation of early to closed-canopy late seral states, compared with reference conditions.

The effects on seral state proportion of management under all action alternatives, notably mechanical thinning and prescribed wildfire, at the 20-year timestep was modeled for this ERU (see table 3-23). Modeling shows the same small increase in the open-canopy late seral states (J and K) across all action alternatives, with similar and corresponding small decreases in the closed canopy late seral states (H, I, L, and M). Overall, this ERU would remain highly departed from reference conditions.

Table 3-23. Ponderosa Pine Forest ERU Seral State Proportion and Departure

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Early	A, B, F, N	0	17	17	15	16	16
Mid ¹	C	0	28	15	13	15	13
Late ²	D, E	0	9	11	10	10	9
Mid ³	G	0	5	19	21	20	22
Late ⁴	H, I, L, M	0	39	35	36	35	37
Late ⁵	J, K	100	1	4	4	4	4
Departure Total	N/A	0	99	96	96	96	96

Source: Forest Service 2019a

¹ Small trees with open canopy cover (see table 3-5)

² Medium to very large trees, single storied, with open canopy cover (see table 3-5)

³ Small trees with closed canopy cover (see table 3-5)

⁴ Medium to very large trees, multi-storied, with closed canopy cover (see table 3-5)

⁵ Medium to very large trees, multi-storied, with open canopy cover (see table 3-5)

Ponderosa Pine-Evergreen Oak Forest

As discussed in the affected environment, departure in this ERU is due to an underrepresentation of open-canopy late seral state D and an overrepresentation of mid-seral states (B and C), due to past disturbance history. Resulting seral state proportion at the 20-year timestep under the action alternatives was not modeled for this ERU. This is because this ERU comprises a relatively small proportion of the plan area and because relatively little management would occur in this ERU; however, under all action alternatives, overrepresented mid-seral states B and C would grow into the desired open-canopy late seral state D.

Piñon-Juniper Evergreen Shrub

As discussed in the affected environment, departure in this ERU is due to long-term wildfire suppression. This has led to an overrepresentation of early and mid-seral states (B, C, and E) with woody closed canopy and an underrepresentation of open-canopy, late seral state D.

The effects of prescribed wildfire management under all action alternatives on seral state proportion at the 20-year timestep was modeled for this ERU (see table 3-24). Modeling shows that the early and mid-seral states (B, C, and E) would decrease to a point slightly beyond reference conditions, with corresponding increases in the open-canopy, late seral state D; however, movement toward reference conditions in state D would be relatively limited. The closed-canopy, mid-seral state F would also increase. Similarly, early grass-, forb-, and shrub-dominated seral state A, which is currently near reference conditions, would increase substantially following prescribed wildfire treatments. Departure from reference conditions would remain moderate overall.

Table 3-24. Piñon-Juniper Evergreen Shrub ERU Seral State Proportion and Departure

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Early	A	5	7	15	10	15	15
Mid	B, C, E	55	79	42	44	42	42
Late	D	40	3	11	11	11	11
Mid	F	0	11	32	35	32	32
Late	G	0	0	0	0	0	0
Departure Total	N/A	0	37	43	40	43	43

Source: Forest Service 2019a

Juniper Grass

As discussed in the affected environment, departure in this ERU is due to an overrepresentation of herbaceous and small tree-dominated early and mid-seral states (A, B, C, and E) and an underrepresentation of open-canopy late seral state D.

The effects of management under all action alternatives on seral state proportion at the 20-year timestep was modeled for this ERU (see table 3-25). Modeling shows that these seral state departures would generally be improved from existing conditions. Mid-seral states (B, C, and E) would return to near reference conditions. While the open-canopy late seral state D would greatly increase, it would still be below reference; however, the grass-dominated state A, likely overrepresented due to several large fires on the Guadalupe Ranger District, would continue to expand under all action alternatives. Departure from reference conditions would remain moderate to high overall, depending on the alternative.

Table 3-25. Juniper Grass ERU Seral State Proportion and Departure

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Early	A	5	43	58	47	58	44
Mid	B, C, E	25	50	14	17	14	19
Late	D	50	2	19	19	19	19
Mid	F	10	4	5	9	5	10
Late	G	10	0	5	8	5	9
Departure Total	N/A	0	64	53	42	53	39

Source: Forest Service 2019a

Piñon-Juniper Woodland

As discussed in the affected environment, departure in this ERU is due primarily to an overrepresentation of small tree-dominated early and mid-seral states (B, C, and E), and underrepresentation of closed-canopy late seral state G.

The effects of management under all action alternatives on seral state proportion at the 20-year timestep was modeled for this ERU (see table 3-26). Modeling shows that these seral state departures would generally be improved from existing conditions. Mid-seral states (B, C, and E), likely the result of past wildfires, would be substantially reduced but would remain over the reference value. The late seral state G would increase, but it would remain substantially below the reference condition under all action alternatives. Departure from reference conditions would remain moderate overall.

Table 3-26. Piñon-Juniper Woodland ERU Seral State Proportion and Departure

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Early	A	10	4	11	8	11	8
Mid	B, C, E	5	70	28	29	27	29
Late	D	10	8	14	12	13	12
Mid	F	15	10	29	30	29	30
Late	G	60	9	18	21	19	21
Departure Total	N/A	0	65	42	41	41	41

Source: Forest Service 2019a

Piñon-Juniper Grass

As discussed in the affected environment, departure in this ERU is due primarily to an overrepresentation of small tree-dominated early and mid-seral states (B, C, and E) and underrepresentation of open-canopy late seral state D. Departures are likely attributable to long-term wildfire suppression and high livestock grazing pressure.

The effects of management under all action alternatives on seral state proportion at the 20-year timestep was modeled for this ERU (see table 3-27). Modeling shows that these seral state departures would generally be improved from existing conditions. Mid-seral states (B, C, and E) would be substantially reduced but would remain somewhat over the reference value. The late seral state D would increase, but it would remain substantially below the reference condition under all action alternatives. Departure from reference conditions would remain moderate overall.

Table 3-27. Piñon-Juniper Grass ERU Seral State Proportion and Departure

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Early	A	5	13	15	11	15	12
Mid	B, C, E	25	74	36	38	35	39
Late	D	50	2	11	9	11	10
Mid	F	10	8	28	29	28	28
Late	G	10	2	11	13	12	11
Departure Total	N/A	0	58	39	41	39	40

Source: Forest Service 2019a

Gambel Oak Shrubland

As discussed in the affected environment, departure in this ERU is due to major underrepresentation of early to mid-seral herbaceous and shrub states (A, B, and C). This is likely attributable to succession in the absence of disturbance, primarily fire due to wildfire suppression. Resulting seral state proportion at the 20-year timestep under the action alternatives was not modeled for this ERU. This is because this ERU comprises a relatively small proportion of the plan area and because relatively little management would occur in this ERU; however, under all action alternatives, it is likely that continued absence of fire would maintain the trend in departure for this ERU.

Mountain Mahogany Mixed Shrubland

As discussed in the affected environment, departure in this shrub-dominated ERU is due primarily to tree encroachment. There is an overrepresentation of mid-seral open, shrub-dominated state B and late seral tree-dominated state D and an underrepresentation of late seral shrub-dominated state C. Departures are likely attributable to long-term wildfire suppression and livestock overgrazing.

Typically, there is little management in this ERU. Management may include limited mechanical thinning and prescribed wildfire. The effects under all action alternatives on seral state proportion at the 20-year timestep was modeled for this ERU (see table 3-28). Modeling shows that the seral state departure in the shrub-dominated late seral state C and tree-dominated late seral state D would trend toward reference conditions; however, movement toward reference conditions in state D would be relatively minimal. Departure from reference conditions would remain low to moderate overall, depending on the alternative, with moderate overall departure for alternatives D and E.

Table 3-28. Mountain Mahogany Mixed Shrubland ERU Seral State Proportion and Departure

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Early	A	5	3	2	1	19	1
Mid	B	50	18	24	21	39	19
Late	C	15	0	21	19	39	16

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Late	D	30	79	53	59	3	64
Departure Total	N/A	0	49	30	33	38	34

Source: Forest Service 2019a

Chihuahuan Desert Scrub

As discussed in the affected environment, seral state departure is low in this ERU. This is due to a lack of disturbance and a resulting underrepresentation of sparsely vegetated early seral state A. Resulting seral state proportion at the 20-year timestep under the action alternatives was not modeled for this ERU. That is because this ERU comprises a relatively small proportion of the plan area and because relatively little management would occur in this ERU. Management under all action alternatives would likely continue to result in low overall departure.

Montane/Subalpine Grassland

As discussed in the affected environment, departure in this ERU is due primarily to tree encroachment and nonnative naturalized species establishment. There is an overrepresentation of early to mid-seral woody encroachment (states E, F, and G) and an underrepresentation of early to late-seral herbaceous-dominated states (A, B, and D). The effects of management under all action alternatives on seral state proportion at the 20-year timestep was modeled for this ERU (see table 3-29). Departure would likely remain high despite management under all action alternatives. This is because it is unlikely that native or late-seral herbaceous species would be able to replace nonnative naturalized species, such as bluegrass.

Table 3-29. Montane/Subalpine Grassland ERU Seral State Proportion and Departure

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Early to Mid	A, C	20	0	0	0	0	0
Late	B	45	0	0	0	0	0
Early to Mid	D	36	6	6	6	6	6
Early to Mid (Woody Encroachment)	E, F, G	0	94	94	94	94	94
Departure Total	N/A	0	94	94	94	94	94

Source: Forest Service 2019a

Semi-Desert Grassland

As discussed in the affected environment, departure in this ERU is due primarily to encroachment by woody species like mesquite and juniper. There is an overrepresentation of early to mid-seral open woody encroachment (states C and D) and an underrepresentation of early to late-seral perennial herbaceous-dominated states (A and B). The effects of management under all action alternatives on seral state proportion at the 20-year timestep was modeled for this ERU (see table 3-30). Departure overall would remain high, with no mechanism in place to reverse the trend toward woody encroachment.

Table 3-30. Semi-Desert Grassland ERU Seral State Proportion and Departure

Seral State	States	Reference Value (%)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Early to Mid	A	20	4	4	2	1	2
Late	B	75	0	0	0	0	0
Early to Mid (Woody Encroachment, open)	C, D	5	94	92	93	94	93
Early to Mid (Woody Encroachment, closed)	E, F, G, H	0	1	5	5	6	6
Departure Total	N/A	0	92	91	93	94	93

Source: Forest Service 2019a

Environmental Consequences for Upland Vegetation Communities Under Alternative B

Effects from Access and Recreation

More than the other alternatives, alternative B balances access to the Lincoln NF and recreation opportunities with natural resource protection. Effects would be similar to those described in Effects from Access and Recreation, above, under Environmental Consequences for Upland Vegetation Communities Common to All Alternatives; however, since additional guidelines for emphasizing resource protection during road construction and maintenance exist, effects would likely be lower in intensity.

Effects from Natural Resource Management

Under alternative B, where ERUs are departed or trending away from the reference conditions prescribed, prescribed wildfire and naturally ignited fire could be combined with mechanical thinning treatments. That is often the most effective approach to restoring forest structure and function. Management would focus on restoring fire as a key ecosystem process in frequent fire ERUs, with a particular emphasis on the mixed conifer with aspen, mixed conifer/frequent fire, ponderosa pine, and piñon-juniper woodland ERUs. This means effects may be most pronounced in these ERUs. Where this management is carried out, movement toward desired conditions would occur faster than under alternative A.

Chemical application techniques would be used to minimize negative effects that can result from vegetation treatments, such as an increased potential for nonnative, invasive plant species due to ground disturbance, as discussed in Environmental Consequences for Upland Vegetation Common to All Alternatives. Following up treatments with spot application of herbicides, as needed, would reduce the potential for this effect. This would help to move treated areas toward desired conditions more quickly than under alternative A.

Effects from Economic Extraction

See Effects from Economic Extraction above under Environmental Consequences for Upland Vegetation Communities Common to All Alternatives.

Effects from Wilderness and Special Management Areas

See Effects from Wilderness and Special Management Areas above under Environmental Consequences for Upland Vegetation Communities Common to All Alternatives.

Seral State Proportion

The effects on seral state proportion are discussed under Environmental Consequences for Upland Vegetation Communities Common to Alternatives B, C, D, and E.

Environmental Consequences for Upland Vegetation Communities Under Alternative C

Effects from Access and Recreation

Impacts are the same as those described under alternative B.

Effects from Natural Resource Management

Under alternative C, natural processes would be emphasized to move ERUs toward desired conditions where ERUs are departed or trending away from reference conditions. Movement toward desired conditions in these areas would likely be faster than under alternative A, but not as fast as under other action alternatives, where combining natural processes with use of mechanical treatments methods would be an option.

Chemical application to minimize the potential for nonnative, invasive plant establishment and spread following vegetation treatments would not occur under alternative C. As such, the potential for this effect would be increased. This may mean that treated areas move toward desired conditions more slowly than under alternatives allowing chemical treatments.

Effects from Economic Extraction

See Effects from Economic Extraction above under Environmental Consequences for Upland Vegetation Communities Common to All Alternatives.

Effects from Wilderness and Special Management Areas

For effects from wilderness and special management areas, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Upland Vegetation Communities Common to All Alternatives.

Seral State Proportion

The effects on seral state proportion are discussed under Environmental Consequences for Upland Vegetation Communities Common to Alternatives B, C, D, and E.

Environmental Consequences for Upland Vegetation Communities Under Alternative D

Effects from Access and Recreation

Impacts are the same as described under alternative B.

Effects from Natural Resource Management

Impacts are the same as those described under alternative B.

Effects from Economic Extraction

See Effects from Economic Extraction above under Environmental Consequences for Upland Vegetation Communities Common to All Alternatives.

Effects from Wilderness and Special Management Areas

See Effects from Wilderness and Special Management Areas above under Environmental Consequences for Upland Vegetation Communities Common to All Alternatives.

Seral State Proportion

The effects on seral state proportion are discussed under Environmental Consequences for Upland Vegetation Communities Common to Alternatives B, C, D, and E.

Environmental Consequences for Upland Vegetation Communities Under Alternative E

Effects from Access and Recreation

Impacts are the same as those described under alternative B.

Effects from Natural Resource Management

Impacts are the same as those described under alternative B.

Effects from Economic Extraction

See Effects from Economic Extraction above under Environmental Consequences for Upland Vegetation Communities Common to All Alternatives.

Effects from Wilderness and Special Management Areas

See Effects from Wilderness and Special Management Areas above under Environmental Consequences for Upland Vegetation Communities Common to All Alternatives.

Seral State Proportion

The effects on seral state proportion are discussed under Environmental Consequences for Upland Vegetation Communities Common to Alternatives B, C, D, and E.

Cumulative Environmental Consequences for Upland Vegetation Communities

The cumulative analysis area is the context area, as described in the Lincoln NF ecological assessment and shown on figure 4 of that assessment (Forest Service 2019a, p. 59–60). In summary, this is defined by the ecological sections and subsections from the National Hierarchical Framework of Ecological Units, which encompass the Lincoln NF. These are the White Mountains-San Francisco Peaks-Mogollon Rim (M313A), Sacramento-Manzano Mountains (M313B), and the Chihuahuan Semi-Desert Ecoregion Province's Basin and Range (321A) ecoregion section. Detailed descriptions of each ecoregion section are provided by McNab and Avers (1994) and McNab et al. (2007). This assessment area was chosen because ecological units contain the range of ERUs in the plan area. For example, only small amounts of the spruce-fir forest ERU occur outside of National Forest System land near the Lincoln NF; however, inclusion of the White Mountain-San Francisco Peaks-Mogollon Rim ecological section allowed for a larger context area for that ERU. The context area is described in detail in the Lincoln NF ecological assessment (Forest Service 2019a).

Numerous Federal, State, tribal, county, and privately owned lands surround the Lincoln NF. The nearby Cibola National Forest has developed a land management plan with plan components similar to those of the Lincoln NF. The Forest Service has similar objectives for both forests to increase acres of prescribed wildfire and mechanical thinning for resource benefit; they prioritize treatments in highly departed ERUs. Generally, other Federal land management plans, such as Bureau of Land Management resource management plans; New Mexico State Forestry Division regulations and management; tribal resource management plans; and county comprehensive and general plans contain management direction and actions that would align with forest management to improve vegetation condition in the context area. Maintaining connections to lands that lie outside of the plan area is integral for an all-lands approach to

land management into the future and to generate changes that benefit ecosystems and people over greater areas.

Effects on upland vegetation that would occur from similar or complimentary forest plan direction would beneficially affect the condition of treated ERUs in central-southern New Mexico. This would increase resiliency to disturbances, reduce uncharacteristic wildfire risk, and potentially support an increase in the timber and forest product industry on a larger scale than any one forest could alone. This, combined with similar efforts on tribal, State, and other Federal lands as described above, would have further beneficial effects on upland vegetation communities in the region.

The cumulative effects that past activities have had on upland vegetation communities are discussed as part of the affected environment and establish a baseline condition for management. Throughout the broader landscape, past management practices have resulted in forest conditions that are departed from reference conditions, creating a risk of not achieving desired conditions in the future. Trees are smaller, younger, and denser overall than they would have been historically, and fuels are built up and more continuous. Grasslands are encroached on by woody species, and current herbaceous understory cover is lower than the potential.

Broad regional stressors that may intensify in the future include rising population levels and participation in outdoor recreation, both locally and nationally, with resulting increased demand for and pressures on public lands. Higher temperatures and more frequent drought will likely lead to increased fire frequency and intensity and increased demand for high-elevation recreation opportunities to escape the heat of lower elevations. Related to vegetation conditions, these changes may increase the demand for commercial and noncommercial forest products, elevate the importance of public lands in providing for the habitat needs of displaced wildlife species, and change societal desires related to the mix of uses that public lands should provide.

Growing recreation use over the planning period, due to increasing population levels and demand in the surrounding area, could affect ecosystem integrity by creating larger impacts in high use areas, such as denuding areas of vegetation, increasing nonnative, invasive plant establishment and spread, compacting soil, and disturbing wildlife patterns; however, recreation direction included under all action alternatives provides measures to mitigate such impacts from recreation (see Recreation section).

It is assumed that proposed management in the plan area that aligns with or compliments tribal, Federal, and State management to improve vegetation condition in the context of the larger ecoregion would cumulatively contribute to the movement of vegetation toward desired conditions. Proposed natural resource management efforts using mechanical thinning and prescribed wildfire to move ERUs toward reference conditions would contribute to landscape restoration on a large scale, with a focus on reestablishing the composition, structure, patterns, and processes necessary to facilitate healthy, resilient, sustainable ecosystems. This management would also lessen the impact of nonnative, invasive plants, improve wildlife habitat, and reduce the risk of uncharacteristic wildfire. Increasing health and ecosystem function would also increase the ability of ecosystems in the context area to adapt to climate change. Ultimately, ecosystems exhibiting desired conditions better provide for multiple uses and better contribute to sustainable social and economic systems.

Riparian and Wetland Ecosystems

Affected Environment

Riparian areas, the interface of terrestrial and aquatic ecosystems, are affected by the presence of surface and subsurface, perennial or intermittent, flowing, or standing bodies of water. They are composed of vegetation species distinctively different from adjacent areas where water is more limited. In these systems, terrestrial and aquatic ecological processes are integrated in watersheds. Riparian ecosystems

and their associated vegetation contribute to water quality and storage, wildlife habitat, and recreation opportunities. Riparian ecosystems can have a disproportionate influence on overall ecosystem sustainability because of their small size relative to the more broadly distributed upland ecosystems.

Riparian habitats are among the most critical elements of biodiversity on the landscape. In Arizona and New Mexico, 80 percent of all vertebrate species use riparian areas for at least half their life cycles, and more than half of these completely depend on riparian areas (Chaney et al. 1990). Likewise, aquatic habitats and fish productivity are directly related to properly functioning riparian systems (Triepeke et al. 2013).

Riparian areas are generally small in the plan area, comprising only approximately 0.3 percent of the Lincoln NF. There is little transition to upland ecosystems. Because most stream systems are incised, or highly confined, many perennial streams on the Lincoln NF may have subsurface stretches where the “riparian area” may look similar to and respond to disturbances like adjacent upland ecosystems.

Much of the riparian vegetation within the Lincoln NF boundary is in headwater systems, and many of the main watercourses are on private land. The primary ecosystem services of riparian vegetation are riparian habitat for aquatic and terrestrial wildlife, groundwater storage, and filtration for local water use and municipal watersheds, surface water for livestock use, and aesthetic values for recreationists.

There are 15 riparian ERUs represented on the Lincoln NF, ranging from 8 acres for the historic riparian ERU, to 695 acres for the little walnut-ponderosa pine ERU. More than half of the approximately 2,800 acres of Lincoln NF riparian ERUs are in wilderness or WSAs. Almost 1,100 acres are in the Guadalupe Escarpment WSA, and nearly 400 acres are in the White Mountain and Capitan Mountains Wilderness Areas. These riparian ERUs and the relative proportion of the Lincoln NF’s riparian areas they represent are displayed in figure 3-2 and the distribution of riparian ERUs on the Lincoln NF is shown in table 3-31. Descriptions of the riparian ERUs are included in the assessment (Forest Service 2019a).

Table 3-31. Distribution of Riparian ERUs on the Lincoln NF

Riparian ERU	Acres on the Lincoln NF	Percent of Total ERU acres
Cottonwood/hackberry	41	1.5
Fremont cottonwood/shrub	218	7.8
Narrowleaf cottonwood/shrub	64	.18
Rio Grande cottonwood/shrub	47	1.7
Desert willow	71	2.5
Little walnut/desert willow	325	11.6
Arizona alder-willow	46	1.6
Ponderosa pine/willow	298	10.6
Upper montane conifer/willow	202	7.2
Willow-thinleaf alder	48	1.7
Arizona walnut	24	.86
Little walnut-chinkapin oak	301	10.8
Little walnut-ponderosa pine	695	24.8
Herbaceous wetland	435	15.5
Historic riparian-agriculture	8	.29

Source: Forest Service GIS 2019

Five riparian ERUs are more present than others on the Lincoln NF: cottonwood/hackberry, little walnut-chinkapin oak, upper montane conifer/willow, little walnut/desert willow, and little walnut-ponderosa pine. The relatively high presence of these riparian ERUs is unique to the Lincoln NF. Three riparian ERUs in particular are unique to the area, as they are present only in the Guadalupe Ranger District and adjacent lands: the little walnut-chinkapin oak, little walnut/desert willow, and little walnut-ponderosa pine ERUs.

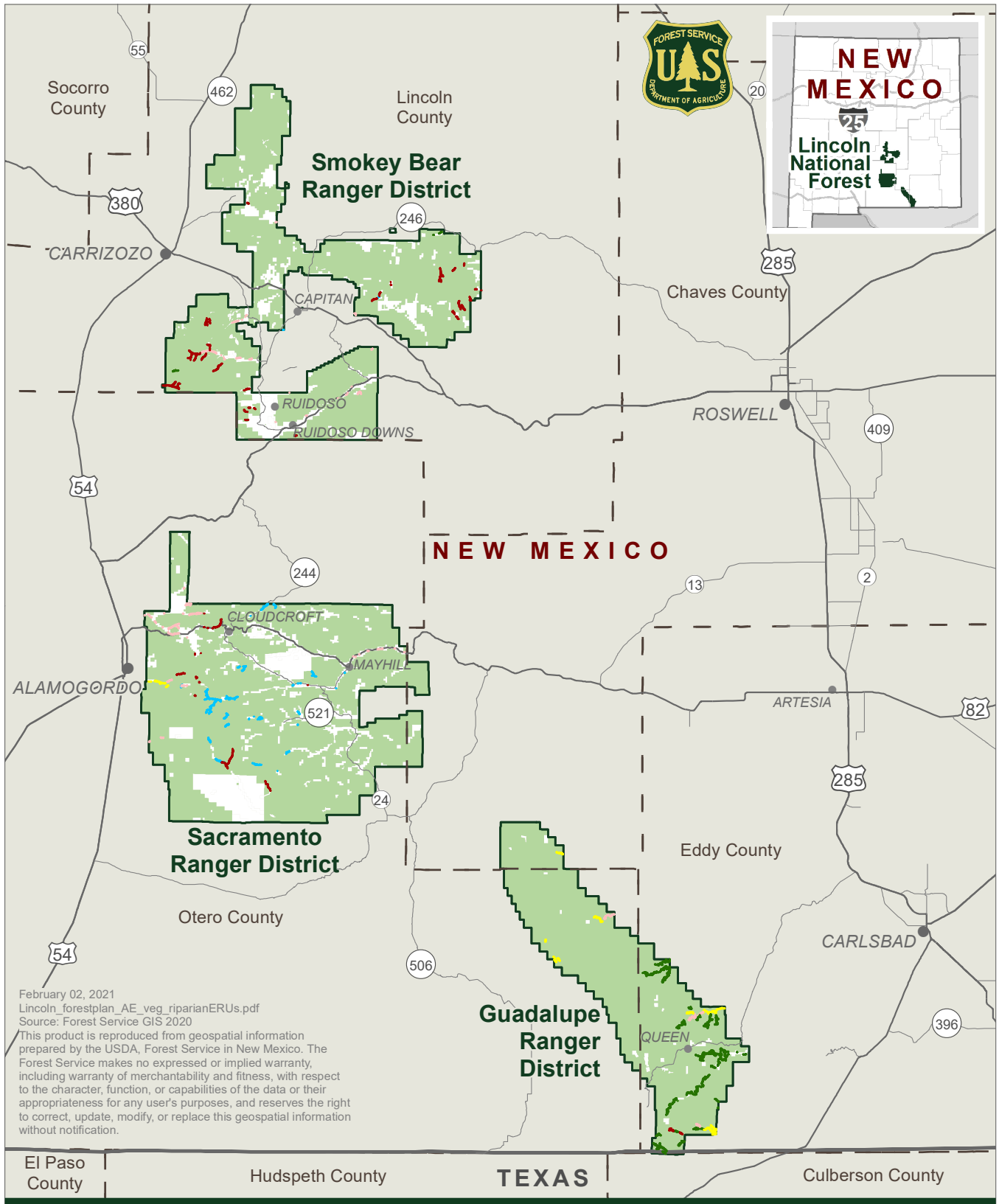
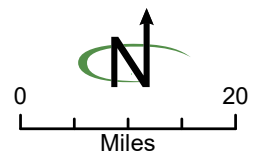


Figure 3-2 Riparian Ecological Response Units

- Cottonwood group
- Desert willow group
- Montane conifer willow group
- Walnut evergreen tree group
- Herbaceous wetland group
- Lincoln National Forest, Forest Plan revision area
- County



Riparian areas are generally characterized by shallow water tables, cooler temperatures, and greater ecological productivity; however, human alterations to the landscape, such as impoundments, diversions, pumping, invasive plant introductions, grazing, and recreation, can also alter these systems.

Riparian and wetland ecosystems on the Lincoln NF are, in general, degraded due to headcutting and channels. These actions lower the water table and reduce water available for robust riparian areas. Secondary factors of degradation include roads, grazing, and recreation (including trails and dispersed recreation), encroaching conifer species, and the spread of nonnative, invasive plants. These factors remove vegetation and compact soils in riparian areas. This can lead to significant departures from their historical or natural condition in terms of species composition, proportion of bare soils, and streambank stability. Such effects ultimately exacerbate headcutting and incisement and causing erosion and sedimentation downstream.

In addition to the human activities and their attendant increased water demand, as described above, climatic changes, such as long-term drought, will continue to affect these systems. Water tables are lower, and there have been decreases in the periodic flooding necessary for some important riparian species to regenerate. Reduced available water shifts species composition and reduces available soil moisture. Bare soil and reduced native species provide conditions that render the communities vulnerable to such disturbances as the establishment of nonnative, invasive plants. Nonnative, invasive plants, in combination with adjacent uncharacteristically dense upland vegetation, increase the risk of fire entering riparian areas. Unlike most upland vegetation communities, fire is not a natural part of riparian ecosystems, and its effects can remove vegetation communities. Loss of riparian vegetation leads to higher water temperatures, increased erosion and sedimentation, and an overall decrease in water quality that negatively affects aquatic species and wildlife.

According to the Forest Service Ecological Assessment for the Lincoln NF (Forest Service 2019a), all riparian ERUs are experiencing some degree of departure from their historical or natural conditions. This makes them vulnerable to more significant impacts from such disturbances as nonnative invasive plants and fire.

Riparian areas were also assessed using the proper functioning condition (PFC) method. It uses a consistent approach for considering hydrology, vegetation, and erosion and deposition (soil) attributes and how well the physical processes are functioning. It also indicates if riparian ERUs depart from desired conditions.

PFC is a state of resiliency that will allow a riparian/wetland area to hold together during disturbances with a high degree of reliability. This resiliency allows an area to effectively control erosion, improve water quality, filter sediment, develop floodplains and retain floodwaters, recharge groundwater supplies, stabilize streambanks, and support species' habitat and biodiversity. Riparian-wetland areas that are not functioning properly cannot sustain these values (BLM, Forest Service, and NRCS 2003).

Definitions of PFC have been developed to assess whether a given area is functioning properly, functioning at risk, or nonfunctional. These categories are defined as follows:

- PFC—Adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows
- Functioning at risk (FAR)—In functional condition, but a soil, water, or vegetation attribute makes them susceptible to degradation
- Nonfunctional—Not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows

It is worth noting that there is a need to collect more PFC assessments on the Lincoln NF. Currently, assessments are done in response to some specific management need, such as reviewing a grazing allotment management plan. PFC assessments at key locations that are representative of a watershed or subwatershed and conducted on a systematic and repeatable basis would allow for more accurate monitoring of trends.

Estimated PFC values for the watersheds are summarized in table 3-32.

There are approximately 99 miles of perennial streams in the three ranger districts of the Lincoln NF. As shown in table 3-32, 48 percent of the Lincoln NF is in PFC; the remainder is either FAR (34 percent) or nonfunctioning (18 percent) (Forest Service 2019a). Where systems are FAR or nonfunctioning, it is likely due to a lack of connection to, or reduction of, the floodplain and a shift in vegetation to more upland-affiliated species. This condition, taken with the continued human activities on the Lincoln NF that accelerate the departure of riparian ERUs from their historical conditions, contributes to the continued loss of resiliency and health of riparian resources in the project area.

Table 3-32. Percentage of Functioning Condition for Watersheds in the Lincoln NF Watersheds

Watershed Name	Nonfunctioning	Functioning-At Risk	Properly Functioning Condition
Upper Rio Peñasco, Wills Canyon, Hubble Canyon	20	56	24
Aqua Chiquita River	27	53	20
Sacramento River	20	43	37
Alamo and Caballero Canyons	2	8	90
La Luz, Soldano and Fresnal Canyons	5	25	70
Rio Bonito	25	25	50
Last Chance Riparian, Sitting Bull Creek	25	25	50
Percentage of All Watersheds in Given Condition in Lincoln NF	18	34	48

Source: Forest Service GIS 2019

Environmental Consequences for Riparian and Wetland Ecosystems

The following discussion of environmental consequences addresses the effects of the alternatives on riparian, including wetland riparian, and aquatic ecosystems. It does not discuss the effects on plant or animal species or resource uses. Those discussions are housed under their respective topic headings; however, the links between riparian and aquatic ecosystems and watershed conditions are discussed. This is because the health and function of each are inseparable. Environmental consequences are not site-specific at this planning level and will be described with qualitative descriptions supported by past studies and observations. The section is organized by the issue topics identified during scoping and subsequent alternatives development along with effects from WSRs. Effects from mineral extraction were determined to be minimal at the planning level and are not discussed further in this section.

Methodology and Analysis Process

This qualitative analysis considers riparian and aquatic ecosystems as a whole, not as individual ERUs or groupings of ERUs.

Assumptions

- Where riparian enclosures are deemed necessary, they are maintained in functional condition.
- New Mexico water law remains as is; the state does not legally recognize ecological flow needs, and there are no instream water rights.
- The various watershed restoration activities described in the plan will occur to the extent necessary to achieve the objectives described by each alternative. The specific locations and designs of these activities are not known at this time; therefore, this analysis refers to the potential of the effect to occur, realizing that in many cases these are only estimates.
- Best management practices will be implemented during all management activities.
- Conditions described in this analysis are generalized across the Lincoln NF and may not represent water quality or flow conditions at any specific location.

Spatial and Temporal Bounds of Analysis

The alternatives are analyzed within a 10- to 15-year period, since this is the same duration as the plan and effects could be evident from implementation within this time. The spatial extent are those riparian and wetland ecosystems that are on Forest Service-administered lands within the Lincoln NF boundary, since these are the features that could be affected by the proposed alternatives.

Indicators

Five indicators were used to examine the effects on riparian and wetland ecosystems, as follows:

- Road maintenance, construction, and decommissioning
- Recreation
- Restoration
- Livestock grazing
- Recommended wilderness and other specially designated areas

Environmental Consequences for Riparian and Wetland Ecosystems Common to All Alternatives

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Roads, trails, and stream crossings are known to cause sedimentation and erosion. High road densities degrade floodplain function, increase erosion, and decrease vegetation cover. Roads that cross riparian areas have direct impacts through vegetation removal and water flow alteration and can affect connectivity for riparian and aquatic species. Roads outside riparian areas may have indirect riparian effects, including concentration of overland flow, increased sedimentation, and accelerated runoff with increased peak flows and related damage.

Roads can also facilitate the introduction and spread of nonnative species. As noted above in the affected environment, nonnative invasive plants, both animal and plant, are already present in or next to many riparian and aquatic ecosystems. Nonnative invasive plants can displace native species, alter vegetation structure, and lead to declines in ecological status and functional diversity. They can also interfere with

natural processes, such as nutrient and fire cycles, and alter water quality status, which reduces resilience and adaptive capacity.

Road maintenance, realignment, or decommissioning would reduce sediment delivery caused by the transportation system. Where decommissioning occurs in drainage bottoms, constraints on natural water flow, channel movement, and water table levels are removed. This, in turn, improves habitat connectivity, riparian and wetland vegetation communities, and ecological processes, function, and resilience.

Recreation

Dispersed recreation areas can be detrimental to riparian areas where human use concentrates in riparian areas next to streams and wetland features. Detrimental effects intensify if sites are accessed by motorized vehicle.

Concentrated human use can destabilize soils by foot and vehicle traffic, damaging aquatic habitat and water quality through loss of vegetation and increased sedimentation. Restoring dispersed sites can have long-term positive impacts on vegetation and water quality and have short-term negative impacts related to disturbance.

Dispersed sites that are merely closed and not rehabilitated would not experience the short-term impacts from heavy equipment use in riparian areas; however, they also would not likely improve or recover completely on their own. Sites would remain compacted from years of vehicle traffic; the compaction would inhibit revegetation, leaving exposed soils and vulnerabilities to invasive plant encroachment. The compacted bare ground would prevent infiltration of precipitation, which would cause continued runoff and erosion, degrading water quality.

Effects from Natural Resource Management

Restoration

Mechanical vegetation treatments use heavy equipment, such as skidders, during operations. Potential effects from this activity include vegetation and soil disturbances. Bare areas are created when this heavy equipment moves across the land, removing vegetation and compacting soil. These areas concentrate water, leading to erosion and sedimentation in the riparian area. These potentially adverse effects are possible during mechanized activities in riparian areas, where allowed. Guidelines limit the extent and use of heavy equipment in riparian areas to specific conditions, such as temporary crossings.

Heavy equipment may be used during these activities, thereby increasing ground disturbance and increasing erosion; however, these effects are expected to be short term in duration, whereas benefits of restoration treatments and watershed improvement projects are long term. In the long term, restoration projects would expand riparian and wetland vegetation in watersheds. Improvements are expected to result in the return of riparian and wetland vegetation communities that are healthy and diverse in age, structure, cover, and composition.

Effects from Livestock Grazing and Rangeland Management

Livestock grazing in riparian areas decreases the structure, diversity, and vigor of riparian vegetation. This includes loss of riparian vegetation. Where riparian plants have been diminished or eliminated, other attributes are affected. Riparian plants stabilize streambanks and provide channels, shade, energy dissipation for floods, nutrient controls, and filtration of pollutants. As a result, loss of this riparian vegetation reduces these benefits, resulting in riparian areas that are not properly functioning and are at risk of being lost.

During flood flows, riparian plants protect the streambanks by covering them and slowing flood flows. They trap sediment, rebuild and expand floodplains, raise the water table, and expand riparian communities. Larger and well vegetated floodplains retain water longer (Tabacchi et al. 2000), raising stream baseflow during the driest part of the year. Livestock adversely affect stream channel form, process, function, and habitat in places where they have diminished or eliminated woody riparian species.

Trampling of vegetation by livestock can degrade or even eliminate riparian and wetland ecosystems through streambank erosion, channel widening, channel sedimentation/aggradation, and lowering of the water table (American Fisheries Society 2015). This can then reduce the amount of water available to support aquatic communities and terrestrial wildlife species (Rasby and Walz 2011). This leads to areas of bare soil, destabilized channels, erosion, and sedimentation and changes to infiltration of water. Livestock hooves and body weight alone easily collapse and otherwise erode streambanks as they trail along, cross, and drink from streams. Compaction also results in decreased infiltration and impacts on ground cover. This diversity is critical to aquatic habitat.

Where surface water sources have been developed for livestock, riparian areas have lost vigor and disappeared due to lack of water. This is especially true where springs have been developed but water has not been provided for the associated ecosystem.

Management of livestock grazing can have potential positive impacts on the landscape, mitigating the disturbance effects of grazing. Grazing can reduce invasive plant infestations, and maintenance of infrastructure, such as fencing and riparian exclosures, can help protect rangeland from impacts by nonnative species, such as feral horses and pigs, and by native species, such as elk.

Effects from Wilderness and Special Management Areas

Designated wilderness is common to every alternative (82,900 acres). Management of designated wilderness prohibits motorized and mechanized ground disturbance, establishes wilderness guidance for reduced disturbance for all wildfire suppression activities and recreation (such as camping a minimum distance from surface water). Wilderness management protects riparian and wetland ecosystems through minimizing ground disturbance.

Wild and Scenic Rivers

Fifty-five WSR segments would be managed as eligible for designation in the National Wild and Scenic Rivers System under alternative A; 54 river segments would be managed as eligible under alternatives B, C, D, and E. Management activities, such as timber harvest and erosion mitigation, would be prohibited within eligible river corridors, unless treatment is needed to protect eligibility, classification, or values. Such designations can limit disturbance-related impacts, such as road building, recreation, timber harvesting, and grazing.

Environmental Consequences for Riparian and Wetland Ecosystems Under Alternative A

Alternative A, the no-action alternative, reflects current management practices under the 1986 Forest Plan, as amended and implemented. Under this alternative, in addition to the effects described in Environmental Consequences for Riparian and Wetland Ecosystems Common to All Alternatives, above, impacts on riparian and wetland ecosystems would include those described below.

Effects from Access and Recreation

Road Construction, Maintenance, and Decommissioning

Alternative A includes an objective to decommission 100 miles of roads and travel ways identified for such action through scoping and public involvement; however, road and travel way closures have not equaled this amount.

Under this alternative, road construction is prohibited on unstable soils and slopes greater than 40 percent. This would also affect riparian and wetland ecosystems by decreasing the risk of erosion, sedimentation, and incisement. Where roads are relocated, the emphasis is on relocating roads out of canyon bottoms.

Recreation

Alternative A manages for a variety of developed and dispersed recreation experiences and provides a system of trails and roads for motorized recreation use. It does not include management for dispersed camping or motorized and nonmotorized trails in riparian areas. Impacts on riparian areas would continue as described under Environmental Consequences for Riparian and Wetland Ecosystems Common to All Alternatives.

Effects from Natural Resources Management

Restoration

Alternative A provides some direction for the rehabilitating and maintaining riparian conditions, including the use of native species during restoration; however, it lacks clarification on where to prioritize riparian restoration, contains no objectives for riparian restoration, and does not establish riparian management zones. Accordingly, riparian area restoration projects would continue in a slow and fragmentary fashion under this alternative, which would contribute to the continued departure of riparian and wetland ecosystems from PFC.

Similarly, alternative A provides no direction to prevent the establishment or spread of nonnative plant species into upland areas or riparian and wetland ecosystems. This would increase the risk to ecological integrity and sustainability in riparian and wetland ecosystems posed by new or expanding nonnative, plant species.

Effects from Livestock Grazing and Rangeland Management

For alternative A, livestock would continue to be managed using the management areas developed under the 1986 Forest Plan (Forest Service 1986). This would continue the piecemeal approach to grazing management, which does not account for conditions across the entire Lincoln NF. Managing for grazing at the management area level does not provide for efficient and consistent direction for resources across the Lincoln NF, which could lead to conflicting management. For example, some allotments span multiple management areas with different prioritized resource management.

Effects from Wilderness and Special Management Areas

For designated wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Riparian and Wetland Ecosystems Common to All Alternatives.

Alternative A does not recommend any areas for wilderness. Under the current plan, the Guadalupe Escarpment WSA was recommended as non-wilderness. It would continue to be managed as Management Area 3A – South Guadalupe. Management actions for this area are protective, but not at the same level as the recommended wilderness plan components.

With no new recommended wilderness, riparian and wetland ecosystems would continue to lack protection. Such activities as motorized access and recreation would continue in these areas. Accordingly, disturbance-related impacts would continue (see Environmental Consequences for Riparian and Wetland Ecosystems Common to All Alternatives).

Environmental Consequences for Riparian and Wetland Ecosystems Common to Alternatives B, C, D, and E

Effects from Access and Recreation

All action alternatives would manage developed recreation similar to alternative A. They would include guidelines requiring dispersed camping sites to be rehabilitated or mitigated when environmental damage is occurring to riparian areas and for motorized and nonmotorized trails that adversely affect riparian areas to be relocated where possible. This would protect riparian areas from the impacts described under Environmental Consequences for Riparian and Wetland Ecosystems Common to All Alternatives greater than Alternative A.

Effects from Natural Resources Management

Restoration

Under the action alternatives, riparian management zones would be determined on a project-by-project basis. The exact width of the riparian management zones may vary, based on the project. The following would be considered in developing the riparian management zones:

- Ecological or geomorphic factors or waterbody type, but include those areas that provide riparian and aquatic ecosystem functions and connectivity
- Width and slope of the riparian zone, soil type, or hydrologic soil group
- Presence of threatened or endangered species

Vegetation and fuels treatments in resource riparian management zones would focus on eliminating non-riparian vegetation and reestablishing riparian vegetation species and habitat. This would reestablish desired species composition and cover in riparian areas and move these vegetation communities toward desired conditions. It would also assist in restoring natural hydrologic cycles by reconnecting the floodplains to the stream channels to a greater extent than alternative A.

Guidelines under the action alternatives would limit motorized equipment to designated routes in riparian areas. The exception would be when there is an established stream crossing or when short-term uses are required to improve resource conditions or maintain infrastructure. This would reduce impacts on riparian vegetation, reduce soil compaction and rutting, and reduce the potential for water channelization and erosion compared with alternative A. In addition, the action alternatives include a guideline to protect large, mature, late seral trees from management activities that could degrade them as suitable habitat for at-risk species. These plan components would provide protection for riparian areas during projects and improve riparian vegetation cover and composition to a greater extent than alternative A.

Effects from Livestock Grazing and Rangeland Management

Alternatives B, C, D, and E include ecosystem desired conditions and objectives, standards, and guidelines that would move rangelands toward desired conditions more than under Alternative A. All decisions would still be made at the allotment level through term grazing permits, allotment management plans, and annual operating instructions; however, range management would be consistent across the

Lincoln NF and at the landscape level, as required by the 2012 Planning Rule. Grazing levels may change over time with changing conditions, but those decisions would be made on a project-specific basis.

Under alternatives B, C, D and E, livestock use would be managed through an adaptive strategy, leading to improvements in how riparian areas are recognized and managed. In addition, the proposed plan includes improved plan components for the range program. These plan components cover a broader range of potential effects from livestock use than what is found in alternative A. These include incorporating adaptive management, sustainable water developments, and guidelines to avoid concentrated grazing in riparian management zones. These proposed plan components, along with the adaptive management strategy, would work to move riparian areas toward desired conditions more than under alternative A; however, due to the complexity and extent of the riparian areas in the plan area, such impacts as reduced vigor in riparian plants and loss of age classes related to livestock use in riparian areas, likely would continue.

Effects from Wilderness and Special Management Areas

For designated wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Riparian and Wetland Ecosystems Common to All Alternatives.

Environmental Consequences for Riparian and Wetland Ecosystems Under Alternative B

Effects from Access and Recreation

Road Construction, Maintenance, and Decommissioning

Alternative B includes guidelines that would limit the delivery of sediment to waterbodies and adjacent riparian areas and require new roads to mitigate or eliminate impacts in riparian management zones. In addition, alternative B includes objectives for decommissioning 75 miles of administratively closed roads, which is similar to the 100 miles included in alternative A. Alternative B also would maintain 20 percent of trails to national quality standards and would adopt a guideline to restrict public access on roads built for project-specific activities. This guideline would also require roads not needed for other objectives to be reclaimed or obliterated. Compared with alternative A, these forest plan components would increase protection for riparian areas and reduce impacts described under Environmental Consequences for Riparian and Wetland Ecosystems Common to All Alternatives.

Recreation

Impacts from recreation for alternative B are described under Environmental Consequences For Riparian and Wetland Ecosystems Common to Alternatives B, C, D, and E.

Effects from Natural Resources Management

Restoration

Alternative B emphasizes active riparian area management and restoration, including objectives to complete at least 5 habitat connectivity projects and restore or enhance at least 20 acres of wetlands over 10 years. Other objectives focus on maintaining or improving riparian areas on the Lincoln NF over the next 10 years, including maintaining and enhancing 12 miles of riparian areas considered to be functioning at risk or nonfunctioning over a 10 year period. A focus on riparian restoration projects would move riparian areas toward desired conditions and improve the PFC, compared with alternative A. Alternative B would allow chemical treatments to enhance the effects of restoration. These treatments

would be applied using applicable laws and regulations, which would reduce or eliminate impacts on riparian areas.

Effects from Wilderness and Special Management Areas

Table 3-33 shows the acres of riparian ERUs in recommended wilderness areas under each action alternative. Alternative B would protect about 400 acres of riparian ERUs in recommended wilderness areas.

Table 3-33. Acres of Riparian ERUs in Recommended Wilderness by Action Alternative

Alternative	Alternative B	Alternative C	Alternative D	Alternative E
Acres of riparian ERUs in recommended wilderness	400	1,100	400	400

Source: Forest Service GIS 2020

Alternative B includes two special cave management areas that include plan components that include withdrawal from mineral, geothermal, or oil and gas development, prohibits new rights-of-ways for major infrastructure, and prevents new facility construction from introducing pollution. These plan components would provide protection for riparian and wetland areas within the management areas compared to alternative A from impacts as described under Environmental Consequences for Riparian and Wetland Ecosystems Common to All Alternatives.

Environmental Consequences for Riparian and Wetland Ecosystems Under Alternative C

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Same as under alternative B.

Recreation

Same as under alternative B.

Effects from Natural Resources Management

Restoration

Same as under alternative B.

Effects from Wilderness and Special Management Areas

As shown in table 3-33, above, the greatest acres of riparian ERUs (approximately 1,100 acres) would be within recommended wilderness areas under alternative C. By including more riparian ERU acres in recommended wilderness, alternative C would reduce disturbance from activities such as recreation and mechanical treatments compared with alternative A; however, additional constraints on restoration treatments could also affect the effectiveness of restoration.

Alternative C would designate the same special cave managements areas as alternative B with impacts as described under that alternative.

Environmental Consequences for Riparian and Wetland Ecosystems Under Alternative D

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Alternative D would include a plan component that would prioritize decommissioning administratively closed roads in riparian areas. This would reduce the impacts of roads, compared with alternative A.

Recreation

Same as under alternative C.

Effects from Natural Resources Management

Restoration

Alternative D would increase objectives for riparian projects. It would complete at least 40 acres of wetland mitigation or restoration and 8 habitat improvement projects while maintaining the same objectives for improving PFC on stream reaches. Compared with all the other alternatives, the additional restoration projects would improve riparian vegetation cover and composition and increase PFC for those areas treated.

Effects from Wilderness and Special Management Areas

Same as under alternative B.

Environmental Consequences for Riparian and Wetland Ecosystems Under Alternative E

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Same as under alternative B.

Recreation

Same as under alternative B.

Effects from Natural Resources Management

Restoration

Alternative E would reduce the objective for improving riparian areas considered to be functioning at risk or nonfunctioning to 8 miles compared with 12 miles under alternative B. Compared with alternative B, this would reduce improvements to impaired riparian areas, but it would still improve more impaired riparian areas than alternative A.

Effects from Wilderness and Special Management Areas

Alternative E would recommend more acres of wilderness than alternative A; however, it would still protect approximately the same acreage of riparian ERUs as alternative B (400 acres; table 3-33).

Alternative E would not designate the two special cave management areas and would not protect riparian and wetland areas in those management areas from surface disturbance related to new rights-of-ways or

mineral, geothermal, and oil and gas development or pollution from new facilities construction as would occur under alternative B.

Cumulative Environmental Consequences for Riparian and Wetland Ecosystems

The spatial and temporal distribution of riparian ecosystems across the landscape depends on climate, geology, and hydrology, collectively.

The time frame for assessing cumulative effects on riparian and wetland ecosystems is 10 to 15 years. As noted above, riparian and wetland ecosystems account for just 0.3 percent of the Lincoln NF; however, the position of these areas on the landscape as transitional zones between the upland terrestrial ecosystems and the stream ecosystems means that all activities in a watershed that affect water quality, water yield, and vegetation structure and composition would also cumulatively affect the riparian zone. The boundaries of the analysis are the subwatersheds that overlap the Lincoln NF and those that extend beyond it.

Past, present, and future activities within the boundary of the Lincoln NF are as follows: livestock grazing, prescribed and natural fires, wildfire suppression, recreation, vegetation management, nonnative invasive plant treatments, road construction and maintenance, road decommissioning, wildlife habitat restoration and management, and watershed restoration and management.

Beyond the Lincoln NF boundary, past, present, and future actions by other entities that add to cumulative effects are those activities described above, as well as those associated with rural residential communities. In any watershed, regardless of landownership, these activities cumulatively and both beneficially and adversely affect riparian and wetland resources, as well as water quality, water quantity, and watershed condition.

Riparian and wetland ecosystems would be cumulatively affected by the same management uses that affect soil and watershed resources; thus, the cumulative effects analyses in the Watersheds and Water, Upland Vegetation Communities, and Soils sections are directly applicable to riparian and aquatic ecosystems, as terrestrial and aquatic processes are integrated in watersheds. They are also part of how watershed conditions are defined. This section expands on that analysis, with specificity to riparian and aquatic ecosystems.

Water originating from the Lincoln NF will continue to be used both on and off the Lincoln NF for many uses. Groundwater and surface water uses include drinking water, waste disposal, livestock and agriculture, industry, recreation, and wildlife. Groundwater discharge is the reason that perennial streams, springs, and seeps flow throughout the year. Under natural conditions, a groundwater system exists in a state of dynamic equilibrium, and a long-term balance between natural recharge and discharge processes maintains this equilibrium.

Groundwater pumping from wells can disturb this system, resulting in lower water tables and reduced stream flows. Because surface water and shallow groundwater sustain riparian and aquatic ecosystems, trends in groundwater removal can continue to negatively affect these resources. Effects on riparian vegetation occur when water table drawdowns limit the available moisture to riparian vegetation. Drawdowns also create sustained water tables below the minimum rooting depths for facultative wetland species. This can cause poor growth, reduced seed production, and, in severe enough cases, the death of plants, loss of species, and change to vegetation.

The cumulative effects of historical land uses, especially high livestock use combined with drought, have resulted in impacts to the extent and condition of riparian areas. Loss of riparian areas has been documented across the Southwest, including on the Lincoln NF (Forest Service 2019a). This loss has been due to overgrazing from cows, sheep, and goats, gullying as the water table drops, and development. Intense grazing pressure results in loss of ground cover, younger age classes in riparian areas, and vigor and reduction in stability of associated water resources, such as streambanks. While this level of livestock use is no longer in practice, the effects persist.

Improved livestock management has led to the recovery of many riparian areas, while others have been lost due to loss of water and lack of vegetation. Management of riparian areas in and outside the plan area is improving due to forest-wide livestock management plan components under the proposed plan and statewide initiatives; nevertheless, climate factors are expected to greatly affect riparian areas, even within the next 15 years. Drought is likely during this period, leading to impacts from lack of water and increased wildfires. Increased water withdrawals, especially out of the plan area, are likely to affect riparian areas through loss of the water that sustains these systems.

The transportation network on the Lincoln NF consists of approximately 2,390 miles of paved Federal, State, county, and National Forest System roads and unpaved county and National Forest System roads. It also includes trails for motorized vehicles and aviation facilities. Beyond the Lincoln NF border are many more miles.

As noted in the Transportation and Forest Access section, the Forest Service anticipates that the demand for road and trail use will increase with growing populations and a desire for access to recreation and National Forest commodities. Roads adversely affect hydrologic processes in several ways (see the Watersheds and Water section). Cumulatively, adverse impacts are expected on riparian and wetland ecosystem PFC. This would be the result of degraded water quality and connectivity of riparian areas. This would come about through the use of the remaining roads and any construction of new roads.

Soils

Affected Environment

Soil is a dynamic system that is formed over time as a function of interactions between parent material, organic matter, topographic location, climate, and biotic community. These functions also relate to chemical, physical, and biological properties of soil that provide vital ecosystem services, including nutrient cycling and water filtration and storage for plants. Due to the slow rate of formation in the arid southwestern climate, soils are essentially a nonrenewable resource (Forest Service 2019a). In addition, because soil development varies over time, its properties also vary across the landscape. Given this difference, ERUs (described below) are an effective tool for analyzing soil properties. As stated in the Upland Vegetation section, ERUs are distinct vegetative areas that are classified by similarities in vegetation, soil, and fire regime.

The diverse and productive soils of the Lincoln NF are described, characterized, and classified in the Terrestrial Ecological Unit Inventory in the Lincoln NF Plan Assessment Report for Ecological Resources (Forest Service 2019a). These units demonstrate relationships between climate, geographic location, geology, geomorphology, aspect, slope, soil, and vegetation. They are grouped into 14 distinct upland ERUs, related to vegetation types, that the Forest Service has analyzed for soil condition and soil erosion hazard. The soil condition and erosion hazard parameters are based on the ability of water to infiltrate soils and for soil to recycle nutrients, which are directly related to the ecosystem services soil provides to plants.

Within the 14 upland ERUs present on the Lincoln NF, 5 of the 12 soil orders are represented: Alfisols, Aridisols, Entisols, Inceptisols, and Mollisols (Forest Service 2019a).

Alfisols are inherently fertile with soil horizon development and are normally formed under forested vegetation. These soils form in a wide range of parent materials and occur under a large range of environmental conditions. They are found in six ERUs and account for 12 percent of the Lincoln NF (Forest Service 2019a).

Aridisols are characterized by a surface layer that is generally light in color and low in organic matter. Water deficiency is a major limiting characteristic of these soils. They are found in three ERUs and account for 6 percent of the Lincoln NF (Forest Service 2019a).

Entisols are very young soils with little to no subsurface soil development. These soils form in landscape positions where the soil material has not been in place long enough for soil-forming processes to create distinctive soil horizons; areas with recent deposition, such as floodplains, alluvial fans, or stream terraces, are examples (Forest Service 2019a). In general, these soils exist in settings where erosion or deposition is happening at rates faster than those needed for soil formation. Entisols on the Lincoln NF mostly occur on active steep scarp and mountain and hill slopes although some of these soils occur on flat valley plains formed in alluvium (Forest Service 2019a). They are found in four ERUs and account for 2 percent of the Lincoln NF (Forest Service 2019a).

Inceptisols have moderate degrees of soil weathering and soil horizon development, but they typically lack significant clay accumulation in the subsoil. These soils generally occur on relatively young geomorphic surfaces (landforms) that are stable enough to allow some profile development. Their natural productivity varies widely and is dependent on clay and organic matter content, and other plant-related factors. They are found in six ERUs and account for 2 percent of the Lincoln NF (Forest Service 2019a).

Mollisols have a dark-colored surface horizon, are relatively high in organic matter, and are highly fertile. These soils form as a result of deep inputs of organic matter and nutrients from decaying roots and litter (Forest Service 2019a). Mollisols are the dominate soils found on the Lincoln NF, accounting for approximately 78 percent (Forest Service 2019a). These soils are distributed widely, mostly occurring on relatively flat to moderately sloping landform and can be found in all 14 ERUs on the Lincoln NF (Forest Service 2019a).

Soils can be naturally susceptible to erosion because of such factors as topography, vegetation type and density, ground cover, wind, and soil-moisture properties. Controls in the topographic factor are slope, aspect, and landscape position (Pellant et al. 2020). Soils are also susceptible to climate change. Vegetation loss results when temperatures increase and water availability decreases. This results in changes to soil conditions due to soil erosion, or salinization. This affects the capability of soils to support the needs of vegetation and associated ecosystems.

Soil Condition

Soil condition is based on the soil's ability to resist erosion and recycle nutrients, and the ability of water to infiltrate soil. Surface disturbance often compacts soils, which affects these abilities, resulting in decreased soil condition. Soil condition rates soils as they exist currently and reflects the effects of management and disturbance history; soils are generally assumed to be in satisfactory condition under baseline conditions (Forest Service 2019a).

Soil condition ratings, as presented in the Lincoln NF 2019 Ecological Assessment, are summarized as follows:

- Satisfactory—Indicators signify that soil function is being sustained and soil is functioning properly and normally. The ability of the soil to maintain resource values and sustain outputs is high.
- Impaired—Indicators signify a reduction in soil function. The ability of the soil to function properly and normally has been reduced or there is an increased vulnerability to degradation or both. An impaired category indicates a need to investigate the ecosystem to determine the cause and degree of decline in soil functions. Changes in land management practices or other preventative measures may be appropriate.
- Unsatisfactory—Indicators signify that there has been a loss of soil function. Degradation of vital soil functions results in the inability of the soil to maintain resource values, sustain outputs, or recover from impacts. Unsatisfactory soils are candidates for improved management or restoration designed to recover soil functions.

Table 3-34 lists soil condition ratings in the plan area (figure 3-3). Soils with impaired or unsatisfactory condition ratings are analyzed together under Environmental Consequences for Soils; this is because impaired soil is expected to become unsatisfactory over time without corrective management.

Table 3-34. Acres of Soil Condition Ratings in the Plan Area

Soil Condition	Acres	Percentage of National Forest in the Plan Area
Satisfactory	969,700	88.7
Impaired	26,400	2.4
Unsatisfactory	96,700	8.9

Source: Forest Service GIS 2020

Approximately 11.3 percent of the Lincoln NF is in impaired or unsatisfactory soil condition; however, 88.7 percent of it is in satisfactory condition.

Soil Erosion Hazard

Soil erosion hazard is the probability of soil loss from the complete removal of vegetation and litter. Soils are given a slight, moderate, or severe erosion hazard rating, as described below, based on maximum soil loss potential and the threshold soil loss of a site (Forest Service 2019a). The threshold of soil loss is exceeded when the geologic rate of soil loss is greater than the rate of soil formation (Forest Service 2019a). The potential for exceedance is the maximum soil loss potential.

Erosion hazard ratings are characterized as follows:

- Slight—Maximum soil loss does not exceed the threshold, so the probability of the loss of soil production potential is low.
- Moderate—Indicates that the loss in soil production potential from erosion is probable and significant if unchecked.
- Severe—Indicates that the loss of soil production potential from erosion is inevitable and irreversible if unchecked.

Table 3-35 lists erosion hazard ratings in the plan area (figure 3-4). Thirty-three percent of the soils on the Lincoln NF have a slight erosion hazard rating, which is typically associated with slopes of less than 15 percent (Forest Service 2019a). The majority of soils (65.6 percent) on the Lincoln NF have moderate to severe erosion hazard ratings. Systems with severe erosion hazard ratings occur in watersheds that have uncharacteristic disturbance regimes and fuel loadings (Forest Service 2019a). This results in large areas of land that lack canopy cover and effective ground cover; it also would increase the risk of accelerated soil erosion and debris flows on the landscape.

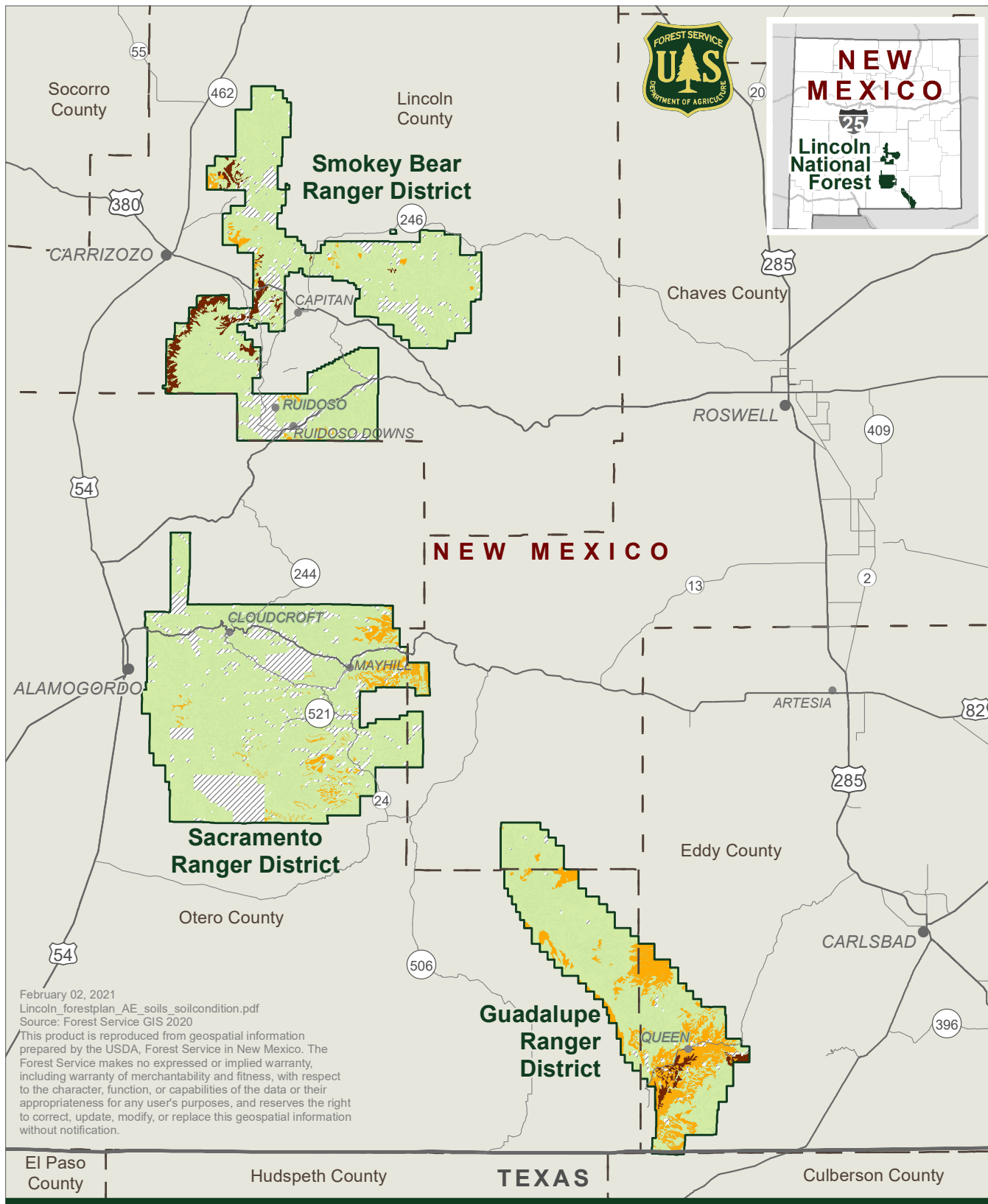
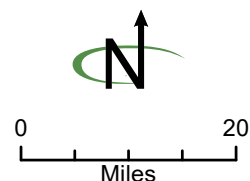


Figure 3-3 Soil Condition Ratings

- Impaired
- Unsatisfactory
- Satisfactory
- Private or other
- Lincoln National Forest, Forest Plan revision area
- County



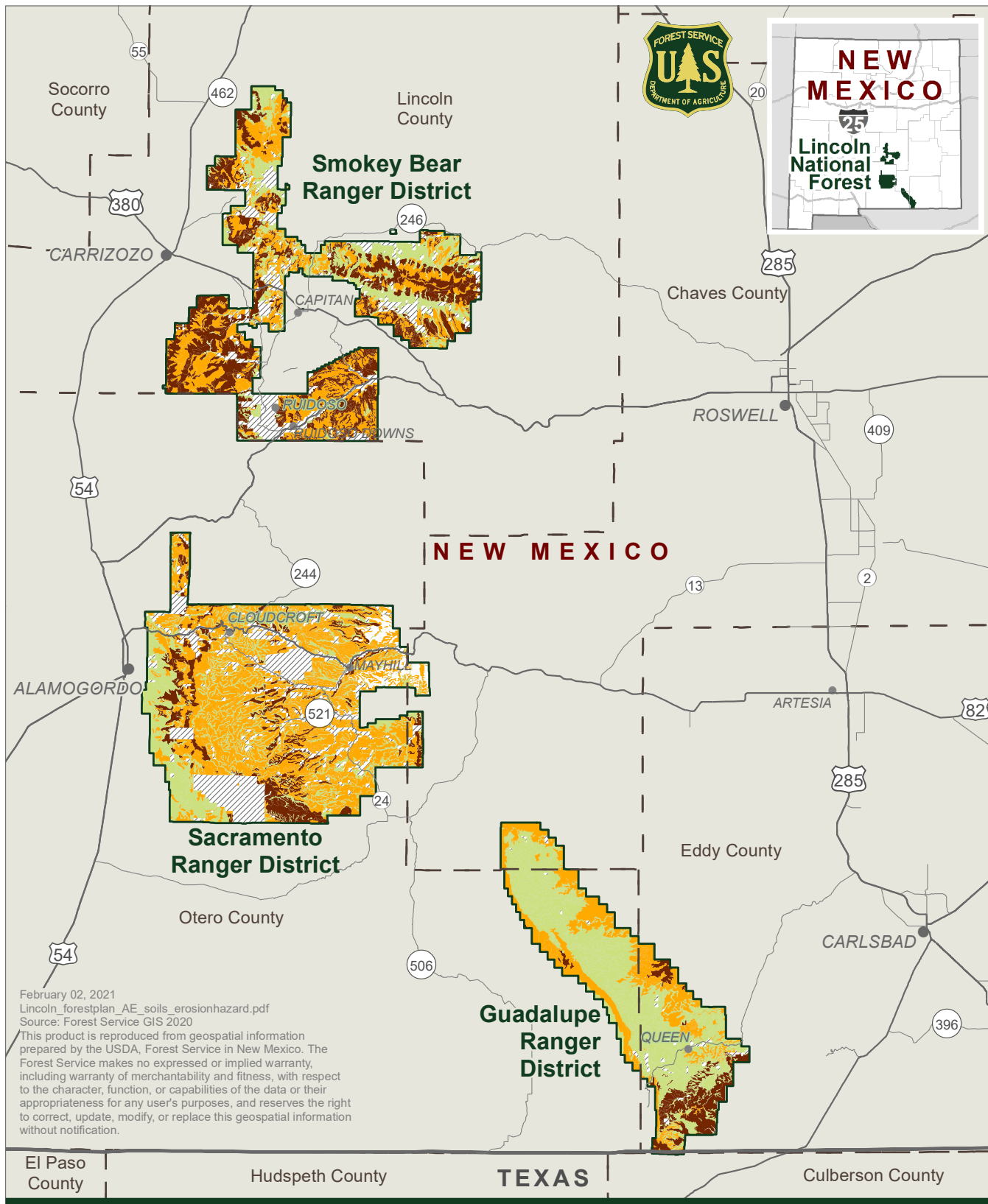


Table 3-35. Acres of Erosion Hazard Ratings in the Plan Area

Erosion Hazard	Acres	Percentage of National Forest in the Plan Area ¹
Slight	361,400	33.0
Moderate	479,400	43.9
Severe	237,100	21.7

Source: Forest Service GIS 2020

¹The remaining 1.4 percent (14,900 acres) are rock outcrop, not included in the soil condition ratings.

Slope

In addition to erosion hazard, slope is used to determine where areas are more vulnerable to erosion. In general, runoff generation and soil erosion typically increase as the percent slope increases. Slope influences the lateral movement of water in soil, which can result in runoff and soil erosion. South-facing slopes are more vulnerable to high evaporation rates and generally have more shallow soils than north-facing slopes (Pellant et al. 2020). On the Lincoln NF, soils occur on slopes ranging from 0 to 80 percent (Forest Service 2019a). Slopes of less than 15 percent are considered stable, slopes ranging from 15 to 40 percent are considered metastable, and slopes over 40 percent are considered unstable (Forest Service 2019a). Table 3-36 lists percent slope for these intervals for soils in the plan area (figure 3-5).

Table 3-36. Acres of Percent Slopes in Plan Area

Percent Slope	Acres	Percentage of National Forest in Plan Area
Stable (0–15)	278,200	25.4
Metastable (15–40)	322,300	29.5
Unstable (>40)	336,400	30.8
Other slopes	156,100	14.3

Source: Forest Service GIS 2020

With newer technology for vegetation treatments (such as smoother tires and tracks and tethered/winch assist systems on vehicles) and the use of best management practices to reduce impacts on soils, the Forest Service manages vegetation on unstable slopes of up to 60 percent. The Forest Service analyzed slopes for each ERU, as described in its Forest Plan Assessment Report (Forest Service 2019a). Most slopes analyzed fit within the above intervals and are summarized in table 3-36, but approximately 156,100 acres (14.3 percent) do not fit within the intervals. This is because slope estimates are based on ERUs, and some ERUs have a wider range of slopes than others. For example, the Forest Service measured slopes of 0 to 40 percent in one ERU, which is approximately 9.2 percent (100,200 acres) of the Lincoln NF (GIS 2020). This interval is representative of both the 0 to 15 percent and 15 to 40 percent intervals. This means that more acres are attributed to them, but the number of acres for each is uncertain. Given this distribution and the data listed in table 3-36, the slope intervals, and therefore slope stability, are relatively evenly distributed on the Lincoln NF.

Environmental Consequences for Soils

This analysis considers soil condition, erosion hazard, and slope to determine environmental consequences for soils on the Lincoln NF. The area of analysis for soils is 1.1 million acres of National Forest Systems lands in the plan area.

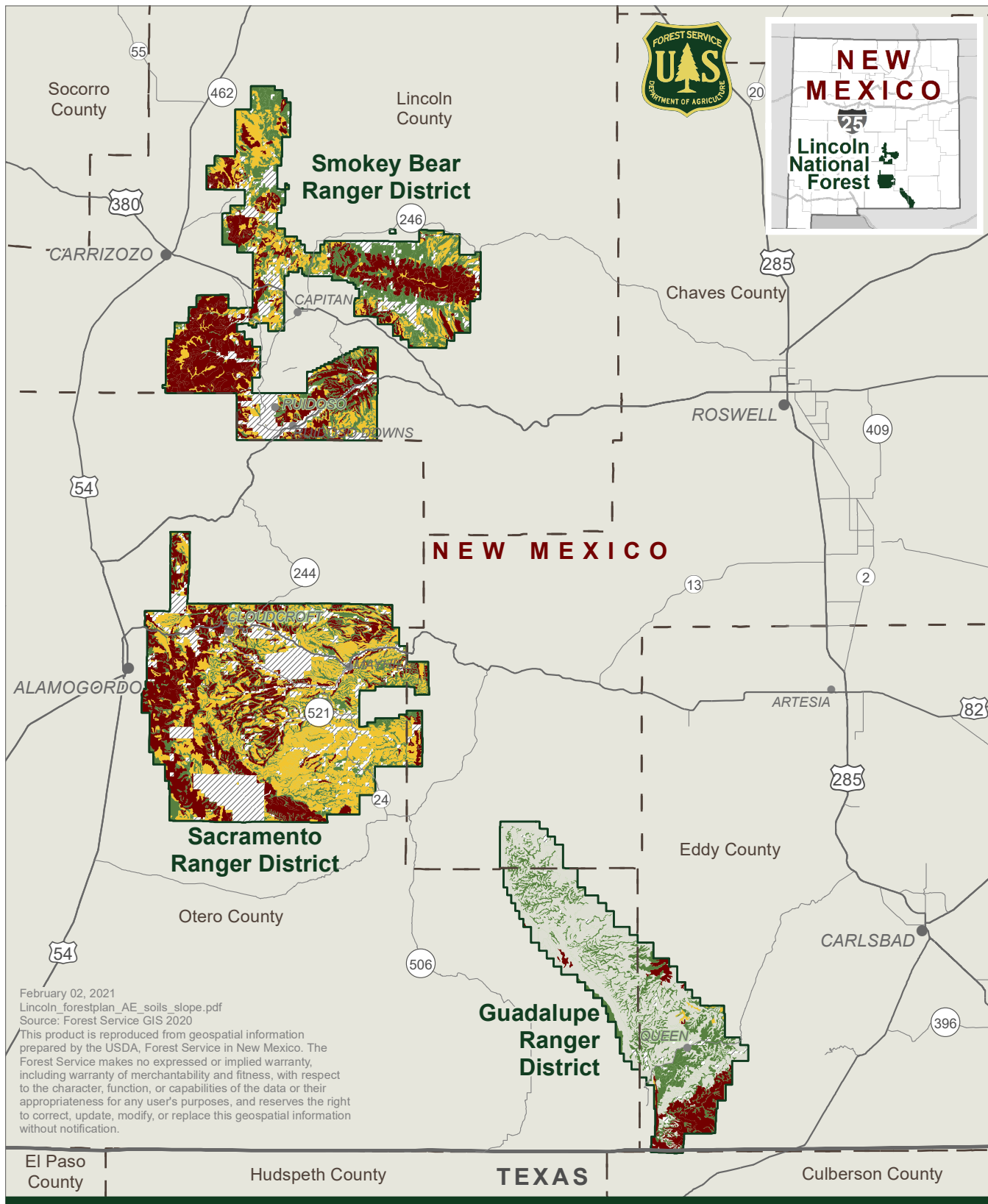
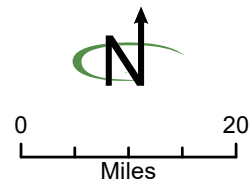


Figure 3-5 Slopes

- Unstable (>40)
- Metastable (15-40)
- Stable (0-15)
- Other slopes
- Private or other
- Lincoln National Forest, Forest Plan revision area
- County



Methodology and Analysis Process

The analysis focuses on the general impacts from proposed alternatives over the plan area, instead of identifying site-specific impacts on soil. The section is organized by the issue topics identified during scoping and subsequent alternatives development along with effects from wild and scenic rivers.

Potential effects of decisions and management actions were identified by reviewing the best available science and using qualitative and quantitative data related to impact indicators. Acres were used to best reflect the scale and magnitude of these effects. A GIS dataset and overlays of resources and resource uses were used to quantify effects, when available.

Assumptions

- As slope increases, the potential for erosion increases and the risk of soil instability following disturbance increases, particularly if cover, structure, or permeability has been altered (Pellant et al. 2020).
- Soils with high erodibility have a lower probability of success for restoration than soils with less erosion potential (Pellant et al. 2020).
- Biological soil crusts (communities of living organisms that occur on soil surfaces) and wet soils have characteristics that make them highly susceptible to such impacts as increased erosion rates and compaction, and they are difficult to restore or reclaim (Belnap et al. 2001; NRCS 2001).
- Surface-disturbing activities will require standard operating procedures and Forest Service best management practices for watershed improvement to reduce impacts on soil resources (Forest Service 2012).
- Soils on National Forest System lands will be managed to minimize erosion and maintain inherent productivity. At the same time, best management practices will keep surface disturbance at minimal acceptable levels, thus preventing physical or chemical degradation (Forest Service 2012).
- Restoration will be consistent with soil resource capabilities (Forest Service 2019a).
- Assumptions for livestock grazing and rangeland management:
 - Acres in satisfactory condition, or with slight erosion hazard, or stable slope conditions are more resistant to and resilient against the negative effects of grazing. Conversely, acres in impaired or unsatisfactory condition, moderate to severe erosion hazard, or metastable to unstable slope conditions are more at risk to the negative effects of grazing.
 - Soil condition and erosion hazard ratings can be maintained or worsened, depending on grazing pressure.
 - Slope interval ratings are not affected by grazing but can contribute to soil condition and erosion hazard ratings.
 - Areas outside delineated allotments and closed allotments would not have grazing and rangeland management, so grazing effects would not occur in these areas.
 - Vacant allotments may have grazing effects if they are opened to permitted animals. This would occur at least some of the time over the life of the plan.

Indicators

- Acres of soil condition ratings for the plan area
- Acres of erosion hazard ratings for the plan area

- Acres of slopes for the plan area at intervals of 0 to 15 percent, 15 to 40 percent, and greater than 40 percent

Environmental Consequences for Soils Common to All Alternatives

Effects from Access and Recreation

Recreation

Soils near trails likely have impaired or unsatisfactory soil condition. Both nonmotorized and motorized recreation on designated trails would compact soils and increase soil susceptibility to erosion; soils on trails with steeper slopes and soils with moderate to severe erosion hazard ratings would be at the most risk. Soil compaction increases bulk density and inhibits water movement through soil (Leung and Marion 1996), which could decrease soil condition. Visitors can also introduce exotic vegetation and trample native vegetation along trails, which would alter nutrient cycling of soils and decrease soil condition.

Dispersed camping would compact soils and decrease soil aggregate stability; the result would be soil erosion and soil loss. Impacts on soils are greatest when camping is dispersed in new areas rather than repeat uses of an already disturbed area (Marion et al. 2018). This is because more soils would be exposed to impacts across the Lincoln NF.

Effects from Natural Resources Management

Both mechanical treatments and prescribed wildfire treatments would remove vegetation, which would increase soil erosion susceptibility and would be more pronounced when soils are dry or supersaturated or on fine-textured soils, such as silts and clays; however, use of Forest Service best management practices would ensure that equipment is only operated when soil compaction and erosion would be minimized (Forest Service 2012). In riparian areas, soils can be both saturated and fine textured. Soil compaction can break apart soil aggregates, which directly affects water infiltration, air movement, and the rate of chemical transport in soils. It does this by reducing the pore space between aggregates and increasing bulk density. Best management practices would avoid ground equipment operations on wet or easily compacted soils (Forest Service 2012).

Impacts on soils from mechanical treatment, including timber harvesting, would vary, depending on the slope. For example, harvesting on soils with steep slopes would increase instability, which could lead to accelerated mass flow (Grigal 2000). Heavy machinery used to fell trees would compact soils. In addition, the effects of compaction would persist on soils for several decades (Grigal 2000). Compaction would be greatest for soils on temporary roads used to access trees. Vehicles would remove forest debris and cause rutting, which would result in ponding and an increased potential for water erosion (Grigal 2000).

Additional impacts, such as water erosion, would depend on the amount of soil exposed during the treatment and the site conditions, especially the slope, local soil properties, and patterns of precipitation. Soils on metastable and unstable slopes would be more susceptible to soil erosion. The Forest Service would avoid ground equipment operations where soil puddling occurs to limit water erosion (Forest Service 2012).

Effects from Livestock Grazing and Rangeland Management

Domestic animals and associated infrastructure could damage soils through physical disruption, including shearing and compacting. Grazed sites have higher compaction, as evidenced by higher bulk density, than ungrazed sites (Tate et al. 2004). Furthermore, cattle would affect the uniformity of the soil horizon by forming indentations that increase surface roughness (Russell et al. 2001). This would increase

susceptibility to erosion, particularly on steeper slopes. After 15 years (the life of the plan), soil erosion and compaction would likely result in worsened soil conditions.

Effects from Wilderness and Special Management Areas

Designated wilderness is common to every alternative (82,900 acres). Management of wilderness prohibits motorized and mechanized ground disturbance and establishes wilderness guidance for minimized disturbance for all wildfire suppression activities. This guideline provides protection against soil compaction and soil erosion associated with these activities and prevents soil degradation through natural processes over the life of the plan.

Effects from Wild and Scenic Rivers

Under alternative A, 55 WSR segments would be managed as eligible for designation in the National Wild and Scenic Rivers System; 54 river segments would be managed as eligible under alternatives B, C, D, and E. Soils near rivers are sometimes saturated or poorly drained and susceptible to compaction. For impaired or unsatisfactory soils, protections these areas provide would maintain or prevent degraded soil condition and reduce erosion susceptibility. This would also ensure that satisfactory soils remain in good soil condition.

Environmental Consequences for Soils Under Alternative A

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Alternative A would decommission up to 100 miles of roads over the life of the plan, which would continue to reduce erosion susceptibility, especially for soils on steeper slopes.

Recreation

Under alternative A, management areas would continue to have specific standards and guidelines for trail management, but trail maintenance is restricted to the availability of volunteer groups, partners, and staff. This means that some trails have been degraded due to soil compaction, trail widening, and erosion by recreationists over time (Leung and Marion 1996).

Both nonmotorized and motorized recreation on designated trails would continue to compact soils and increase soil susceptibility to erosion; soils on trails with steeper slopes and soils with moderate to severe erosion hazard ratings would be at the most risk. Impacts on soils would be the same as those described under Environmental Consequences Common to All Alternatives.

Dispersed recreation, specifically dispersed camping, can occur up to 300 feet from a system road. As with trails, soils near roads likely have impaired or unsatisfactory soil condition and are more susceptible to erosion. Impacts would be the same as those described under Environmental Consequences Common to All Alternatives.

Effects from Natural Resources Management

Alternative A would continue to manage vegetation based on the management area emphases, while prioritizing soil productivity. These require the Forest Service to interpret the intent of the management areas in site-specific decisions and to determine vegetation treatments as project-level needs arise. It includes no objectives for using mechanical treatments and prescribed wildfire to treat ERUs and move them toward desired conditions; instead, mechanical timber harvest and wildfire suppression are emphasized in some management areas while other management activities are emphasized on other parts

of the Lincoln NF. Desired ecosystem conditions may not be met using this management area approach, because it would not be effective in restoring vegetation across the landscape. This means soil condition may decrease over the life of the plan.

Impacts on soils from timber harvesting related to soil compaction and soil instability would be the same as those described under Environmental Consequences Common to All Alternatives. The long-term objective of timber harvesting under alternative A is an improved overall ecosystem, which would continue to improve soil conditions for the following soil functions: the soil's ability to resist erosion and to recycle nutrients, and the ability of water to infiltrate.

Effects from Livestock Grazing and Rangeland Management

Alternative A would continue to manage individual allotments in the numerous management areas in the 1986 Forest Plan (see table 2-2); there would be no ecosystem desired conditions or landscape-level management approach for soil resources. Managing for grazing at the management area level does not provide for efficient and consistent direction for resources across the Lincoln NF and could lead to conflicting management. For example, some allotments span multiple management areas with different prioritized resource management.

Effects from Wilderness and Special Management Areas

For designated wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Soils Common to All Alternatives.

The Lincoln NF is currently divided into management areas, with corresponding plan components that emphasize soil productivity preservation. Under alternative A, there are 20,200 acres for the Guadalupe Escarpment WSA. Of these acres, 15,100 acres are soils in satisfactory condition and 5,100 acres are soils in unsatisfactory condition. This WSA would be managed as non-wilderness, which would provide no special protections for soils compared with soils managed on a wilderness area. In addition, alternative A does not include plan components for avoiding or minimizing impacts on soil in this area. Conditions may worsen over time for soils in the Guadalupe Escarpment WSA since soil management is not considered.

Environmental Consequences for Soils Common to Alternatives B, C, D, and E

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Roads, trails, and stream crossings are known to cause erosion; high road densities decrease vegetation cover and increase soil erosion susceptibility.

Road construction would remove vegetation, which would degrade soil condition by reducing soil nutrient cycling and increasing soil erosion susceptibility. It is likely that soil loss would occur, which would worsen soil condition further. The action alternatives would include a guideline to avoid or mitigate activities impacting soil stability on soils with impaired or unsatisfactory soil condition. This would reduce impacts on soils that have already reduced nutrient cycling, high susceptibility to erosion, or both.

Road maintenance and decommissioning would be similar to alternative A. The proposed plan includes plan components to protect soil resources from road impacts, including guidelines to use best management practices when performing maintenance activities to minimize disturbance on soils and designing ground-disturbing activities to minimize soil compaction and soil loss. Best management

practices would include, but are not limited to, avoiding saturated soils, assessing soil conditions before performing maintenance or construction, and avoiding steep slopes when possible (Forest Service 2012).

Recreation

The action alternatives include a guideline to protect poorly drained and unsatisfactory soils in areas of concentrated use, while promoting developed and dispersed recreation. Dispersed campsites would be rehabilitated or otherwise mitigated if environmental damage occurs; however, if soils are already compacted or soil has been lost, or both, their soil condition is unlikely to improve (Grigal 2000). The guideline to rehabilitate or mitigate dispersed campsites would not occur under alternative A.

Effects from Natural Resources Management

Technological improvements to vehicles used to treat vegetation would enable treatments to occur on slopes up to 60 percent and in some cases even steeper slopes, depending on soil conditions. The action alternatives do not include a slope limit for vegetation treatments, while alternative A includes slope limits for vegetation treatments. The action alternatives would include a guideline to reduce short-term and long-term impacts on soils due to ground disturbance, including soil loss. Where disturbance cannot be avoided, site-specific soil conservation practices, as mentioned under Environmental Consequences Common to All Alternatives, would be implemented. Since this guideline is not specific to slope intervals, it would be beneficial in reducing erosion susceptibility for soils on all slope intervals but especially for those on unstable soils. The action alternatives would also include an objective to improve impaired and unsatisfactory soil condition scores in priority watersheds over 5-year periods.

Over the life of the plan, mechanical thinning objectives that include timber harvesting would move vegetation states to desired outcomes to a greater extent than alternative A. This would be done by reducing hazardous fuels and potentially decreasing high-severity fires across the landscape. Decreasing high-severity fires across the landscape would prevent further soil degradation that results in impaired soil condition, whereas the risk of high-severity fires and resulting impacts on soils would continue under alternative A. Improvements to soil condition include soil's improved ability to resist erosion and to recycle nutrients and improved water infiltration. In addition, soil erosion susceptibility would likely decrease in treated areas as desired vegetation outcomes are achieved.

Effects from Livestock Grazing and Rangeland Management

All action alternatives maintain the same level of livestock grazing as the 1986 Forest Plan (alternative A), as amended (Forest Service 1986). Alternatives B, C, D, and E would include ecosystem desired conditions for ERUs and objectives, standards, and guidelines to move rangelands toward desired conditions. These plan components provide range managers with a consistent, landscape-level management approach for allotment-level decisions, more than under alternative A. The proposed plan is anticipated to improve grazing management and would move upland vegetation communities toward desired conditions, more than under alternative A.

Effects from Wilderness and Special Management Areas

For designated wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Soils Common to All Alternatives.

Desired conditions for recommended wilderness and designated areas aim at maintaining natural processes and ecosystem services. Alternatives B, C, D, and E propose varying acreages of recommended wilderness, which would include a management approach for the Forest Service to consider rehabilitating compacted sites that do not complement wilderness character. These plan components would improve soil condition over the life of the plan compared with alternative A.

For significant caves, the action alternatives would include a guideline to limit management activities that increase sedimentation or decrease soil productivity in caves. This would decrease erosion susceptibility and prevent soil degradation in caves. This would not occur under alternative A.

Environmental Consequences for Soils Under Alternative B

Effects from Access and Recreation

Impacts would be the same as those described under Environmental Consequences for Soils Common to Alternatives B, C, D, and E.

Effects from Natural Resources Management

Alternative B includes 10-year objectives to use mechanical thinning to treat 11,000 to 19,500 acres and prescribed wildfire to treat 200,000 acres to move forested and woodland ERUs to desired conditions. Impacts on soils from vegetation treatments would be as described under Environmental Consequences for Soils Common to Alternatives B, C, D, and E. Compared with alternative A, alternative B would prevent or reduce the frequency and size of high-severity fires that could result in large-scale landscape changes.

Direct, short-term impacts on soils from prescribed wildfire would include consumption of organic matter and damage to soil organisms at the surface of the soil horizon, which could decrease soil organism diversity. Localized prescribed burning would transfer heat into the soils, exposing it to thermal extremes. This would have a direct impact on soil nutrient availability and soil porosity, thereby limiting water infiltration (Busse et al. 2010). This could result in dry or water-repellant soils that lack cohesion between soil particles and are more susceptible to wind erosion and runoff; however, these short-term impacts would be outweighed by the long-term beneficial impacts of vegetation treatments, as described under Environmental Consequences for Soils Common to Alternatives B, C, D, and E. Prescribed burning objectives are not included under alternative A and short-term impacts on soils would not occur under alternative A. Soils exposed to lower-intensity fires would not be permanently burned. For soils that are nutrient deficient, low-severity burns can increase the availability of soil nutrients, which could enable plant growth (Keeley et al. 2009).

Effects from Wilderness and Special Management Areas

For designated wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Soils Common to All Alternatives.

Desired conditions for recommended wilderness and designated areas aim at maintaining natural processes and ecosystem services. Alternative B would include a management approach for the Forest Service to consider rehabilitating compacted sites that do not complement wilderness character, which would prevent further soil degradation and improve soil condition over the life of the plan. In these areas, there are 21,500 more acres of satisfactory soils than impaired or unsatisfactory soils (see table 3-37). This means soil condition would likely be consistent with the current trend, but the 8,400 acres of unsatisfactory soils could improve over the life of the plan compared with alternative A.

Table 3-37. Acres of Soil for Indicators with Recommended Wilderness Under Alternative B

Indicator	In Recommended Wilderness (acres)
Satisfactory soil condition	29,900
Impaired soil condition	0
Unsatisfactory soil condition	8,400

Source: Forest Service GIS 2020

The Guadalupe and Snowy River Special Cave Management Areas (see figure 2-12) have similar acreages of satisfactory soils (see table 3-38), but Guadalupe has 4,600 more acres of unsatisfactory soils than Snowy River. Since both areas would protect more satisfactory soils than impaired and unsatisfactory soils, the current trend would be maintained; however, like recommended wilderness areas, unsatisfactory soils could improve over the life of the plan, unlike alternative A, which designates less acres for recommended wilderness.

Table 3-38. Acres of Soil for Indicators with Special Cave Management Areas Under Alternatives B, C, and D

Indicator	Guadalupe Special Cave Management Area	Snowy River Special Cave Management Area
Satisfactory soil condition	20,500	20,700
Impaired soil condition	0	0
Unsatisfactory soil condition	5,500	900

Source: Forest Service GIS 2020

Environmental Consequences for Soils Under Alternative C

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Same as under alternative B.

Recreation

Impacts would be the same as those described under Environmental Consequences for Soils Common to Alternatives B, C, D, and E.

Effects from Natural Resources Management

Alternative C would emphasize natural processes, such as wildland fire, as a primary restoration tool to treat frequent fire and piñon-juniper ERUs. This would result in some soils being severely burned, whereas other soils untouched by wildland fires would not be harmed. Vegetation desired conditions would take longer to achieve with this management approach; therefore, the threat of severe fires and the potential for severely burned soils would last over the life of the plan.

Mechanical thinning objectives would be limited under alternative C, compared with alternative A. This would decrease the potential for long-term beneficial impacts on soil condition, as described under Environmental Consequences for Soils Common to Alternatives B, C, D, and E, and may be less effective in improving soil condition compared with alternative A; however, alternative C would include an objective to mechanically treat 6,500 to 12,500 acres over 10 years. This treatment objective would increase the potential to preserve natural vegetation conditions over the long term that promote improved soil conditions, including resistance to erosion. This is unlike alternative A, which includes no objectives for using mechanical treatments and prescribed wildfire to treat ERUs.

Effects from Wilderness and Special Management Areas

For designated wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Soils Common to All Alternatives.

Alternative C would provide the most acreage for recommended wilderness. There are 28,900 acres of soils in satisfactory soil condition, 600 acres of impaired soils, and 7,600 acres of unsatisfactory soils in a quarter-mile of the eligible WSRs. Impacts on soils in special cave management areas and their acreages would be the same as those described under alternative B. Impacts on soils in recommended wilderness

would be the same as those described under Environmental Consequences Common Under Alternative B; however, under alternative C there would be the most soil protection and potential for improved soil conditions. This would come about by providing 297,900 more acres of satisfactory soils and 45,900 more acres of impaired or unsatisfactory soils than under alternative B (table 3-39). The 47,400 acres of unsatisfactory and 1,100 acres of impaired soils could improve over the life of the plan compared with alternative A.

Table 3-39. Acres of Soil for Indicators with Recommended Wilderness Under Alternative C

Indicator	In Recommended Wilderness
Satisfactory soil condition	307,800
Impaired soil condition	1,100
Unsatisfactory soil condition	47,400

Source: Forest Service GIS 2020

Environmental Consequences for Soils Under Alternative D

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Alternative D would also prioritize decommissioning administratively closed roads that affect riparian areas, where soils are sensitive to disturbance, especially to compaction forces. Over the life of the plan, soil condition would improve in riparian areas where administratively closed roads are decommissioned.

Recreation

Same as under alternative C.

Effects from Natural Resources Management

Same as under alternative B.

Effects from Wilderness and Special Management Areas

For designated wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Soils Common to All Alternatives. Effects from recommended wilderness and cave management areas would be the same as under alternative B.

Environmental Consequences for Soils Under Alternative E

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Same as described under alternative B.

Recreation Activities

Alternative E would encourage the designation of additional caves for recreation. If more caves are discovered and used for recreation uses, this would increase the potential for soil erosion, compared with alternative A, which would not designate caves for recreation uses, where foot traffic does not usually occur. This would be especially hazardous for soil with moderate or severe erosion hazard ratings.

Effects from Natural Resources Management

Same as described under alternative B.

Effects from Wilderness and Special Management Areas

For designated wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Soils Common to All Alternatives.

Alternative E would provide fewer acres of recommended wilderness (see table 3-40) than alternative B. This would limit the potential for enhanced soil condition, as described under Environmental Consequences for Soils Under Alternative B; however, alternative E would provide more acres of recommended wilderness for resource protection than alternative A. Compared with alternative A, soil conditions, including nutrient cycling, water infiltration, and resistance to erosion, would improve in the long term for these areas.

Table 3-40. Acres of Soil for Indicators with Recommended Wilderness Under Alternative E

Indicator	In Recommended Wilderness (acres)
Satisfactory soil condition	15,100
Impaired soil condition	0
Unsatisfactory soil condition	5,100

Source: Forest Service GIS 2020

Cumulative Environmental Consequences for Soils

The cumulative effects study area for soils is all soils that are on and next to the Lincoln NF. Areas next to the Lincoln NF include Bureau of Land Management (BLM) administrative land, Lincoln County, Eddy County, Otero County, and Texas counties that border the Guadalupe Ranger District (Culberson and Hudspeth Counties). The timeline for assessing cumulative effects on soil is 15 years, which is the life of the plan. This is the time frame for the proposed activities. It is enough time to assess the effects of soil compaction and increased erosion susceptibility and whether plan components have increased soil condition; however, if soil has been lost, it would take several decades for soil conditions to improve.

Past, present, and future activities within the administrative boundary of the Lincoln NF are livestock grazing, prescribed and natural fires, wildfire suppression, recreation, vegetation management, nonnative invasive plant treatments, road and trail construction and maintenance, wildlife habitat restoration and management, mining, and oil and gas activity. Beyond the Lincoln NF boundary, past, present, and future actions by other entities are those described above, as well as activities associated with rural residential communities. Regardless of landownership, these activities affect (both beneficially and adversely) soil erosion susceptibility and soil condition.

The Upper Hondo Soil and Water Conservation District, in the geographic area of Lincoln County, has the authority to prevent soil erosion through conservation practices and programs. BLM resource management plans for the Las Cruces District Office, including the Roswell and Carlsbad Field Offices, employ best management practices and conservation objectives to prevent soil loss and sedimentation (BLM 1986, 1997, 1998). The White Sands Resource Area Resource Management Plan provides protection for areas with high erosion susceptibility to reduce disturbance and would reclaim soil-disturbed areas (BLM 1986). In addition, the plan requires the BLM to coordinate with other Federal agencies for soil management (BLM 1986). Combined with the plan components under the action alternatives, these additive effects would cumulatively decrease erosion susceptibility, and thus decrease acres of soils with moderate to severe erosion hazard ratings, and improve soil condition.

Livestock have been grazed throughout the Lincoln NF since the late 1800s with large numbers of livestock in the last 2 decades of the nineteenth century. This resulted in significant soil erosion and loss as the land became more overgrazed (Forest Service 2019a). Best management practices to mitigate

adverse impacts on soils, primarily through ground cover retention requirements, have since been implemented on the Lincoln NF. The Forest Service intends to continue managing livestock grazing on National Forest System lands to sustain soil conditions; thus, while grazing by other non-forest entities may adversely affect soil condition, these effects would not be exacerbated by planned Forest Service actions.

The Lincoln NF is dominated by ERUs with very short fire return intervals. Shifts in fire regimes have increased the potential for uncharacteristic wildfires. Areas near the Lincoln NF are likely in the same or similar condition, and all areas would have drought conditions that exacerbate dry conditions. Combined with wildfires in areas near the Lincoln NF, these conditions would result in additive cumulative effects that would increase soil erosion susceptibility, dry soils, and altered soil nutrients; this would degrade the soil condition (Forest Service 2019a).

The absence of wildfire in some areas has resulted in denser, even-aged forests that have reduced understory vegetation. Forest management under the action alternatives would allow for some use of wildfire and prescribed wildfire. Cumulatively, reintroducing fire to the landscape should reduce erosion susceptibility and increase beneficial effects on soils.

When combined with other treatments and management in areas near the Lincoln NF, the impacts on soil from prescribed wildfire and mechanical treatments, including timber management, under all alternatives would result in mass erosion that could result in worsened soil condition; however, when combined with the long-term effects of vegetation treatments and timber management under the action alternatives and similar vegetation management by other agencies (both current and planned), the Lincoln NF should become more resilient to disturbance by wildfire and have improved ecosystem function. In turn, soil erosion susceptibility would decrease, and soil conditions would improve over the long term.

Watersheds and Water

Affected Environment

The affected environment for water resources is surface water, such as streams and springs, groundwater, and watersheds. Additional detailed information on water resources can be found in volumes I and II of the assessment report prepared in support of the land management plan (Forest Service 2019a, 2019b).

Watersheds

A watershed is a region or land area drained by a single stream, river, or drainage network. These drainage areas are determined by topography, so that a drop of water falling inside the boundary will flow to a selected point on a stream. Because of this, watershed boundaries cross ownership boundaries.

The U.S. Geological Survey developed a systematic method of delineating watershed boundaries and giving them a number code (Seaber et al. 1987), called the hydrologic unit code. Each two digits in the number system represent a drainage basin, with successive numbers referring to smaller watersheds nested within the larger one. The Lincoln NF is entirely in the Rio Grande Region (hydrologic unit code 13), which is on the eastern side of the Continental Divide. In this region, the Lincoln NF is in three subregions: the Rio Grande closed basins (hydrologic unit code 1305), the Upper Pecos River basin (hydrologic unit code 1306), and the Lower Pecos River basin (hydrologic unit code 1307) (Johnson et al. 2003).

This analysis includes subbasins (fourth level; 8-digit units). The six subbasins that overlap the Lincoln NF are the Tularosa Valley, Arroyo Del Macho, Rio Hondo, Rio Peñasco, Upper Pecos-Black, and the Salt basin. The Lincoln NF is in portions of 34 5th (10-digit) hydrologic unit code watersheds. Nested

within these larger watersheds are 122 individual 6th (12-digit) subwatersheds that intersect the plan area. Most of the analysis below focuses on these subwatersheds.

Watershed Condition

Watershed condition is the state of the physical and biological processes in a watershed; these processes affect soil condition and hydrologic function, which in turn support ecosystems. Watershed condition can be represented by a continuum from naturally pristine to degraded. The WCF, an analysis method developed by the Forest Service, classifies the state of all subwatersheds on the Lincoln NF (Forest Service 2011a, 2011b).

Watersheds are classified as one of the following condition categories:

- Class 1 (properly functioning)—Watersheds exhibit high geomorphic, hydrologic, and biotic integrity, relative to their natural potential condition, and they are functioning properly.
- Class 2 (functioning at risk)—Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity, relative to their natural potential condition, and they are functioning but at risk.
- Class 3 (impaired function)—Watersheds exhibit low geomorphic, hydrologic, and biotic integrity, relative to their natural potential condition, and their function is impaired.

On the Lincoln NF, nine subwatersheds are functioning properly, 76 are functioning at risk, and 17 are impaired. Overall, 91 percent of the Lincoln NF subwatersheds are not properly functioning (figure 3-6 and table 3-41). Many of the impaired watersheds are found in areas of heavy recreation where road density is high, near the villages of Cloudecroft and Ruidoso, and areas with impaired water quality ratings. Many of the properly functioning watersheds lie within roadless areas or other remote areas difficult to access.

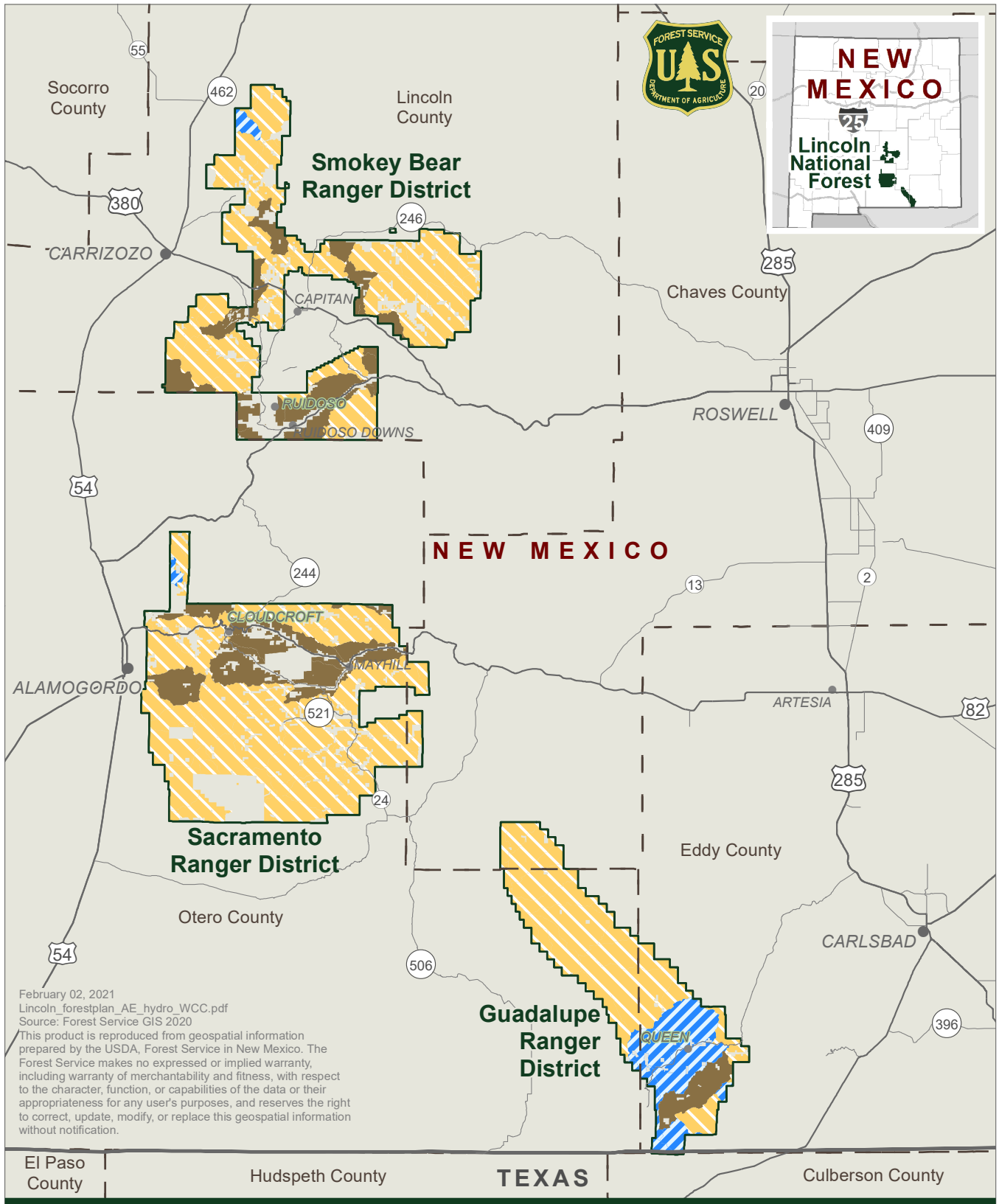
Table 3-41. Watershed Condition Framework Ratings for the Lincoln NF

Watershed Condition Rating	Overall Watershed Condition (Number of Watersheds)	Overall Watershed Condition (Percent of Watersheds)
Functioning properly	9	9
Functioning at risk	76	74
Impaired function	17	17

Source: Forest Service GIS 2020

The twelve indicators used to classify subwatersheds are in four groups: aquatic physical, aquatic biological, terrestrial physical, and terrestrial biological. On the Lincoln NF, the following analysis indicators exhibit the greatest departure from natural conditions: water quality, aquatic habitat, aquatic biota, riparian and wetland vegetation, roads and trails, soils, fire regime, and rangeland vegetation (table 3-42). The number of subwatersheds with indicators functioning at risk or with impaired function indicates there is a need to restore ecosystem resiliency across the landscape. A full listing of the subwatersheds and their condition indicator ratings appears in the assessment report (Forest Service 2019a).

Watershed conditions change because of disturbance from human-related activities and natural events. They can diverge from properly functioning conditions when disturbances fall substantially outside the range of natural variability. For example, river changes occur naturally in undisturbed areas but occur more rapidly on disturbed lands. This is because disturbance often reduces ground cover and changes to runoff patterns, soil changes, or both. Arid lands are more susceptible to change because they naturally have less ground cover (Forest Service 1999); therefore, thresholds for change vary in individual watersheds, depending on local characteristics.



February 02, 2021
 Lincoln_forestplan_AE_hydro_WCC.pdf
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Figure 3-6 Watershed Condition Ratings

- Functioning properly
- Functioning at risk
- Impaired function
- Lincoln National Forest
- Forest Plan revision area
- County

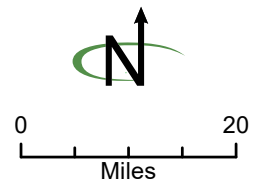


Table 3-42. Watershed Condition Framework Ratings for 103 Subwatersheds on the Lincoln NF (Number of Watersheds Listed by Indicator and Analysis Metric)

Indicator Groups	Aquatic Physical			Aquatic Biological		Terrestrial Physical		Terrestrial Biological				
	Water Quality	Water Quantity	Aquatic Habitat	Aquatic Biota	Riparian/ Wetland Vegetation	Roads and Trails	Soils	Fire Regime	Forest Cover	Rangeland Vegetation	Terrestrial Nonnative Invasive Plants	Forest Health
Functioning properly	57	75	17	22	6	6	44	9	51	25	46	100
FAR	24	10	32	50	40	23	55	25	23	49	40	3
Impaired function	22	18	54	31	57	74	4	69	29	29	17	0

Source: Forest Service GIS 2020

Beyond simply assessing watershed condition, the WCF is used to identify priority watersheds, which are areas where land management decisions should emphasize maintaining or improving watershed conditions. The Forest Service designated the Perk Canyon and Perk Canyon Cuevo in the Sacramento Mountains as priority watersheds in 2012, with essential projects identified to improve watershed conditions. As essential projects in these watersheds are completed, the watersheds would be removed from the list and replaced by new priority watersheds that need restoration. Where restoration is needed, a wide range of treatments should be sequenced, based on a long-term watershed restoration action plan.

Surface Water Resources

Surface water on the Lincoln NF is streams, reservoirs, lakes, wetlands, stock ponds, and springs (figure 3-7). These features provide habitat for diverse communities of vegetation, wildlife, and fish, as well as water for such downstream uses as crop irrigation, domestic livestock, municipal and domestic water supplies, commercial, and industrial uses.

Streams

Streams are classified by their flow characteristics into perennial, intermittent, and ephemeral types. These flow types provide information about the timing of water in the streams. Miles of mapped stream types were calculated using the National Hydrography dataset, as reported in the assessment report (Forest Service 2019a).

The stream types are described as follows:

- Perennial streams flow year-round because they get water from ground storage; however, these streams may dry up during extreme droughts.
- Intermittent streams fall between ephemeral and perennial. They get water from the ground seasonally and usually dry up in the summer.
- Ephemeral streams flow only in direct response to precipitation or snowmelt.

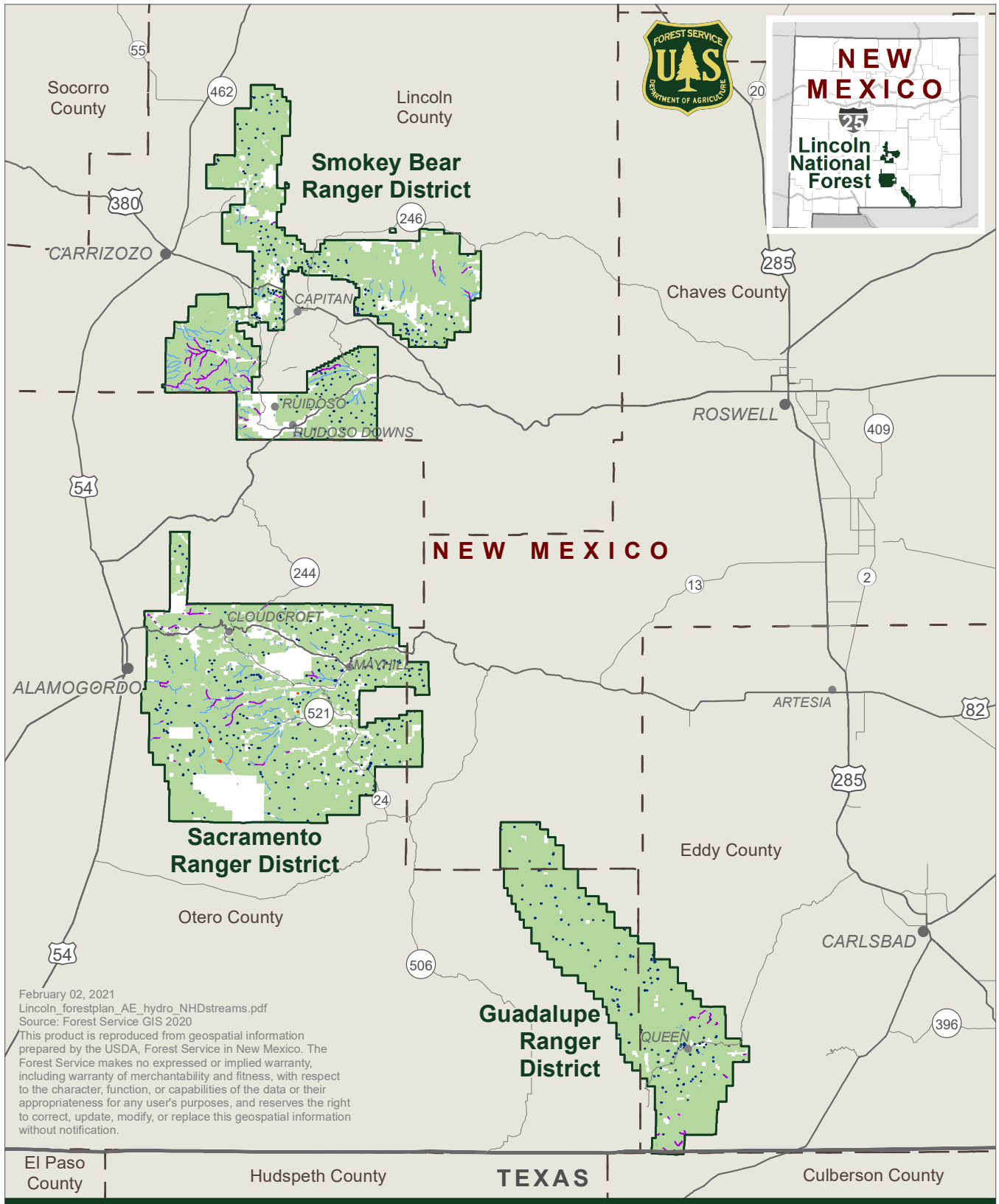
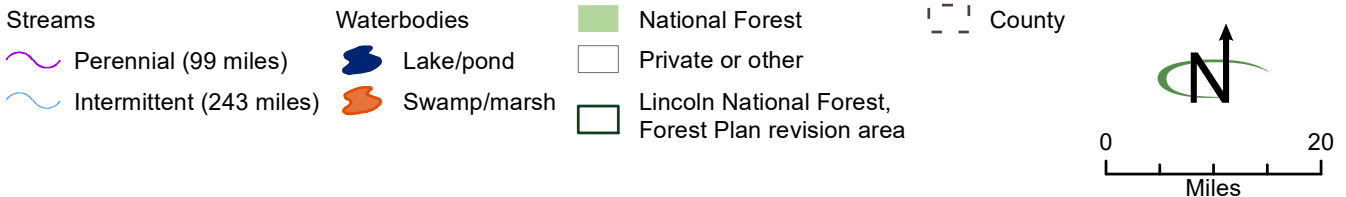


Figure 3-7 Surface Water Features



The Forest Service used the National Hydrography dataset to provide data about water resource features in the plan area. There are 9,460 miles of mapped stream channels in the plan area (table 3-43). Intermittent streams account for 243 miles and ephemeral channels account for 9,117 miles.

Table 3-43. Streams, Waterbodies, and Seeps, and Springs on the Lincoln NF

	Total
Perennial streams (miles)	99 ¹
Intermittent streams (miles)	243
Ephemeral streams (miles)	9,117
Lakes and reservoirs (acres)	321
Swamps and marshes (acres)	21
Seeps and springs (count)	348

Source: NHD GIS 2020

¹ – Overall, there are 193 miles of perennial streams within the proclamation boundary of the Lincoln NF.

Mapped perennial streams account for only 99 miles (1 percent) of stream channels on Lincoln NF-managed surface lands; overall, there are 193 miles of perennial streams within the proclamation boundary of the Lincoln NF (table 3-43). Even though perennial streams account for only a small proportion of streams on the Lincoln NF, their density and occurrence is far greater than the larger watersheds downstream. This is because a good portion of the Lincoln NF is at higher elevations than the surrounding areas with lower temperatures and higher precipitation rates. Headwaters for many perennial streams lie within the boundaries of the Lincoln NF, and much of the recharge to the surrounding groundwater basins comes from lands administered by the Lincoln NF. The few perennial streams on the Lincoln NF either dry up before reaching the alluvial valley floors or sink into the desert alluvium and cease to flow perennially.

Most perennial stream miles on the Lincoln NF are in the Rio Peñasco and Rio Hondo subbasins (figure 3-7). The Rio Peñasco and its perennial tributaries constitute most of the perennial stream miles in this subbasin. In the Rio Hondo subbasin, the Rio Bonito and Rio Ruidoso and their tributaries contain most of the perennial stream miles.

Intermittent and ephemeral streams provide many of the same ecosystem services as perennial streams (Levick et al. 2008). All streams are pathways for the movement of water, nutrients, and sediment throughout the watershed. Intermittent and ephemeral streams comprise most of the streams on the Lincoln NF. These features have greater relative moisture than the surrounding area, often stored in the ground.

The assessment identified that most of stream systems on the Lincoln NF have become deeply incised and some have widened. This prevents water during high flows from accessing the adjacent floodplain, leading to the loss of riparian and wetland vegetation. As riparian vegetation is lost along the streambanks, erosion is accelerated and streams convey higher sediment loads. Channel incision has also diminished baseflow; this is because of the riparian areas' diminished capacity to store water and because the adjacent water table is lowering. Most of the stream systems on the Lincoln NF have experienced this and are trending downward (Forest Service 2019a).

Seeps and Springs

Springs are a valuable but limited resource on the Lincoln NF. Water discharged from springs supports riparian habitat and provides important water sources for wildlife, livestock, and human needs. Springs

also serve as an important source of base flows for perennial streams and can maintain stream flows during the drier times of the year.

There are 348 springs on the Lincoln NF (table 3-43). Spring data is derived from the U.S. Geological Services National Hydrography Dataset. Data from this source is not complete, as the number of springs in the dataset may be 25 to 50 percent less than what is actually on the ground.

The Tularosa Valley and Rio Peñasco watersheds contain the highest concentration of springs on the Lincoln NF. Local geology and the abundance of shallow perched aquifers in the Sacramento Mountains contribute to this high numbers of springs. Many of the springs in the Rio Peñasco watershed are next to or near the headwaters of the Rio Peñasco (figure 3-8).

The New Mexico Bureau of Geology and Mineral Resources conducted a spring inventory as part of the Sacramento Mountains hydrogeology study. Although the data represent only a one-time sampling over a single area of the Lincoln NF, it is likely representative of springs over the entire National Forest. Sixty-two springs were inventoried, and 17 were rated as undisturbed, 16 as slight, 21 as moderate, and 5 as high. Springs identified with moderate or high disturbance most likely included diversion structures; these springs were developed or were easily accessed by livestock, meaning there were not fenced (Newton et. al. 2012).

A number of springs on the Lincoln NF are developed for livestock and wildlife use as well as for domestic purposes. Spring developments capture and divert varying amounts of spring water to troughs and tanks. During the assessment, approximately 140 springs were identified as developed (Forest Service 2019a), about a third of which were developed in the Rio Peñasco watershed.

Water Quantity

Across the Lincoln NF, average annual precipitation ranges from about 13 inches at the lower elevations to over 36 inches at the high peaks. The hydrology—that is, the average annual streamflow, baseflow, and groundwater recharge—is dominated by the summer monsoon season, with the highest flows recorded during July and August.

The quantity of perennial streamflow on the Lincoln NF and in the watersheds beyond its boundaries depends on precipitation and temperature patterns. Rainfall runoff contributions are most important from July through October, with groundwater contributions being most important November through June. There is some snowmelt from January through March that contributes to flow, but it is highly variable due to large fluctuations in annual snowfall totals.

Annual variations in temperature and precipitation affect water quantity and streamflow. Even seasonal weather changes have an impact; however, due to lower water tables, there is less water available for streams on the Lincoln NF. Some streams have low or no flow during periods of average to above average precipitation (Forest Service 2019a).

Reference conditions for streams on the Lincoln NF would have fluctuated with periods of high precipitation and drought, but extreme events would not have resulted in the extreme high and low flows observed. Currently, more extreme flood flows occur with excess sedimentation. This is due to degraded riparian conditions, loss of floodplain connectivity, and more gullies in the uplands that concentrate flow to the perennial drainages. During dry times of the year or prolonged drought, streamflow is lower than it was during reference conditions; in many areas perennial flow has ceased due to the loss of water-holding capacity in the riparian areas (Forest Service 2019a).

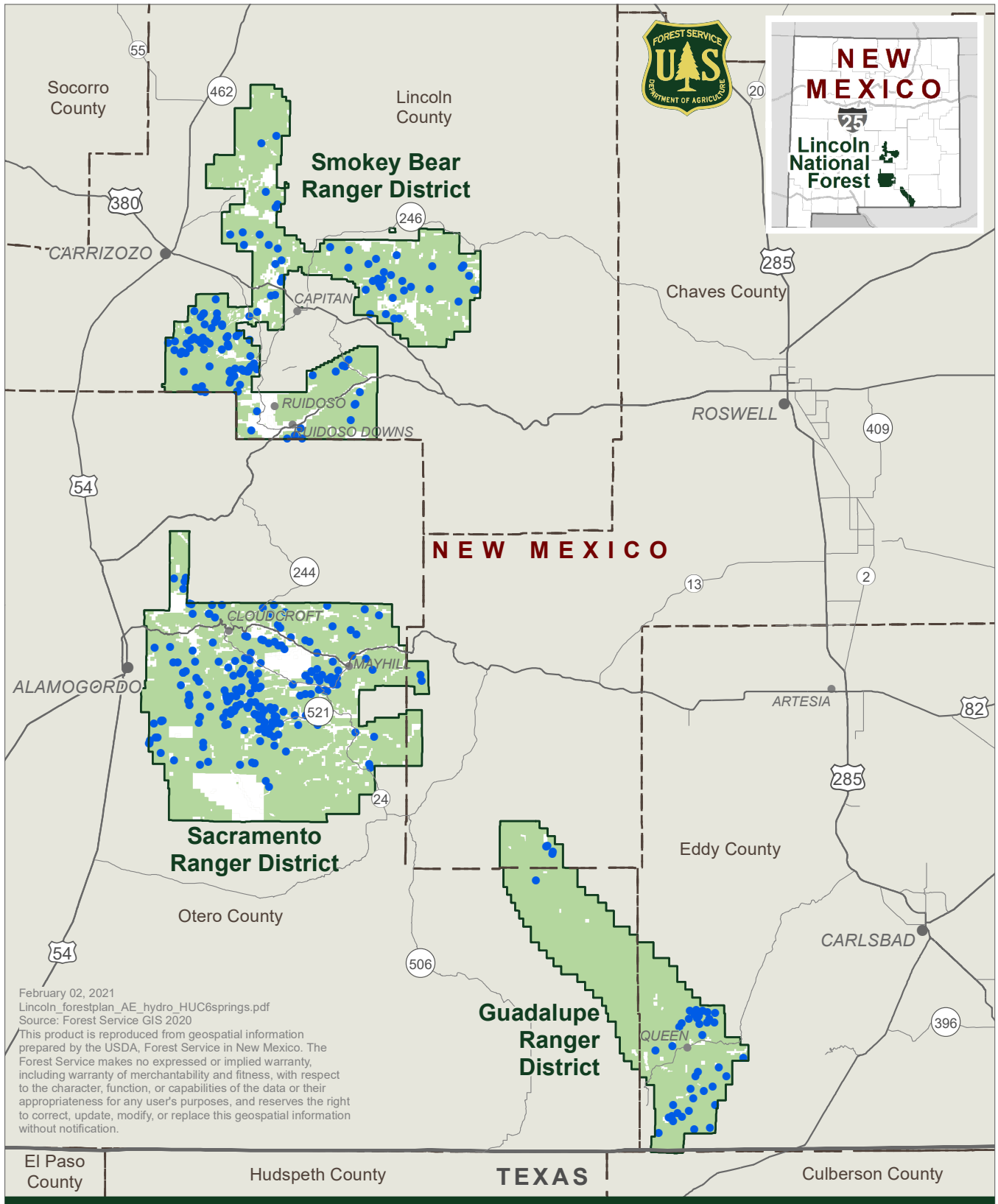


Figure 3-8 Springs

- Spring/ seep
- National Forest
- Private or other
- Lincoln National Forest, Forest Plan revision area
- - - County



Water Quality

The primary source of pollution on National Forest System lands are nonpoint source pollutants. These are derived from diffuse overland sources, in contrast to point sources of pollutants, which discharge from identifiable outlets, such as pipes, ditches, agricultural fields, or industrial or sewage treatment facilities.

Activities generating nonpoint source pollutants on the Lincoln NF are past and present mining, livestock grazing, road construction, timber and fuelwood harvesting, recreation, and ground disturbance from off-highway vehicles. Natural and unknown sources of pollutants may also contribute to nonpoint source pollution on the Lincoln NF.

The State of New Mexico assesses water quality in its streams. Figure 3-9 include streams in the project area that are listed as impaired in the State of New Mexico's 303(d) list (EPA GIS 2020) Specific impairments are *Escherichia coli* (*E. coli*) total phosphorus, temperature, turbidity, low flow alterations, nutrient and eutrophication, sedimentation and siltation, and polychlorinated biphenyls and dichlorodiphenyltrichloroethane (DDT) in fish tissue. The most common impairments are temperature, turbidity, and sedimentation and siltation, followed by low flow alterations and *E. coli*. Thirty-six miles of perennial streams were listed as impaired by the State of New Mexico. This represents 36 percent of all perennial streams on the Lincoln NF.

Groundwater

While the Lincoln NF may not be considered an important reservoir of groundwater overall, it is a very important source of recharge for the aquifers surrounding the Lincoln NF. Groundwater basins that overlap the plan area are the Tularosa, Hondo, Peñasco, Salt, Roswell Artesian, and Carlsbad basins, as declared by the New Mexico Office of the State Engineer (figure 3-10).

Groundwater recharges as a result of mountain-front mechanisms, which is very important in arid and semiarid regions like the Southwest. It is the result of higher precipitation and lower temperatures in the mountainous areas, the relatively shallow nature of mountain soils, compared with lower lying areas, and fractured bedrock.

Groundwater and surface water are interdependent in almost all ecosystems. Groundwater plays significant roles in sustaining the flow, chemistry, and temperature of streams, lakes, springs, seeps, and wetlands. Many communities around the Lincoln NF rely heavily on it, as do groundwater dependent ecosystems. Changing water use patterns, concentrated areas of groundwater withdrawal, and variations in precipitation have created localized areas where water table declines and diminished surface water flows have been of concern for some of the groundwater basins on the Lincoln NF (Darr et al. 2010).

There is not a lot of information about groundwater quality, although the New Mexico Water Quality Control Commission has developed regulations to protect groundwater resources. The State of New Mexico also relies on its drinking water rules, which incorporate regulations from the Federal Safe Drinking Water Act and establish additional requirements. The Safe Drinking Water Act and State Drinking Water Rules apply to public water systems only.

Groundwater quality typically is monitored only at facilities with a permit to discharge pollutants or when individuals test their own domestic well water; however, there are a few potential sources of pollutants that could affect groundwater quality in and around the Lincoln NF associated with old landfills, historic mining, leaky underground storage tanks, and septic tanks.

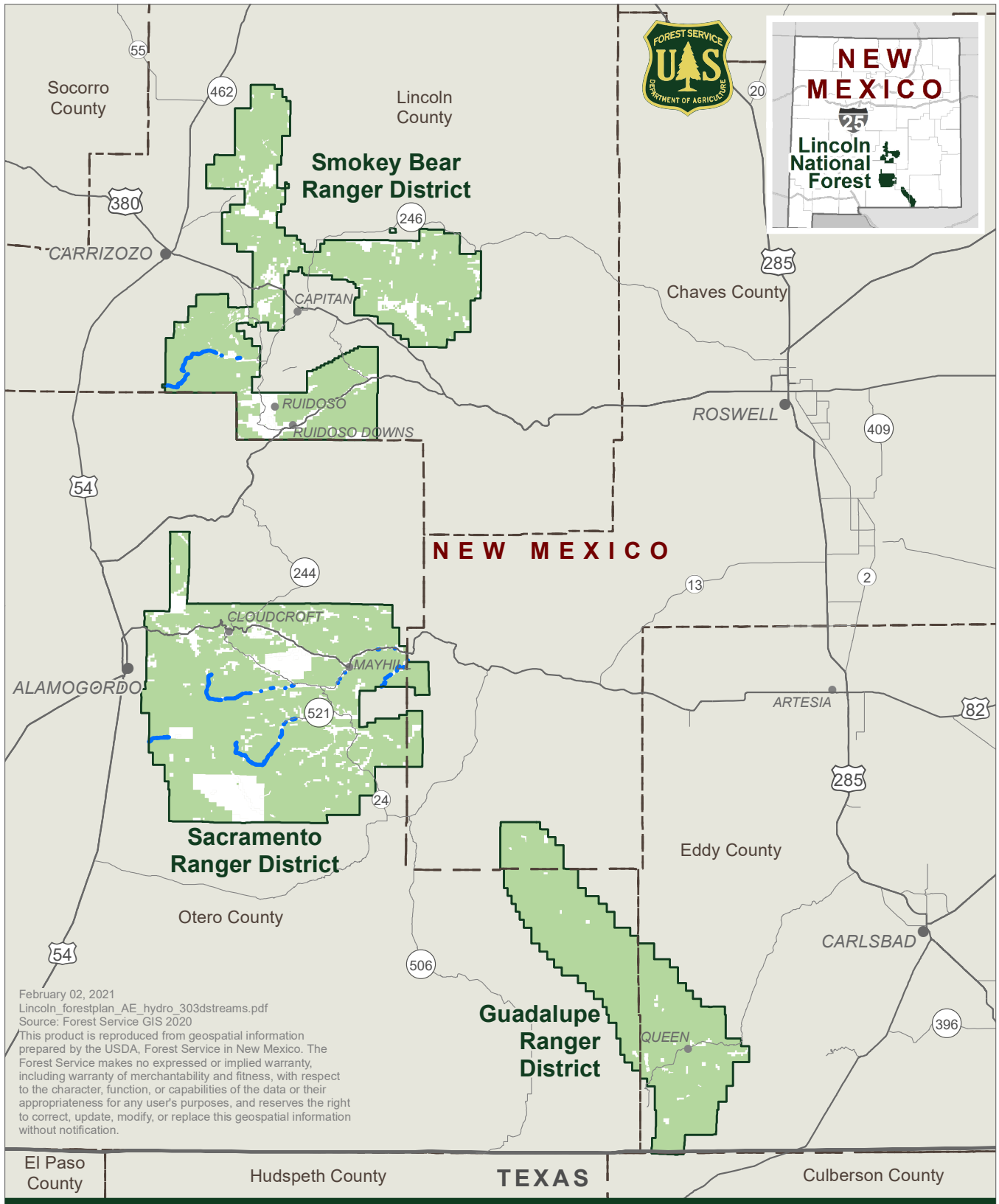
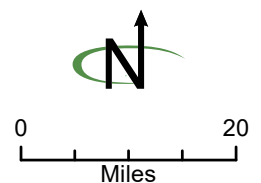
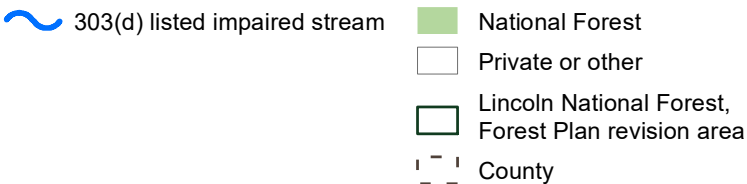


Figure 3-9 Impaired Streams



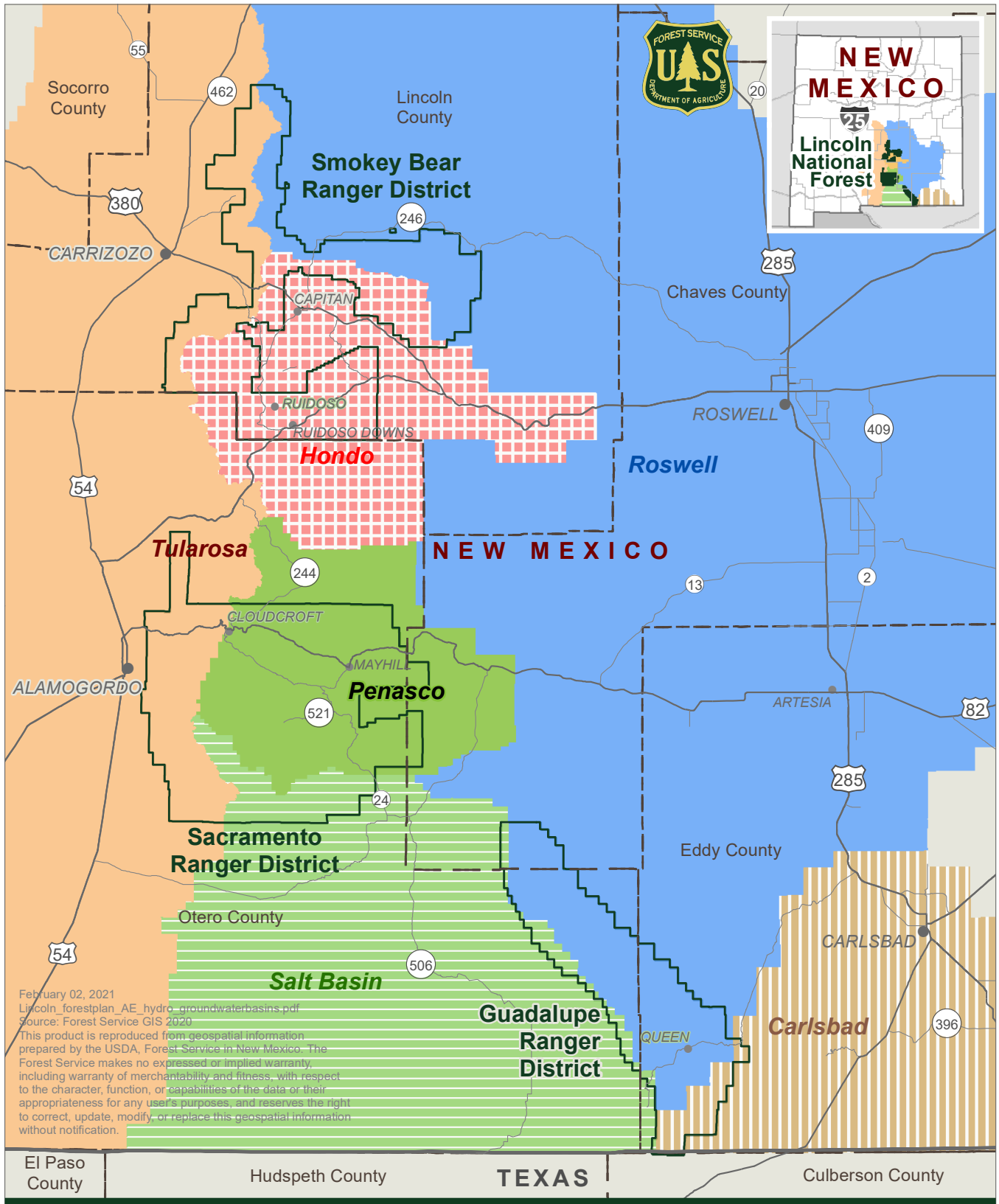
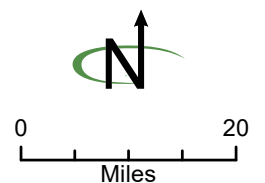


Figure 3-10 Groundwater Basins

- Carlsbad
- Roswell
- Lincoln National Forest, Forest Plan revision area
- Hondo
- Salt Basin
- County
- Penasco
- Tularosa



Water Uses

Most watersheds on the Lincoln NF provide water for human use downstream. Most of these water resources are used for drinking water, livestock watering, and agricultural irrigation, as well as for oil and gas exploration and development.

At the state level, the six subbasins that encompass the Lincoln NF have been incorporated into two larger water planning regions, 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 subbasins. It roughly coincides with the Lower Pecos River basin boundary, though the northern and eastern boundaries vary slightly from the river basin boundaries (NMISC 2016).

The Tularosa-Sacramento-Salt Basins Water Planning Region includes the Tularosa Valley and Salt basin subbasins. The two regions rely on water supplies from both groundwater and surface water sources. Surface water supplies approximately 30 percent of water diversions, while groundwater accounts for 70 percent of diversions. Approximately 65 percent of the primary water use is for irrigation. Water is also used for public water supply, including for the villages of Cloudcroft and Ruidoso, which are on the Lincoln NF. The remaining water uses are for commercial and livestock purposes.

Water Rights

With regard to water uses and development, Forest Service policy (Forest Service Manual 2541.02) directs national forests and grasslands to obtain water needed for the National Forest System, in accord with legal authority and with due consideration for the needs of other water users. This objective includes securing water rights for waters not reserved, in accordance with State laws for water needed on acquired lands, and securing rights on reserved lands, if the reservation doctrine or other Federal law does not apply to the uses involved (Forest Service Manual 2451.22).

According to the New Mexico Office of the State Engineer's database (NMOSE GIS 2020), there are nearly 3,850 water rights on the Lincoln NF, and many others are next to its boundary. These rights are primarily used for livestock and domestic purposes, such as private inholdings, campgrounds, and other administrative sites. Of these, approximately 32 percent are held in ownership by the Federal Government, and roughly 68 percent are privately held (Forest Service 2019a).

Environmental Consequences for Watersheds and Water

Methodology and Analysis Process

This section describes the methodology and analysis processes used to determine the environmental consequences of each alternative on watersheds and water resources. Environmental consequences are not site specific at this planning level and will be described with qualitative descriptions supported by past studies and observations.

The section is organized by the issue topics identified during scoping and subsequent alternatives development. Activities in the plan area, such as those of wildlife, special uses, mining, economic extraction, and groundwater use, were not carried through the following analysis of the alternatives. This is because there is little difference between the alternatives and the existing condition in terms of effects on water resources.

Groundwater

In south-central New Mexico, most groundwater is withdrawn on lands outside the Lincoln NF; therefore, the Forest Service has no influence on this practice. Forest Service groundwater policy (Forest Service

Manuals 2560, 2880) and agency technical guides provide direction for well drilling and pumping on the Lincoln NF. They specify that these activities must not adversely affect connected riparian habitat and water quantity and quality. Because direction in the Forest Service manual is considered adequate and groundwater withdrawal is governed by state regulations, additional management direction was not specified under any of the action alternatives and they were not analyzed in this EIS.

Assumptions

- The various watershed restoration activities described in the plan will occur to the extent necessary to achieve the objectives described by each alternative. The specific locations and designs of these activities are not known at this time; therefore this analysis refers to the potential of the effect to occur, realizing that in many cases, these are only estimates.
- The actual improvement rates of watershed condition depend on funding and support by Forest Service leadership and collaborators.
- Water conservation practices (best management practices) will be implemented during all management activities.
- Some resources, such as groundwater, are not within the agency's authority to control; these were noted.
- Conditions described in this analysis are generalized for the entire Lincoln NF and may not represent water quality or flow conditions at any specific location.

Indicators

- Road maintenance/construction/decommissioning
- Recreation
- Water resource improvement
- Vegetation management (mechanical thinning and prescribed burning)
- Livestock grazing
- Recommended wilderness and designated areas

Environmental Consequences for Water Resources Common to All Alternatives

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Motorized routes in watersheds can have many long-term adverse impacts on hydrologic processes (Gucinski et al. 2001), including altering hydrographs, causing channels to widen, incise, and aggrade, degrading water quality through sedimentation and turbidity, disrupting geomorphic and biologic connectivity, and increasing stream temperatures.

While various plan components in the transportation, riparian, and other section seek to diminish the adverse effects by roads, as motorized route density increases in a watershed, water resources are more likely to be adversely affected. In general, watersheds with more than 1 mile of road per square mile can be considered to have moderate to high road density (Forest Service 2011b).

Several subwatersheds on the Lincoln NF have road densities higher than 1 mile of road per square mile; some of the subwatersheds with the highest impacts from roads and trails are Cottonwood Wash, Carizzo

Creek, and Upper Rio Ruidoso subwatersheds in the Smokey Bear District, and Fresnal Canyon, Lost River, Arkansas Canyon-Sacramento River, and La Luz Canyon subwatersheds in the Sacramento District (Forest Service 2019a).

Road relocation is a common restoration practice that involves moving roads to reduce impacts on stream channels, such as through stream diversion and augmentation, while reducing sediment delivery to the hydrologic network. Road relocation should provide long-term benefit to surface water resources and watershed condition. This would come about through restored hillslope drainage patterns, increased infiltration, water storage and retention, restored hydrographs, decreased channel aggradation, and improved water quality.

Each alternative manages 55 eligible WSR segments, including 141 miles of perennial streams on the Lincoln NF. Within designated WSRs, new road construction and motorized trail construction is restricted by stipulations that require the protection of the water quality and free-flowing condition at the time of designation. Since roads are likely to adversely affect both hydraulics—for example, bridges, culverts, and riprap can impinge on the free-flowing condition of streams and water quality—the likelihood for adverse effects of new roads on aquatic habitat in the future is reduced by the WSR designations.

Recreation

Recreation is especially harmful where there is repetitive and heavy use close to a waterbody. The construction of campgrounds, picnic areas, and trails disturbs the soil, making it more likely to erode and become deposited within a waterbody. Sediment and turbidity adversely affect aquatic habitat and can cause geomorphic processes to become imbalanced. Construction also typically involves heavy machinery, which can adversely affect water quality. Best management practices identified in the current and proposed forest plan, including grading and erosion control measures, would lessen the effects of construction and heavy machinery.

Dispersed recreation areas are detrimental to surface water, when compared with developed sites, because they are often situated too close to streams and lakes. By their nature, they offer no services, such as toilets or fencing, to guide people toward best management practices. Dispersed sites are typically difficult to manage because they can be numerous and in remote locations. Especially where accessible by vehicle, but also possible at wilderness sites, soil compaction and bare soil from overuse can result in erosion and sedimentation (Leung and Marion 2000). Dispersed camping is common on the Lincoln NF with impacts observed on the Rio Bonito, Agua Chiquita, Rio Peñasco, and Water Canyon.

Streambanks are often destabilized through foot-shear and trailing, adversely affecting aquatic and riparian habitat where banks become less resilient to flood flows, eliminating under-cuts, and adding sediment to streams. Water quality is adversely affected when human waste, fuel for stoves and all-terrain vehicles, and others, and other contaminants are introduced to waterbodies. Several streams on the Lincoln NF are affected by dispersed camping and overcrowding; specifically, they are the Rio Bonito, Rio Peñasco, Wills Canyon, Water Canyon, and Agua Chiquita.

While developed sites permanently alter the environment, they are generally designed with best management practices in mind, meaning properly sited developed recreation should affect surface water resources less than dispersed sites; this is because they concentrate and manage the use. Developed recreation sites guide people to have a contained minimal impact on the local environment and are monitored for condition and use. That being said, impermeable surfaces, faulty sanitation services, and water supply diversions can be detrimental to water quality and quantity if not well sited and managed. This is because they can contribute pollutants and alter flow volumes.

Trails can adversely affect surface water resources where they concentrate water over long distances, giving it erosive power. The effect is amplified on motorized trails because they are typically wider, more compacted, more disturbed, and often rutted, which further concentrates water. If the eroded soil is delivered to a stream channel, sedimentation can adversely affect water quality and aquatic habitat (Olive and Marion 2009). Where trails intercept overland flow, they can dewater soil and stream channels downslope, while augmenting flow to other hillslopes and streams. Adding water to drier areas can result in erosion, channel incision, and channel widening, which have implications for water quality and geomorphic processes.

Fifty-five WSR segments would be managed as eligible for designation in the National Wild and Scenic Rivers System under alternative A; 54 river segments would be managed as eligible under alternatives B, C, D, and E. Standards direct managers to protect and enhance the river values for which they were designated, as well as their water quality and free-flowing nature. Standards also limit facility, road, and trail construction, especially in wild segments. Ultimately, WSR management should benefit surface water resources because ground disturbance and recreation are scrutinized, minimizing the potential for adverse effects.

Effects from Natural Resources Management

Water Resource Improvement Activities

Stream channel restoration projects should have the long-term beneficial effects of rehabilitated geomorphic and biological processes, which would help to restore stream and riparian ecosystem services. Changes to stream sinuosity, width-to-depth ratios, frequency and depths of pools, physical barrier removal, such as culverts, headcuts, and dams, and side channel restoration would restore natural stream processes. These activities also would improve aquatic habitat, stream temperature and sediment regimes, and streambank stability. The placement of wood, boulders, and gravel would improve channel morphology by creating pools, dissipating energy, and increasing sinuosity.

While improvement projects are typically successful at improving long-term resource conditions, they usually pose some localized risk of unintended, short-term adverse impacts on stream channels, water quality, and elevated stream temperature. With the implementation of effective mitigation measures, the long-term benefits to water resources usually outweigh the short-term risks.

Effects from Livestock Grazing and Rangeland Management

Daily water intake for a beef cow may vary from 3 to 30 gallons, depending on age, body size, stage of production, and the environment (Rasby and Walz 2011). Where numerous cattle are drinking from water sources, their consumption removes available water from stream channels, riparian vegetation, wildlife, and humans downstream. Depending on the stocking rate, consumption of water by cattle from springs and stream channels can decrease water availability.

Livestock grazing can also adversely and directly affect water quality (Armour et al. 1991). Where animals concentrate at stream channels and springs, they are most likely to contaminate surface waters. Most livestock-generated pollution is related to soil disturbance and erosion. Soil becomes compacted in areas where livestock habitually congregate. Compacted soil is less hospitable to plant roots than uncompacted soil. Where roots are unable to penetrate the soil they are less able to take in nutrients and water, making plants more vulnerable to toppling, disease, and drought. Compacted soil also decreases bank strength (Abernethy and Rutherford 2001), causing streams to become more susceptible to erosion.

Livestock hooves and body weight alone easily collapse and otherwise erode streambanks as they trail along, cross, and drink from streams. Soil can be dislodged by hoof action where the ground is moist and

sloped (Warren et al. 1986). The loosened soil becomes entrained during precipitation and high flows, contributing to turbidity and sedimentation. Significant contributions of sediment to a channel can disrupt the delicate balance between incision and aggradation, adversely affecting aquatic and riparian habitats.

Through their feces and urine, livestock contribute nutrients and organic matter (Sheffield et al. 1997), bacteria, such as *E. coli* (Davies-Colley et al. 2004), and protozoan pathogens, such as *Giardia* (Nader et al. 1998) to stream channels. Several perennial streams on the Lincoln NF are listed as impaired in the State of New Mexico's 303(d) list for excessive *E. coli*. Nutrient addition to surface waters, particularly phosphorus and nitrogen, can increase algal growth, decrease water clarity, and increase ammonia concentrations, which can be toxic to fish. The increased organic matter also serves as a food source for bacteria and other microorganisms, resulting in lower oxygen levels in the water. Bacteria and protozoan pathogens can be harmful to humans and wildlife.

Livestock grazing can adversely affect stream temperature (Beschta 1997). Where stream channels lack significant vegetation due to grazing, solar exposure may warm surface water, harming cold water-dependent aquatic species.

Livestock grazing can adversely affect stream channel form, process, function, and habitat where it has diminished or eliminated woody riparian species. As large branches and trunks from these species accumulate in stream channels, it can have significant beneficial hydraulic effects; it could provide habitat diversity, dissipating stream energy (reducing stream channel erosion), directing flow, and creating areas of scour and areas of sedimentation (Tabacchi et al. 2000). This diversity is critical to aquatic habitat.

A decrease in woody species in riparian areas due to grazing can also adversely affect baseflows. During flood flows, flexible plants, such as willows, protect the streambanks by bending in the current, effectively covering the banks and slowing erosion. They trap sediment, rebuild and expand floodplains, raise the water table, and expand riparian communities. Larger and well vegetated floodplains retain water longer (Tabacchi et al. 2000), raising stream baseflow during the driest part of the year.

Livestock grazing management can have potential positive impacts on the landscape, mitigating the disturbance effects of grazing. Maintenance of watering infrastructure can reduce effects on such water sources as springs and stream.

Effects from Economic Extraction

There are no effects on watersheds and water from extractive economic uses that are common to all alternatives. Individual effects are discussed below under subsequent sections.

Effects from Wilderness and Special Management Areas

Designated Wilderness is common to every alternative (82,000 acres). Management of Wilderness prohibits motorized and mechanized ground disturbance and establishes Wilderness guidance for recreation, such as camping a minimum distance from surface water. Wilderness management protects water resources through minimizing ground disturbance and associated effects on water resources.

Environmental Consequences for Water Resources Under Alternative A

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Alternative A does not provide specific guidance on road construction or maintenance next to waterways or any guidance for stream crossings; however, it does emphasize relocating roads out of canyon bottoms

during construction and reconstruction. It does include an objective to decommission 100 miles of roads; however, actual closures have not equaled this amount. Nor does it include an objective for maintaining Forest Service roads on the Lincoln NF. Impacts on water resources and watersheds would continue, as described under Environmental Consequences to Water Resources Common to All Alternatives.

Recreation

Under alternative A, each management area has specific standards and guidelines for recreation that cover developed and dispersed recreation and trail management. It does not provide direction on mitigating resource damage from developed recreation sites. It also does not provide direction on dispersed camping, such as whether to close, rehabilitate, or mitigate dispersed sites causing resource damage. Many of the popular dispersed sites are on routes parallel to streams and lakes on the Lincoln NF. Without plan components to address these problems, adverse impacts on surface waters would continue, as described in Environmental Consequences for Water Resources Common to All Alternatives.

Alternative A does not provide guidance for the construction or use of motorized and nonmotorized trails, except that overland travel was eliminated by the 2005 travel management rule. It does provide guidance for over-snow travel that protects such resources as streams and other waterways. Impacts on water resources have occurred because of minimal trail maintenance. Since alternative A lacks guidance on trail construction, especially any plan components to protect water resources, impacts on water resources would continue, as described under Environmental Consequences to Water Resources Common to All Alternatives.

Effects from Natural Resources Management

Water Resource Improvement Activities

Alternative A does not include objectives for restoring water resources and considers these projects as opportunities arise. Watershed and aquatic restoration would proceed at current levels, albeit without a coordinated focus on priority watersheds. Watershed condition and streams are expected to continue to deteriorate on the Lincoln NF under alternative A.

The current forest plan does not designate riparian management zones, which would protect surface water resources from ground disturbance and other potential project impacts. Because of this, impacts on water quality, stream morphology, and watershed condition would continue.

Vegetation Treatments

Alternative A would continue to manage vegetation, based on management area plan components. These require Forest Service officials to interpret the intent of management areas as decisions arise and to determine vegetation treatments as projects arise. It includes no objectives for using mechanical treatments and prescribed wildfire to treat ERUs and move them toward desired conditions; instead, it emphasizes mechanical timber harvest and wildfire suppression. The threat of uncharacteristic wildfire would continue and be the highest of all alternatives, raising the possibility of increased sedimentation, higher water temperatures, and shifts in flood severity or frequency, essentially destabilizing watersheds.

Effects from Livestock Grazing and Rangeland Management

Alternative A would continue to manage individual allotments in the numerous management areas in the 1986 Forest Plan (see table 2-2). There would be no ecosystem desired conditions or landscape-level management approach for water resources. Managing for grazing at the management area level does not provide for efficient and consistent direction for resources across the Lincoln NF, and this could lead to

conflicting management. For example, some allotments span multiple management areas with different prioritized resource management.

Effects from Wilderness and Special Management Areas

For designated Wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Water Resources Common to All Alternatives.

Even though there is one designated WSA under alternative A, it is not managed for Wilderness. Alternative A also does not recommend any additional Wilderness, and therefore, management under this alternative does not offer the beneficial effects of recommended Wilderness on watersheds and water.

Environmental Consequences for Water Resources Common to Alternatives B, C, D, and E

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

The action alternatives include several guidelines to protect water resources. Examples are guidelines that limit the delivery of sediment and pollutants to waterbodies, that require roads constructed in riparian management zones to mitigate or eliminate resource damage to ecological resources, and that require stream crossings to be wide enough to successfully pass water and sediment. Improved road management guidelines would improve water resources by reducing road runoff and sedimentation and improving hydrologic connectivity across the watersheds that drain into surface waters. Areas where roads cross streams are persistent sources of sediment and erosion, leading to water quality and stability concerns.

The proposed plan commits to decommissioning 75 miles of administratively closed roads within 15 years. This is similar to alternative A, which would decommission 100 miles of administratively closed roads over the life of the plan. The action alternatives would adopt a guideline restricting public access on roads built for project-specific activities. This guideline would also require roads not needed for other objectives to be reclaimed or obliterated. By improving the management of these areas and decommissioning administratively closed roads, sediment and erosion would be reduced, thereby improving the condition of water resources, compared with management under alternative A.

Recreation

The action alternatives balance recreation opportunities on the Lincoln NF with natural resource protection. It includes forest plan components to protect water resources, while promoting developed and dispersed recreation. Dispersed campsites would be rehabilitated or otherwise mitigated if environmental damage occurs. This would reduce adverse impacts from dispersed sites associated with soil compaction, streambank destabilization, and changes in water quality, compared with alternative A.

The action alternatives include components requiring trail construction and maintenance to create a sustainable trail system and requiring that trails not adversely affect natural resources. In addition, the action alternatives include an objective to maintain 20 percent of trails to meet national quality standards within 10 years. This provides additional management direction for motorized and nonmotorized trails, compared with alternative A. Implementing these planning components would minimize impacts on water resources, as described under Environmental Consequences to Water Resources Common to All Alternatives more than under Alternative A.

Effects from Natural Resources Management

Water Resource Improvement Activities

The action alternatives include the establishment of riparian management zones around riparian areas including intermittent and perennial streams. These riparian management zones would be established at the project level, and the width may vary, but several characteristics would be considered when delineating them. Plan components ensure management practices do not cause detrimental changes in water temperature, chemical composition, and sediment deposits that seriously affect water conditions or habitat. In addition, there are guidelines to protect the hydrologic flows that sustain surface water flows and dependent resources. By including these components, there is a more comprehensive approach to protecting, maintaining, and restoring water resource features compared with alternative A.

Under the 2012 planning rule, the Forest Service would identify priority watersheds, such as Perk Canyon and Perk Canyon Cuevo in the Sacramento Mountains. The action alternatives contains landscape-scale restoration objectives that focus on improving designated priority watersheds. These coordinated restoration efforts would be more effective than those under alternative A, because the beneficial effects of restoring impaired hydrologic processes would be cumulative and combined in the watersheds that most need treatment. Once work is complete in these watersheds, the Forest Service would select different priority watersheds based on WCF scores and funding opportunities.

Vegetation Treatments

The action alternatives include mechanical treatment and prescribed wildfire objectives that would treat ERUs and move them toward desired conditions. Vegetation management objectives would be accomplished using wildfire and prescribed wildfire and mechanical treatments. By first reducing fuel levels through mechanical means, it reduces the likelihood that prescribed wildfire would result in high soil burn severity, and therefore adverse effects on hydrologic processes, as described under Environmental Consequences for Water Resources Common to All Alternatives. The focus would be on objectives for treating forested-frequent fire ERUs and the piñon-juniper woodland. Mechanized vegetation management has the potential for short-term negative impacts on water quality and increases in turbidity and sedimentation, due to erosion of soil disturbed by heavy machinery.

The use of fire to restore the natural fire regime in watersheds and mechanized vegetation management could degrade water quality, reduce water quantity, and increase turbidity and sedimentation due to the loss of vegetation or ground cover. Those effects caused by mechanized vegetation management and fire restoration are usually short term, 3 to 5 years on average, or until groundcover has been reestablished.

In addition, chemical treatments could be used to enhance the effects of vegetation management, which could affect water quality; however, all applicable laws and regulations would be followed to reduce impacts on streams and watersheds.

Mechanical forest thinning, including timber harvesting, and prescribed burning should reduce the likelihood of uncharacteristic wildfire (Agee and Skinner 2005), benefitting surface water resources through maintaining ground cover. Adequate groundcover reduces erosion potential by slowing the flow of water over the landscape and adding root strength to the soil. Indirectly these activities maintain water storage capacity, while reducing erosion and sedimentation (Johansen et al. 2001). Compared with alternative A, the long-term effects of these activities would improve watershed condition, stream flow, and water quality.

Effects from Livestock Grazing and Rangeland Management

All alternatives maintain the same level of livestock grazing as the 1986 Forest Plan (alternative A), as amended (Forest Service 1986). Alternatives B, C, D, and E would include ecosystem desired conditions and objectives, standards, and guidelines to move rangelands toward desired conditions for water resources. These plan components provide range managers with a consistent, landscape-level management approach for allotment-level decisions. In addition, alternatives B, C, D, and E would locate range infrastructure and livestock management practices, including providing salt or mineral supplements outside of streams, springs, lakes, and wetlands. These additional guidelines would improve grazing management and would move water resources toward desired conditions, more than under alternative A.

Effects from Wilderness and Special Management Areas

For designated Wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Water Resources Common to All Alternatives.

Desired conditions for recommended Wilderness and designated areas aim at maintaining natural processes and ecosystem services. Alternatives B, C, D, and E propose varying acreages of recommended Wilderness, which would include forest plan components to protect the Wilderness characteristics of the land. Compared with alternative A, this would improve water resource condition over the life of the plan, as described under Environmental Consequences for Water Resources Common to All Alternatives.

Environmental Consequences for Water Resources Under Alternative B

Effects from Access and Recreation

Impacts would be the same as those described under Environmental Consequences for Water Resources Common to Alternatives B, C, D, and E.

Effects from Natural Resources Management

Water Resource Improvement Activities

Under alternative B, there are several objectives that would restore ecological conditions and increase both the short-term adverse and long-term beneficial effects on water resources, as described under Environmental Consequences for Water Resources Common to All Alternatives. These objectives include the following actions: improve the WCF scores for at least two watersheds, at least 20 acres of wetland restoration, and at least 5 miles of aquatic habitat restoration. Restoration using these objectives would ensure that, over the long term, hydrologic processes exhibit improved function and increase the watershed condition scores as quantified by the WCF compared with alternative A.

Vegetation Treatments

Over a 10-year period, alternative B includes vegetation management objectives that would mechanically treat 11,000 to 19,500 acres of the forested-frequent fire ERUs and piñon-juniper woodland ERU. It also includes at least 200,000 acres of prescribed burning in those ERUs. This would result in short-term adverse effects as described under Environmental Consequences for Water Resources Common to All Alternatives. Compared with alternative A, this would diminish the risk of high-intensity wildfire in treated areas.

Effects from Wilderness and Special Management Areas

For designated Wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Water Resources Common to All Alternatives.

Alternative B would recommend 40,500 acres of Wilderness, which would limit ground disturbance caused by recreation in these areas. Recreation in Wilderness is generally spread throughout a large area with limited visitation, when compared with areas open to motorized travel. This reduces the adverse impacts on surface water resources under alternative A from heavily used dispersed campsites that may be up to 300 feet off a National Forest System road.

Environmental Consequences for Water Resources Under Alternative C

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

Impacts would be the same as those described under Environmental Consequences for Water Resources Common to Alternatives B, C, D, and E.

Recreation

Impacts would be the same as those described under alternative B.

Effects from Natural Resources Management

Water Resource Improvement Activities

Impacts would be the same as those described under alternative B.

Vegetation Treatments

Unlike alternative B, under alternative C vegetation management objectives would rely on natural processes, such as wildland fire, to treat the frequent fire ERUs and the piñon-juniper ERUs. It would reduce vegetation objectives for mechanical treatments to 6,500 to 12,500 acres over 10 years. Using wildland fire as a management tool could increase the potential for some areas to burn especially hot, resulting in adverse impacts on hydrologic processes and watershed condition as described under Environmental Consequences for Water Resources Common to All Alternatives. It is reasonable to assume that some watersheds would be adversely affected by high soil burn severity, while other watersheds would have improved conditions. It would reduce the short-term impacts, compared with alternative B, but it would also reduce the long-term beneficial impacts on watershed condition by increasing the potential for high soil burn severity in some watersheds. Overall, it would still decrease the potential for uncharacteristic wildfire compared with alternative A.

Effects from Wilderness and Special Management Areas

For designated Wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Water Resources Common to All Alternatives.

Given its emphasis on passive recreation and conservation, alternative C would have the greatest acreage for recommended Wilderness (402,000 acres). Compared with the other alternatives, alternative C provides the most benefit to surface water resources by limiting motorized access, ground disturbance, and associated impacts.

Environmental Consequences for Water Resources Under Alternative D

Effects from Access and Recreation

Impacts would be the same as those described under Environmental Consequences for Water Resources Common to Alternatives B, C, D, and E.

Effects from Natural Resources Management

Water Resource Improvement Activities

Alternative D would increase the rate and scale of restoration more than any other alternative. It would increase the objectives for improving water resources, including improving the WCF scores for at least six watersheds, at least 40 acres of wetland restoration, and 10 miles of aquatic habitat restoration. These projects should improve hydrologic processes and watershed condition, compared with alternative A.

Vegetation Treatments

Same as described under alternative B.

Effects from Wilderness and Special Management Areas

For designated Wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Water Resources Common to All Alternatives.

Impacts would be the same as those described under alternative B.

Environmental Consequences for Water Resources Under Alternative E

Effects from Access and Recreation

Same as those as described under Environmental Consequences for Water Resources Common to Alternatives B, C, D, and E.

Effects from Natural Resources Management

Water Resource Improvement Activities

Same as described under alternative B.

Vegetation Treatments

Same as described under alternative B.

Effects from Wilderness and Special Management Areas

For designated Wilderness, see Effects from Wilderness and Special Management Areas above under Environmental Consequences for Water Resources Common to All Alternatives.

Alternative E recommends only 21,900 acres for Wilderness designation. Alternative E does not provide much beneficial impacts from recommended Wilderness, but it does include more protection than under alternative A.

Cumulative Environmental Consequences for Watersheds and Water

The timeline for assessing cumulative effects on water resources is 10 to 15 years, the life of the plan. That is because this is the time frame in which the proposed activities could occur. In addition, 10 to 15 years is enough time for the effects of the new plan components on water resources to become evident. The spatial boundaries of the analysis are the 122 subwatersheds that overlap the Lincoln NF but also extend beyond its boundaries. For the most part, stream systems originate in headwaters on the Lincoln NF and flow downstream onto lands owned or administered by entities other than the Forest Service.

Past, present, and future activities within the administrative boundary of the Lincoln NF include livestock grazing, prescribed and natural fires, wildfire suppression, recreation, vegetation management, nonnative

invasive plant treatments, road construction and maintenance, road decommissioning, wildlife habitat restoration and management, and watershed restoration and management. Beyond the Lincoln NF boundary, past, present, and future actions by other entities are those described above, as well as activities associated with rural residential communities. In any watershed, regardless of landownership, these activities cumulatively affect, both beneficially and adversely, water quality, water quantity, and watershed condition. All action alternatives would implement the proposed forest plan while modifying a few of the plan components (table 2-3). All action alternatives would have the same cumulative impacts on water resources.

In the 122 subwatersheds, multiple Federal and state agencies, counties, municipalities, the military, tribes, and other groups, such as soil and water conservation districts, manage the natural resources. Their published management plans largely complement the forest plan components pertaining to water resources and properly functioning watersheds. Most of the plans specifically refer to protecting water resources through land conservation measures, such as hazardous fuels reduction. This suggests that the planned present and future activities on managed adjacent lands may have beneficial cumulative effects on water resources and watersheds by, for example, reduced erosion and improved water retention.

The following paragraphs highlight how specific activities on the Lincoln NF, together with similar activities on other lands in the same watershed, might cumulatively affect water resources and watershed condition.

Livestock have grazed throughout the Lincoln NF since the late 1800s. Large numbers of cattle, sheep, and goats were grazed throughout the Southwest at the end of the nineteenth century, including in the Sacramento Mountains. During this time there was no regulation of grazing, which resulted in extreme erosion, soil loss, channel incision, and degraded watershed function that extend beyond the boundaries of the Lincoln NF. The Forest Service implemented best management practices to mitigate adverse impacts on water and watersheds when it developed the current allotment arrangement in 1957.

The proposed forest plan emphasizes livestock management practices that improve surface water quality and watershed condition. Depending on how other entities manage grazing outside the Lincoln NF boundary, these effects would not be worsened by planned Forest Service actions and grazing on the Lincoln NF.

The Lincoln NF is dominated by ERUs with very short fire return intervals. Shifts in the fire regimes have increased the potential for uncharacteristic wildfires that could increase sedimentation, raise water temperatures, and shift flood severity or frequency, which would degrade watershed condition. The absence of wildfire has resulted in denser, even-aged forests, and overstocked uplands have removed ground cover. This has resulted in higher evapotranspiration, lowered water tables, and reduced understory vegetation. Forest management under the proposed forest plan would allow for use of wildfire and prescribed wildfire. Cumulatively, reintroducing fire to the landscape should have beneficial effects on water quality and watershed condition.

In coordination with prescribed burning and wildland fire management, mechanical treatments would continue on the Lincoln NF under the proposed forest plan. Short-term impacts on surface water resources could degrade water quality, reduce water quantity, and increase turbidity and sedimentation due to ground disturbance. The Forest Service would use best management practices to mitigate these short-term impacts. Over time, mechanical treatments, combined with prescribed burning emphasized under the proposed forest plan, should result in forests that are more resilient to disturbance by wildfire, which should cumulatively benefit water resources and watershed conditions.

Across the Lincoln NF, there are approximately 2,390 miles of National Forest System roads and motorized trails under Forest Service jurisdiction; beyond the Lincoln NF boundary are many more miles of roads and trails. Roads adversely affect hydrologic processes in several ways, and road densities remain high in several subwatersheds with perennial streams on the Lincoln NF (Forest Service 2019a). All alternatives would decommission up to 75 miles of roads over the next 15 years. This is similar to alternative A, which includes decommissioning 100 miles of administratively closed roads over the life of the plan; however, adverse impacts are expected through the use of the remaining roads, as described under alternative A. In combination with roads outside the Lincoln NF, the National Forest System motorized transportation system can be expected to have adverse cumulative impacts on water resources and watershed condition.

Rural development around the Lincoln NF, in conjunction with such Lincoln NF developments as campgrounds, ranger stations, and day-use sites can adversely affect water resources through ground disturbance and water quality contamination. On the Lincoln NF, plan components and best management practices are used to mitigate these impacts, thereby minimizing adverse cumulative impacts by present or future Lincoln NF activities.

Wildlife, Fish, and Plants

Species and habitats are managed in conjunction with other resources according to the Multiple Use Sustained Yield Act of 1960 (Public Law 86-517). For federally endangered and threatened species on the Lincoln NF, habitat management and compatible multiple uses are determined in accordance with section 7 of the Endangered Species Act, as amended (Public Law 93-205). For species of conservation concern, the habitat will be managed as appropriate to the species' needs, and multiple uses will be compatible. This is to ensure that those species persist on the Lincoln NF, in accordance with the 2012 Planning Rule.

Under the current forest plan, rare wildlife, aquatic, and plant species are managed as sensitive species. The regional forester identifies these as plant and animal species for which population viability is a concern. The Forest Service's sensitive species concept is not carried forward as part of the 2012 planning rule. In accordance with that rule, the Forest Service developed a list of potential species of conservation concern that may need the fine-filter approach. Maintaining species that are vulnerable to decline on the Lincoln NF will maintain forest diversity and thus would comply with the National Forest Management Act diversity requirement.

During the evaluation of potential species of conservation concern, the Forest Service considered species on the Region 3 regional forester's sensitive species lists for the Lincoln NF. Some sensitive species were carried forward as species of conservation concern, but others did not meet the criteria during evaluation. The specific reasons a sensitive species was determined to meet or not meet the criteria as a species of conservation concern are provided in the species rationales (Forest Service 2019c).

Plant and animal species depend highly on the function of ecosystems with specific conditions, which create areas favorable for particular species. Important drivers of biodiversity loss and ecosystem service changes are habitat change, long-term trends in climate, nonnative invasive plants, overexploitation, and pollution. The revised forest plan addresses species viability and persistence by providing guidance to maintain or enhance habitat elements that are important for species found on the Lincoln NF, in addition to addressing threats specific to habitat and providing guidance for species-specific threats. This would be done by adopting a complementary ecosystem or coarse-filter and species-specific or fine-filter approach to maintaining species diversity.

The premise behind this approach is that native species evolved and adapted within limits established by natural landforms, vegetation, and disturbance patterns before human alterations; therefore, maintaining

or restoring ecological conditions and functions similar to those under which native species evolved—the coarse-filter approach—offers the best assurance against losses of biological diversity and maintains habitats for most species in an area; however, for some species, the coarse-filter approach may not be adequate, and a fine-filter approach may be necessary.

The fine-filter approach recognizes that for some species, ecological condition or additional specific habitat features (key ecosystem characteristics) may be required, the reference condition is not achievable, or there are risks to species viability not related to habitat, and these factors may not be addressed by the coarse-filter approach. Species of conservation concern are those native to, and known to occur in, the plan area and for which there is substantial concern about the species' ability to persist in the plan area.

This section covers five main categories: terrestrial species and habitats, aquatic species and habitats, special habitats, at-risk species, and nonnative invasive species. Terrestrial, aquatic, and at-risk species are managed for their persistence on the Lincoln NF, while nonnative invasive plants are managed for their eradication or control; this is because these flora and fauna are not native to the Lincoln NF.

Affected Environment

Vegetation is one of the primary factors that influences species diversity and abundance; it is one of the more obvious habitat components influenced by management, land use, and natural disturbance. Species presence and absence on the Lincoln NF is, in many cases, directly tied to availability, current ecological condition, and key ecosystem characteristics of ERUs.

The proposed action, alternatives, and this analysis use the ERU vegetation classification system. ERUs are map unit constructs that combine themes of site potential, historical disturbance conditions, and natural succession. Site potential is a term used to describe the characteristic ecological conditions at late development, resulting from the interactions among climate, soil, and vegetation. More information about the ERU framework and the ERUs of the Lincoln NF can be found in the Upland Vegetation Communities and Riparian and Wetland Ecosystems sections of this chapter. The acres of ERUs on the Lincoln NF are shown in table 3-44.

Table 3-44. ERUs on the Lincoln NF

ERU	Acres	Percentage of Plan Area	Associated Species Groups
Forest ERUs	341,800	31	Large mammals, small mammals, old growth-dependent (Mexican spotted owl), large-tree dependent, cavity nesting birds, migratory birds, pine and deciduous trees, shrubs, grasses, forbs
Woodland ERUs	548,200	50	Large mammals, small mammals, cavity nesting birds, migratory birds, piñon-juniper trees, shrubs, grasses, forbs
Grassland ERUs	77,700	7	Large mammals (including game ungulates), small mammals, migratory birds, grassland-associated birds, sparse trees and shrubs, grasses, forbs
Shrubland ERUs	75,200	7	Large mammals (including game ungulates), small mammals, migratory birds, shrubland-associated birds, sparse trees, shrubs, grasses, forbs

ERU	Acres	Percentage of Plan Area	Associated Species Groups
Riparian ERUs	2,400	0.3	Migratory birds, small mammals (New Mexico meadow jumping mouse), important migratory corridors for large mammals, hydrophilic trees, shrubs, grasses, sedges, forbs, and emergent, floating, or submerged plants
Wetlands	400	Less than 0.01	Waterfowl, fish, aquatic invertebrates, aquatic-dependent plants, hydrophilic trees, shrubs, grasses, sedges, forbs, and emergent, floating, or submerged plants
Sparsely vegetated, developed	47,400	4	Limited habitat value
Total	1,093,100		

Half of the plan area is characterized by woodland ERUs, followed by 30 percent forested ERUs. Compared with other landscapes in the state, the Lincoln NF has limited riparian and wetland habitats to support riparian associated and water-dependent species, such as the New Mexico meadow jumping mouse. In addition, much of these habitats are departed from the natural range of variation or proper functioning condition (see Riparian and Wetland Ecosystems).

Associating particular ERUs with specific species is critical for assessing future management needs. The following subsections describe terrestrial and aquatic species and habitats and the ERUs they are associated with.

Terrestrial Species and Habitats

Terrestrial plant and animal species are those commonly found species that spend all or most of their time on dry land. These are usually mammals, such as deer and rabbits; birds, such as eagles and jays; reptiles, such as snakes and lizards; and macroinvertebrates, such as beetles and snails. Also included are land-based plants, such as trees and grasses. These animals and plants are native to the Lincoln NF and are not considered invasive, nor is their persistence on the Lincoln NF of concern.

Terrestrial species and habitats are associated with the following ERUs on the Lincoln NF:

- Forest ERUs—Mixed conifer-frequent fire, mixed conifer with aspen, ponderosa pine-evergreen oak, ponderosa pine forest, and spruce-fir forest
- Grassland ERUs—Colorado Plateau/Great Basin grassland, montane/subalpine grassland, and semi-desert grassland
- Woodland ERUs—Juniper grass, piñon-juniper evergreen shrub, piñon-juniper grass, piñon-juniper woodland
- Shrubland ERUs—Chihuahuan Desert scrub, Gambel oak shrubland, interior chaparral, and mountain mahogany mixed shrubland

The greater Lincoln NF area contains the Peñasco Canyon important bird area, designated by the Audubon Society. This important bird area is a high-altitude riparian area and wetland that contains Mexican spotted owls (*Strix occidentalis lucida*) and other high priority species in great abundance and is the southernmost known breeding location in New Mexico for Lincoln’s sparrow (*Melospiza lincolnii*).

Aquatic Species and Habitats

Aquatic plant and animal species are those commonly found species that spend all or most of their lives in water features in Lincoln NF streams, springs, and pools. These species are usually represented by fish, such as trout and chubs; amphibians, such as frogs and common salamanders; and macroinvertebrates, such as aquatic insects and clams. It also includes water-dependent plants, such as cattails and water lilies. These species are native to the Lincoln NF and are not considered invasive, nor is their persistence on the Lincoln NF of concern.

Aquatic species and habitats are associated with the riparian ERUs on the Lincoln NF; however, these ERUs comprise only 0.3 percent of the plan area (see table 3-31 in Riparian and Wetland Ecosystem section; see Watersheds and Water section).

Special Habitat Features

Some species use features of the landscape that may not be directly tied to ERUs. There are many species on the Lincoln NF that rely on these habitat features, which are not necessarily associated with specific ERUs. Caves, cliffs, talus slopes, scree, rock features, and mines are widespread microsites in all vegetation ERUs and are analyzed under Caves and Karsts.

Many species are associated with fine-scale habitat features that may or may not be captured by the coarser vegetation community descriptions. Other features important to wildlife and plants are coarse woody debris, such as downed logs, which provides shelter, food, and moisture retention. Other features are rocky riparian areas with deciduous leaf litter, and soil parent material specific to certain plant species. Coarse woody debris and standing snags of sufficient size provide for roosting, nesting, or foraging. These features could affect species if they are departed from baseline conditions. These characteristics are somewhat more transient on the landscape; as snags fall and eventually decay, standing live trees die and become new snags. If the seral stage proportions of most vegetation communities trend toward smaller-diameter trees, future trees may not be large enough to provide the ecological conditions required by species that depend on large diameter snags.

At-risk Species

In accordance with the 2012 Planning Rule, the Forest Service identified at-risk species on the Lincoln NF. There are two categories of at-risk species: those recognized under the Endangered Species Act (ESA) and species of conservation concern. Species recognized under the ESA are categorized as endangered, threatened, proposed, or candidate species. A species of conservation concern is a plant or animal for which the Forest Service has concerns about its ability to remain on a landscape for a long time. Lincoln National Forest created a species of conservation concern list using the best available science intended to prevent species from becoming federally listed.

The Forest Service identified 10 federally listed, proposed, or candidate species and 46 species of conservation concern, for a total of 56 proposed at-risk species, on the Lincoln NF. Each at-risk species was ascribed to particular ERUs, special habitat features, water resources, and threats (table 3-45 and table 3-46).

Threatened and Endangered Species

Endangered species are those plants and animals that have become so rare that they are in danger of becoming extinct. Threatened species are plants and animals that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. A full list of federally listed species with potential to occur on the plan area was identified by the USFWS' Information for Planning and Consultation (IPaC) and is provided in appendix F. The Forest Service will analyze these species in a

separate biological assessment, in accordance with section 7 of the ESA. Those species known to occur on the Lincoln NF are listed in table 3-45 along with the ranger district in which they are found and a brief habitat description.

Table 3-45. Federally Listed Species on the Lincoln NF

Species Name	Status ¹	Critical Habitat	District ²	Habitat Description
Birds				
Mexican spotted owl (<i>Strix occidentalis lucida</i>)	FT	Final; 325,400 acres occur in the plan area	All	Roost and nest habitats occur in late seral forests or rocky canyon habitats; forests are typically uneven-aged, are multistoried, and have high canopy cover; nest trees are typically large (average diameter of nest 24 inches); forages in a variety of habitats, including managed and unmanaged forests, piñon-juniper woodlands, mixed-conifer and ponderosa pine forests, cliff faces and terraces between cliffs, and riparian zones (USFWS 2012). Protected activity centers consist of at least 600 acres of the best nesting and roosting habitat and are centered around Mexican spotted owl locations. Protected areas are considered vital to recovery. There are 15,843 acres of protected activity centers in the plan area.
Mammals				
New Mexico meadow jumping mouse (<i>Zapus hudsonicus luteus</i>)	FE	Final, 1,100 acres occur in plan area	D2	Appears to use only two riparian community types: persistent emergent herbaceous wetlands, such as beaked sedge and reed canarygrass alliances; and scrub-shrub wetlands, such as riparian areas along perennial streams that are composed of willows and alders; especially uses microhabitats of patches or stringers of tall dense sedges on moist soil along the edge of permanent water (USFWS 2020)
Peñasco least chipmunk (<i>Neotamias minimus atristriatus</i>)	C	None designated	D1, D2	Occupies unforested habitats composed of shrubs, rocks, and dense herbaceous vegetation, or forests with trees that lack low-hanging limbs; has been found in two different and distinctive habitat types in New Mexico: the ponderosa pine forest zone in the Sacramento Mountains; and high elevation talus slopes and glacial cirques, surrounded by Engelmann spruce (<i>Picea engelmannii</i>), quaking aspen (<i>Populus tremuloides</i>), corkbark fir (<i>Abies lasiocarpa</i>), and Douglas-fir (<i>Pseudotsuga menziesii</i>) above tree line in the White Mountains (USFWS 2015)

Species Name	Status ¹	Critical Habitat	District ²	Habitat Description
Plants				
Kuenzler hedgehog cactus (<i>Echinocereus fendleri</i> var. <i>kuenzleri</i>)	FT	None designated	All	Typical habitat is the lower fringes of the piñon-juniper woodland, from 5,100 to 6,990 feet, with an average of 180 frost-free days and annual precipitation of about 16 inches; occupied habitat consists of gentle slopes (15 to 60 percent) or benches with gravelly to rocky soils and southern, eastern, and western exposures (USFWS 2017)
Lee's pincushion cactus (<i>Escobaria sneedii</i> var. <i>leei</i>)	FE	None designated	D3	Occurs in semidesert grassland where it is restricted to the Tansi1 Limestone Formation and grows on north-facing ledges; limestones are generally hard and resistant to erosion and support a sparse vegetation of low shrubs, some rosette-forming perennials, many cacti, and both annual and perennial herbs; grows at 3,900 to 4,900 feet in an area where the precipitation averages 11.8 inches per year (USFWS 1986)
Sacramento Mountains thistle (<i>Cirsium vinaceum</i>)	FT	None designated	D2	Continuously wet travertine deposits, with relatively high nitrogen and low phosphorus contents, are the most common habitats; also occupies wet areas downstream of these features and a few valley bottoms with wet calcareous soils; occupied habitats occur between 7,500 and 9,500 feet and are typically meadows and streams with steep slopes, few other plant species, and little grass cover (USFWS 1993)
Sacramento prickly poppy (<i>Argemone pleiacantha</i> ssp. <i>pinnatisecta</i>)	FE	None designated	D2	Occurs in steep, rocky canyons between the piñon/juniper zone of the Chihuahuan Desert scrublands and grasslands (4,300 feet), and the lower edge of the ponderosa pine community of the Great Basin conifer woodlands (7,100 feet); habitats vary, from xeric uplands to mesic sites, and include arid canyon bottoms, dry terraces above riparian areas, streambanks, and areas around springs and seeps (USFWS 2013)
Sneed pincushion cactus (<i>Coryphantha sneedii</i> var. <i>sneedii</i>)	FE	None designated	D3	Exposed areas of steep, sloping limestone in the shrublands or grasslands of the Chihuahuan Desert

Species Name	Status ¹	Critical Habitat	District ²	Habitat Description
Wright’s marsh thistle (<i>Cirsium wrightii</i>)	C	None designated	D2	Occupies marshes and wet cienegas in the northern Chihuahuan Desert; these marshy wetlands are in otherwise semiarid to arid areas; restricted to wet, alkaline soils in spring seeps and marshy edges of streams at 3,450 to 8,500 feet; may also occur in wetlands of piñon-juniper and ponderosa pine-Douglas-fir woodlands (WildEarth Guardians 2008)

Sources: Forest Service 2019a; USFWS 2020

¹ Status codes—FE: federally endangered; FT: federally threatened; P: Proposed; C: Candidate; ExpNE: Experimental population, nonessential

² District 1 (D1) = Smokey Bear Ranger District; District 2 (D2) = Sacramento Ranger District; and District 3 (D3) = Guadalupe Ranger District)

Species of Conservation Concern

Species of conservation concern are those that are native to and known to occur in the plan area and that the regional forester of the Southwest Region has determined substantial concern for its capability to persist over the long term in the plan area. Those that are known to occur on the Lincoln NF are listed in table 3-46 along with the ranger district in which they are found and a brief habitat description. The Forest Service’s sensitive species and management indicator species concepts are not carried forward as part of the 2012 Planning Rule, and species of conservation concern replaces these concepts in land management plans going forward. Designating species of conservation concern is not a forest plan decision. The Regional Forester has authority to change species of conservation concern lists to reflect new information.

Table 3-46. Species of Conservation Concern on the Lincoln NF

Species Name	District ¹	Habitat
Birds		
Piñon jay (<i>Gymnorhinus cyanocephalus</i>)	D1, D2, D3	Piñon-juniper woodlands
Mammals		
Davis Mountain cottontail, robust cottontail (<i>Sylvilagus robustus</i>)	D3	Habitat includes thickets and adjacent open areas, as well as rocky areas where boulders are large enough to provide cover in crevices and crannies
Guadalupe pocket gopher (<i>Thomomys bottae guadalupensis</i>)	D3	Sycamore, cottonwood, and rabbit-brush riparian habitats; loose soils, open grassy pine bottoms; in the Guadalupe Mountains it can be restricted largely to the poorer, thinner soils on the dry, rocky flats and the lower slopes of the mountains; may be absent from the deeper soils at the base of the mountains, which are occupied by <i>Pappogeomys</i> spp. Found in McKittrick Canyon.
Fish		
Headwater catfish (<i>Ictalurus lupus</i>)	D3	Sandy and rocky riffles, runs, and pools of clear creeks and small rivers; springs; clear temperate waters, generally with a moderate gradient; Sitting Bull Falls and other permanent waters in the Guadalupe Mountains
Rio Grande chub (<i>Gila Pandora</i>)	D2, D3	Cold, clear water with vegetation at the edges, especially aquatic vegetation or overhanging trees for shading
Rio Grande cutthroat trout (<i>Oncorhynchus clarkii virginalis</i>)	D1	Clear and cold (higher elevation) fast flowing waters with high oxygen content; reintroduced population at Pine Lodge Creek

Species Name	District ¹	Habitat
Invertebrates		
Bonita diving beetle (<i>Stictotarsus neomexicanus</i>)	D1	Permanent to intermittent ponded wetlands or high elevation pools
Caddisfly (<i>Psychoronia brooksi</i>)	D1	Found throughout the North Fork Rio Ruidoso, near the entrance to Ski Apache; flowing water and seepage spring habitats
Capitan woodlandsnail (<i>Ashmunella pseudodonta</i>)	D1	Terrestrial; talus slopes or rock glaciers; east end of Capitan, talus slope at about 6,200 feet; ranges lower and higher in elevation; Lone and Carrizo Peaks, Patos Mountains, White Oaks, and near Baldonado Springs
Carlsbad agave borer (<i>Agathymus neumogeni carlsbadensis</i>)	D3	Type Locality from the Guadalupe Mountains, Carlsbad Cavern National Park, New Mexico, on the mesa at the head of Yucca Canyon, elevation 5,470 feet
Dumont's fairy shrimp (<i>Streptocephalus henridumontis</i>)	D1	Occurs in turbid, warm water, temporary pools, stock tanks, and playas
Guadalupe woodlandsnail (<i>Ashmunella carlsbadensis</i>)	D3	Guadalupe Mountains of New Mexico and Texas; occurs in heavily wooded canyons, caves, rocky outcroppings; is tolerant of xeric conditions
Henry's elfin (<i>Callophrys henrici solatus</i>)	D2, D3	Found in a wide range of habitats, such as barrens, open woodlands, and mesquite woodlands; larval food plant is <i>Ungnadia speciosa</i> Endl.
Mountainsnail (<i>Oreohelix strigosa nogalensis</i>)	D1	Sierra Blanca and Nogal Peak mountain complex; canyon habitat above 7,000 feet; steep leafy slopes with very little rock, above the canyon bed; overstory maples and aspen; on Nogal Peak, pine-oak woodlands in mesic areas
Northern threeband (<i>Humboldtiana ultima</i>)	D3	In or around seeps and springs of deep canyons, at the base of steep cliffs, often under deciduous trees with moist soils and leaf litter; also in rock rubble and leaf litter but not talus slopes
Poling's hairstreak (<i>Satyrium polingi</i>)	D1, very near D3	Habitat is oak woodland with <i>Quercus grisea</i> as a substantial component species; probably also uses <i>q. emoryi</i> ; larvae feed on new growth and probably male flowers of <i>q. grisea</i> and probably <i>q. emoryi</i> ; adults use nectar from a variety of flowers, including milkweed and catclaw acacia
Ruidoso snaggletooth (<i>Gastrocopta ruidosensis</i>)	D1, D2	Found on bare soil, under stones, and in thin accumulations of grass thatch and juniper litter, on mid-elevation carbonate cliffs and xeric limestone grasslands, along the eastern slopes of the Sacramento Mountains
Sacramento Mountains checkerspot (<i>Euphydryas anicia cloudcrofti</i>)	D2	High-elevation wetland riparian areas and wet meadows
Sierra Blanca woodlandsnail (<i>Ashmunella rhyssa</i>)	D1, D2	Associated with limestone terrain of the Sacramento Mountains; may be found throughout forests at higher elevations
Vagabond holospira (<i>Holospira montivaga</i>)	D3	Fairly exposed, arid western slopes of the Guadalupe Mountains; cliff sides of wooded canyons; rocky ledges of cliffs, canyon walls, and outcrops at 7,000 feet in ponderosa/Gambel oak/piñon/live oak; Black Canyon and southwestern edge of the Guadalupe Mountains
Plants		
Capitan Peak alumroot (<i>Heuchera woodsiaephila</i>)	D1	Apparently limited to high elevation (approximately 8,400 to 9,500 feet) on locally moist sites with stable, forested talus; usually under <i>Pseudotsuga menziesii</i> or <i>Abies concolor</i> and associated with <i>Woodsia plummerae</i>

Species Name	District ¹	Habitat
Chapline's columbine (<i>Aquilegia chaplinei</i>)	D2, D3	Canyon deciduous woodland; moist, shaded crevices, among boulders, along streams in limestone rock or derived soil; subject to periodic flooding
Cloudcroft scorpionweed (<i>Phacelia cloudcroftensis</i>)	D2	Disturbed sites in arroyo channels or along roads, in mixed conifer forest down to upper piñon-juniper woodlands, approximately 6,500 to 7,700 feet; prefers limestone gravels derived from the San Andres and Yeso Formations, where it occurs on flat areas and along steep slopes, in open, exposed areas, and under the shade of pine trees
Eggleaf coral-drops (<i>Besseyia oblongifolia</i>)	D1	High elevation, at approximately 11,000- to 11,800-foot meadows
Fanmustard (<i>Nerisyrenia hypercorax</i>)	D3	In the Chihuahuan Desert region; known only from gypsum exposures along the rim (western escarpment) of the Guadalupe Mountains, southeastern New Mexico
Golden bladderpod (<i>Lesquerella aurea</i>)	D2	Calcareous soils in open areas of ponderosa pine (<i>Pinus ponderosa</i>) or mixed Ponderosa pine-Douglas fir (<i>P. ponderosa-Pseudotsuga menziesii</i>) forests; also often on roadcuts and rocky south-facing slopes; areas populated by <i>L. aurea</i> appear to be drier than adjacent areas; approximately 6,500 to 9,000 feet
Goodding's onion (<i>Allium gooddingii</i>)	D1	Moist, shaded canyon bottoms in climax-conifer forests, 8,000 feet; mountain meadows
Green medusa orchid, ladies'-tresses orchid (<i>Microthelys rubrocallosa</i>)	D2	Light to moderately wooded south-facing pine forests at approximately 8,000 feet (Forest Service 2020b)
Guadalupe mescal bean (<i>Sophora gypsophila</i> var. <i>guadalupensis</i>)	D3	Outcrops of pink, limy, fine-grained, slightly gypsiferous sandstone in Chihuahuan desert scrub and juniper savanna; associated with <i>Tiquilia hispidissima</i>
Gypsum blazingstar (<i>Mentzelia humilis</i> var. <i>guadalupensis</i>)	D3	Occurs on the Yeso Formation, on gypsum outcrops with limestone cobble at about 4,400 to 5,100 feet
Kerr's milk-vetch (<i>Astragalus kerrii</i>)	D1	Found in dry, sandy, or gravelly bars or benches of granitic alluvium in piñon-juniper woodland and lower ponderosa pine forest; usually in water-scoured arroyos on well-drained sand/gravel of igneous origin, in sun or partial shade
New Mexican stonecrop (<i>Rhodiola integrifolia</i> ssp. <i>neomexicana</i>)	D1	Exposed on rocks of a mountain peak; alpine, bare rock/talus/scree
Royal red penstemon (<i>Penstemon cardinalis</i> ssp. <i>regalis</i>)	D3	In New Mexico, occurs on limestone cliffs, boulders, slopes, and canyon bottoms in montane scrub, piñon-juniper woodland, and lower montane coniferous forest; at approximately 4,500 to 6,000 feet
Sacramento Mountain foxtail cactus, Villard's pincushion cactus (<i>Escobaria villardii</i>)	D2	Black grama (<i>Bouteloua eriopoda</i>) grassland on well-developed soil of nearly flat benches, above vertical, north-facing limestone cliffs; loamy soils of desert grassland with Chihuahuan Desert scrub, on broad gravelly limestone benches in mountainous terrain at approximately 4,500 to 6,500 feet
Scarlet penstemon (<i>Penstemon cardinalis</i> ssp. <i>cardinalis</i>)	D1	Canyon bottoms and rocky slopes in piñon-juniper woodland and lower montane coniferous forest at approximately 6,900 to 8,900 feet
Shootingstar geranium (<i>Geranium dodecatheoides</i>)	D1	Occurs primarily among andesitic boulders and outcrops near the edge of canyon-bottom riparian forest, at approximately 7,550 to 9,900 feet
Sierra Blanca cinquefoil (<i>Potentilla sierrae-blancae</i>)	D1	Open windswept crests of ridges and mountain tops on igneous rock substrate with thin soil at 11,000 to 12,000 feet; occasionally found on igneous cliffs and outcrops in canyons as low as 8,000 feet

Species Name	District ¹	Habitat
Sierra Blanca cliff daisy (<i>Ionactis elegans</i>)	D1	Igneous rock faces in montane coniferous forest at approximately 7,600 to 9,500 feet
Sparsely-flowered jewelflower (<i>Streptanthus sparsiflorus</i>)	D3	Limestone canyon bottoms and montane scrub; approximately 5,000 to 7,000 feet
Western spruce dwarf-mistletoe (<i>Arceuthobium microcarpum</i>)	D2	Spruce forests (<i>Picea engelmannii</i> and <i>P. pungens</i>) at approximately 7,900 to 10,000 feet, on mountains and high plateaus
White Mountain false pennyroyal (<i>Hedeoma pulcherrima</i>)	D1, D2	Usually on steep hillsides, in rocky or disturbed habitats, including roadsides, in montane coniferous forest and piñon-juniper woodland; approximately 5,000 to 9,000 feet
White Mountain larkspur (<i>Delphinium novomexicanum</i>)	D1, D2	Canyon bottoms, forest meadows, and road banks in lower and upper montane coniferous forest; approximately 7,200 to 11,200 feet
Winged milk-vetch, tall milkvetch (<i>Astragalus altus</i>)	D1, D2	Limestone soils on steep slopes and road cuts in lower montane coniferous forest; approximately 6,500 to 8,200 feet
Wooton's hawthorn (<i>Crataegus wootoniana</i>)	D1, D2	Canyon bottoms and forest understory in lower montane coniferous forest; approximately 6,500 to 8,000 feet
Wood lily (<i>Lilium philadelphicum</i>)	D2	Moist sandy soils, streambanks, springs; open mixed-conifer, aspen forests at approximately 7,700 to 10,000 feet

Source: Forest Service 2020b

¹ District 1 (D1) = Smokey Bear Ranger District; District 2 (D2) = Sacramento Ranger District; and District 3 (D3) = Guadalupe Ranger District)

Nonnative, Invasive Species

A species is considered invasive if it is nonnative to the ecosystem under consideration and its introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Across the nation's forests, nonnative, invasive species have caused massive disruptions in ecosystem function, reducing biodiversity, and degrading ecosystem health. Historically, the Lincoln NF has suffered from a number of introduced, nonnative species. They have threatened native communities through direct competition and predation or by altering the frequency and intensity of fires and other ecosystem functions. Riparian and aquatic communities have been especially affected over time, and many other ecosystems and native species remain at risk of further invasion of harmful nonnative species.

Nonnative, invasive plants are detrimental, destructive, or difficult to control or eradicate. Nonnative, invasive plants often have a competitive advantage over native plants because they were placed in an environment that is lacking natural constraints such as predators or competition. While eradicating nonnative, invasive plants is not always possible or needed, aggressive control of populations may be important to ensure that native ecosystems are protected.

Nonnative, invasive plants generally tend to inhabit areas that have similar characteristics to their native habitats. In their place of origin, invasive species are controlled by predators, grazers, and other mechanisms that ensure their population numbers remain at a reasonable amount for that given ecosystem. When nonnative, invasive plants occupy a new niche, the new niche may lack those limiters/inhibitors that are present in the original ecosystem. Changing conditions due to climate change and increased human impacts on many systems may alter the spread and establishment of nonnative, invasive plants on the Lincoln NF.

In recent decades, invasive plant species progressively increased in abundance on the Lincoln NF and adjacent lands, which led to increased public concern about the effects of invasive plants (principally

musk thistle and teasel) and greater demand for treatment. The Forest Service initiated two extensive invasive plant surveys in the early 1990s to help assess the extent of the infestation. These surveys revealed the presence of 11 invasive plant species across 4,200 acres; however, most of the surveys were conducted along roads and trails on the Smokey Bear and Sacramento Ranger Districts. They reflect only major infestations and only the observed portions of infestations.

Nonnative, invasive terrestrial animals of concern on the Lincoln NF include feral livestock (e.g., feral pigs [*Sus scrofa*] and horses [*Equus asinus*]) and introduced game species (e.g., Barbary sheep [*Ammotragus lervia*] and oryx [*Oryx gazella*]). Feral animals are formerly domesticated livestock that are able to survive and reproduce in the wild.

Several nonnative, invasive aquatic species have been introduced and are a concern on the Lincoln NF. For example, brook trout (*Salvelinus fontinalis*) survive in streams on the Lincoln NF, and Asian clams (*Corbicula fluminea*) have been introduced into the lower reaches, toward the Pecos basin. Other species, such as rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*), have been introduced, but the waters on the Lincoln NF do not support these fisheries due to a lack of water.

Environmental Consequences for Wildlife, Fish, and Plants

This section focuses on at-risk species identified by the Forest Service and the ecosystem-level and species-specific plan components that would contribute to their persistence on the Lincoln NF. Other native wildlife that are not included as at-risk species are not analyzed in detail, but ecosystem-level plan components are expected to provide for the broad ecological conditions that support native species persistence.

Methodology and Analysis Process

For forest plan revision, management direction that may alleviate or exacerbate threats to ecological condition are evaluated at a programmatic level. The forest plan does not authorize site-specific projects or activities; therefore, there are no direct effects from adopting the forest plan. Direct and indirect site-specific effects will be analyzed when future projects are proposed. Although potential short-term consequences may be described where appropriate from implementing the programmatic approach, this evaluation focuses on longer term indirect and cumulative effects that may occur over the 10- to 15-year life of the forest plan.

Potential effects of decisions and management actions on species, populations, and habitats were identified by reviewing the best available science and using qualitative and quantitative data related to impact indicators. To best reflect the scale and magnitude of these effects, the Forest Service used acres or miles whenever possible. It also used a GIS dataset and overlays of resources and resource uses to quantify effects when available.

Assumptions

- Design features, such as seasonal and spatial restrictions, will limit direct impacts on some species.
- Impacts on at-risk species are directly related to impacts on habitats as included within ERUs.
- Meeting desired conditions for ERUs will improve habitat conditions for wildlife, fish, and plant species that are directly tied to those particular habitat conditions.
- Ecosystem-level plan components will provide for the broad ecological conditions that support native species persistence.

Indicators

The following indicators were used to compare impacts from the alternatives. Quantitative indicators were chosen where possible to best reflect the scale and magnitude of these impacts and are based on measures such as acres or miles of habitat. Specific habitat for most plant and wildlife species is not mapped on the Lincoln NF; however, habitat is contained within, and therefore associated with, ERUs as shown in table 3-44; thus, impacts on species are associated with impacts on ERUs as the best quantitative indicator. Critical habitat for the Mexican spotted owl and New Mexico meadow jumping mouse occurs in the action area; therefore, acres of critical habitat were also used as a quantitative indicator for these species. Because Mexican spotted owl and New Mexico meadow jumping mouse are the only species with a quantitative measure of specific habitat, impacts on them are highlighted in the analysis and used as a surrogate for other species. Effects on these species would be representative for other species at the planning-level.

- Acres of species' habitat, or ERUs, or critical habitat that overlap with recreation management areas (dispersed vs. developed)
- Number of caves open/closed to recreation use
- Acres of species' habitat open to mechanical thinning or prescribed burning
- Number of habitat connectivity projects for wildlife species
- Acres of restored or enhanced habitat (terrestrial, aquatic, riparian, or wetlands)
- Acres of species' habitat and critical habitat that are open/closed to livestock grazing
- Acres/miles of recommended Wilderness and WSRs
- Habitat, or ERU, trends toward reference ecological conditions
- Potential for injury, mortality, or disturbance

Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives

All alternatives would provide necessary ecological conditions to support at-risk species in the plan area (see appendix A). Alternatives affect overall ecological conditions and move ecological conditions toward the desired state at different rates. Specific forest plan components and areas open to activities would vary between alternatives; even so, actions under all alternatives would have common impacts associated with the five major themes: access and recreation, natural resource management, livestock grazing and rangeland management, economics, and Wilderness and special management areas. These are described below.

Effects from Access and Recreation

Each alternative would allow for some measure of recreation, either as dispersed or developed. The miles of roads and trails open for motorized recreational use is the same among alternatives. Designation of roads and trails was previously analyzed as an amendment to the 1986 Forest Plan.

The acres of plant and wildlife species' habitats contained within ERUs, critical habitats, and Mexican spotted owl protected activity centers that would be in ROS areas would be the same across all alternatives (table 3-47).

Table 3-47. Acres of ROS Overlap with Critical Habitat and Mexican Spotted Owl Protected Activity Centers for All Alternatives

ROS Designation	Mexican Spotted Owl Protected Activity Centers	Mexican Spotted Owl Critical Habitat	New Mexico Meadow Jumping Mouse Critical Habitat
Roaded Natural	38,150	147,740	1,060
Rural	460	4,130	40
Semiprimitive Motorized	32,780	103,470	20
Semiprimitive Nonmotorized	26,870	108,920	0
Urban	100	180	0

At-Risk Wildlife Species

Recreation impacts on at-risk wildlife species would be highest in habitats that receive greater levels of concentrated use, such as developed and motorized trails, while recreation impacts would be lower in rural and semiprimitive, nonmotorized designated areas; however, due to recreationists' preference to hike, camp, and recreate around meadows and stream sides, riparian and wetland habitat (e.g., Mexican spotted owl foraging habitat and New Mexico meadow jumping mouse wetland habitat) may be adversely affected in semiprimitive and rural settings.

Recreation and use of roads and trails would have local disturbances that would degrade surrounding habitat used by at-risk wildlife species due to trampling and vegetation loss. These effects could lead to the loss or modification of species' habitat or key ecological elements. Use of roads and trails may also perpetuate habitat fragmentation as wildlife species may avoid human presence and vehicles. This could interfere with daily movement and migration, particularly for less mobile wildlife species such as invertebrates (e.g., woodland snails).

Trampling from such recreation as hiking, mountain biking, and off-highway vehicle use could injure or kill less mobile wildlife species, such as invertebrates, that occur on the Lincoln NF (table 3-50). Noise and human presence can also disturb wildlife species and cause such impacts as changes in behavior, masking of sounds important to survival and reproduction, stress and associated physiological responses, startling and flight responses, interference with mating or foraging, and displacement or habitat avoidance (Slabbekoorn and Ripmeester 2008; Barber et al. 2009; Blickley and Patricelli 2010).

Chronic and frequent noise inhibits the ability of wildlife to detect important sounds, whereas intermittent and unpredictable noise is often perceived as a threat (Francis and Barber 2013). The former would result from such activities as motorized vehicle use and would continue as long as motorized routes are in use; the latter would be caused by recreation facility construction, until construction is complete.

Effects from noise would vary by activity and species. Some wildlife species, such as the Mexican spotted owl, are particularly sensitive to noise disturbance; unsuitable noise levels during nesting may cause nest abandonment or reproductive failure. The level of noise disturbance would be related to the type of activity and decibels produced, the distance to a species, and the level of noise attenuation from the landscape (Shannon et al. 2016).

Dispersed camping, which is allowed on most areas of the Lincoln NF within 300 feet of roads, is the most popular form of dispersed recreational use on the Lincoln NF. In general, activities allowed in dispersed recreation areas would cause less noise and disturbance to wildlife, whereas activities permitted in recreation areas, such as increased motorized access and developed campgrounds, would cause relatively higher levels of disturbance to wildlife. Generally, dispersed camping is more popular at higher elevations in the Smokey Bear and Sacramento Ranger Districts from May through September, which corresponds with at-risk breeding and nesting periods. Domestic dogs and human presence during wildlife

breeding seasons could cause reduced reproductive success through nest or den abandonment or predation by pets.

Visitors engaged in dispersed camping often park trucks, off-road vehicles, and campers within 300 feet of National Forest System roads to set up camp. This could cause harm or cause the mortality of less mobile wildlife species, such as invertebrates, and degrade wildlife habitat. Dispersed camping could also cause disturbance and displacement of wildlife and habitat modification. There are no developed toilets or other facilities in these areas, and trash and human waste can attract predators, degrade water quality, and remove special habitat elements such as downed logs and snags. Impacts from high-intensity use are especially evident in areas of higher recreation preference (e.g., wetlands, meadows, and streams), and associated species would be at greater risk of impacts (e.g., New Mexico meadow jumping mouse). Wetlands and riparian habitats are more important to wildlife than other upland vegetation communities, especially on the Lincoln NF where water resources are scarcer.

Recreation in caves or cave-like habitats increases the risks of spreading diseases such as white-nose syndrome, increasing the risk to bat populations and future viability. Access to caves is managed through a permitting process and would consider current conditions and best available science that would reduce impacts on bats. The number of caves available for access would vary by alternative, as described under each alternative below.

At-Risk Plant Species

Trampling from such recreation as hiking, mountain biking, and off-highway vehicle use could injure or kill at-risk plant species. Recreation and use of roads and trails would have local disturbances that would degrade surrounding habitat. Trampling of vegetation and soil from humans and vehicles would cause cover loss, soil compaction, decreased soil porosity, and increased erosion. It may also facilitate the spread of nonnative plants, which may alter vegetation communities by replacing native species. These effects could lead to the loss or modification of at-risk plant species' habitat.

Depending on their tolerance to habitat disturbance, some species would be affected more than others and would experience decreases in vigor, productivity, or survival. These effects would ultimately affect abundance, distribution, and population viability.

Dispersed camping could also alter habitat and cause harm or mortality of at-risk plant species. This would be due to trampling, waste, and vehicle use. Impacts from high intensity would be concentrated in areas of higher recreation preference, such as wetlands, meadows, and streams. At-risk plant species and habitats associated with riparian ERUs (e.g., Wright's marsh thistle) would, therefore, be at greater risk of impacts.

Effects from Natural Resource Management

All alternatives would incorporate vegetation treatments and include mechanical thinning and commercial harvests, prescribed wildfire, or riparian restoration to varying degrees in upland and riparian ERUs. This would be done to improve ecological condition, abundance, and distribution for species that depend on those vegetation communities.

Depending on the alternative, the acres available for treatment varies, as well as the ERUs in which the activities would take place. Vegetation treatments would be spread over time and space to minimize the loss and modification of at-risk species' habitat at any given time, and to allow treated areas to recover to provide for species' needs before disturbance of other areas occurs. Through careful vegetation management, the Forest Service aims to maintain the ecological integrity of ecological units and to improve ecological resilience over the life of the plan.

Natural resource management under the alternatives is intended to move ecological conditions closer to desired conditions. Achieving desired conditions would improve suitable ecological conditions for at-risk species by increasing the amount of habitat in the desired seral states or properly functioning condition for breeding, roosting, and foraging. It would also increase the resilience of ERUs to uncharacteristic disturbances and climate change and would improve the likelihood of long-term species' persistence. Vegetation initially removed by the treatment methods would ideally come back as healthy, diverse, and resilient communities with no or few nonnative, invasive plants.

Wetland and riparian function would be restored or enhanced; this would increase the extent and condition of riparian-wetland ERUs, which are important habitats for many at-risk species, such as the New Mexico meadow jumping mouse, Sacramento Mountains thistle, and Wright's marsh thistle. This would ultimately increase the amount of habitat in the desired seral states or properly functioning condition for breeding, roosting, and foraging. The rate of habitat improvements and extent of exclusion areas would vary by alternative, as discussed under the alternatives sections below.

At-Risk Wildlife Species

Wildlife species could be disturbed by noise associated with treatments, which could lead to such impacts as stress, displacement, or habitat avoidance. Less mobile at-risk wildlife species (e.g., invertebrates) could be injured or killed from the use of tools to carry out vegetation treatments.

Such treatments as mechanical thinning and prescribed wildfire would modify vegetation. This would affect at-risk wildlife species through localized and temporary habitat alterations due to surface disturbance and vegetation removal. The latter could clear discrete areas of vegetation or remove specific wildlife habitat elements, and these areas would no longer function as habitat for at-risk species until treated sites recover.

Large areas of vegetation removal could fragment surrounding habitats. Habitat fragmentation would interfere with wildlife species' movement and migration ability and could limit gene flow. Removing woody debris for such activities as fuelwood collection would reduce fine-scale habitats, such as nesting and refuge sites. The acres of vegetation treated would be spread out across the Lincoln NF and over the life of the plan, and impacts would also be dispersed, which would limit their intensity. For a detailed description of the effects of vegetation treatments on specific vegetation and riparian communities, see the Upland Vegetation Communities and Riparian and Wetland Ecosystems sections.

At-Risk Plant Species

Vegetation treatments could have short-term impacts on nontarget vegetation, including at-risk plant species. Impacts could come about due to mechanical damage, such as from crushing and uprooting vegetation; unintentional herbicide drift; and burning nontarget vegetation. The use of tools to carry out vegetation treatments would also disturb local areas and may injure or kill at-risk plant species. These threats would be considered lower with the use of manual treatment options and greater with the use of mechanical treatments and prescribed wildfire.

Vegetation modification or removal from treatments such as mechanical thinning and prescribed wildfire would affect at-risk plant species through localized and temporary habitat alterations. Vegetation communities within treatment areas may be altered, or discrete areas may be cleared of vegetation; such areas may no longer function as habitat for at-risk plant species until treated sites recover.

Effects from Livestock Grazing and Rangeland Management

Under all alternatives, livestock grazing would have direct impacts on the quality of at-risk species' habitat by causing changes in vegetation structure. Grazing reduces herbaceous vegetation, which

provides cover and forage for a variety of birds, mammals, and other at-risk wildlife. Livestock could also spread nonnative, invasive plants, which may reduce habitat effectiveness for at-risk plants and animals and increase competition with at-risk plant species. Additionally, livestock trampling of at-risk plants and less mobile wildlife species, such as invertebrates, would cause injury or mortality.

At-Risk Wildlife Species

Livestock grazing can directly affect fish, such as the Rio Grande cutthroat trout, and other aquatic wildlife species, such as aquatic invertebrates. Effects would be the result of facilitating dispersal of nonnative predators by constructing stock tanks; trampling individuals and eggs; causing erosion and sedimentation; causing loss of wetland and riparian vegetation and backwater pools, which provide nursery habitat for fish; and spreading disease (USFWS 2000; Belsky et al. 1999; Ohmart 1995; Hendrickson and Minckley 1984; Arizona State University 1979; Jancovich et al. 1997 in Forest Service 2015b).

Migratory birds would experience habitat loss or degradation from livestock overgrazing riparian areas, which many migrating birds use as stopovers on their migration routes. Reduced vegetation and its diversity, altered vegetation, and reduced habitat connectivity would limit the availability of nesting areas, forage, and cover for many bird species, including migratory and resident species.

Livestock grazing can affect mammalian habitat if it reduces herbaceous plant cover and density, decreases plant litter, and alters the plant species composition and structure of riparian habitats. These changes would reduce forage or prey availability, cover, and breeding habitat for some species. Areas surrounded by livestock waters would be devoid of vegetation and would not provide habitat for wildlife, while forage around livestock waters would be reduced. Livestock directly compete with native ungulates and cattle for browse and herbaceous vegetation, particularly during droughts (Ockenfels et al. 1991). Whitetail deer may avoid sites with high cattle utilization (Brown 1984), and reproductive success may be lower in areas with high cattle stocking rates (Smith 1984).

At-Risk Plant Species

Overgrazing in riparian zones can negatively affect vegetation vigor, community structure, and species composition, which would reduce the quality of habitat for at-risk plant species. Heavily grazed areas have fewer native and stabilizing plant species and instead support invasive vegetation (Gross 2013), which may compete with native plant species for resources. Grazing can also increase dust deposition onto vegetation, which may reduce photosynthesis, respiration, and transpiration and facilitate the penetration of phytotoxic gaseous pollutants (Farmer 1991). This could affect at-risk plant species by reducing reproduction and vigor. It could also decrease the palatability of upland forbs for wildlife species that feed on them.

Where allowed, livestock grazing would affect plants, wildlife, and their habitat. At-risk species, such as the New Mexico meadow jumping mouse, Sacramento Mountains thistle, and Wright's marsh thistle, which are associated with riparian and wetland ERUs, could be affected the most by livestock grazing. This is because livestock disproportionately use these areas for forage, water, and shade. Excessive grazing can alter streambank stability, channel structure, and riparian composition, leading to degraded stream functionality. For example, trampling streambanks can widen streams, cause undercut banks to collapse, reduce riparian vegetation, increase surface runoff, and erode soil. These changes would lead to degraded water quality, due to excess nutrients and sedimentation, and would elevate instream temperatures, due to reduced vegetation cover (Belsky et al. 1999).

Effects from Economic Extraction

At-Risk Plant and Wildlife Species

Compared with other national forests, the Lincoln NF has limited commercial timber harvest and fuelwoods in the main market. Direction has shifted toward resource restoration to provide wood products as a by-product of other management objectives rather than managing for timber resources as a primary objective (see Sustainable Forestry and Forest Products). Thus, timber extraction activities would be a part of vegetation treatments, which are described under Effects from Natural Resource Management. Impacts described in this section are part of impacts previously described in that section, and are not independent of, or additive to, those effects.

Timber harvest could affect at-risk species through habitat loss, habitat degradation, and potential injury or mortality. Timber harvest would remove habitat features used by at-risk wildlife species associated with forest and woodland ERUs; however, desired conditions and guidelines in the forest plan have direction to maintain snags and old-growth trees, and provide key habitat elements for wildlife. For example, in riparian areas project activities and special uses should be designed and implemented to maintain riparian refugia and critical life cycle needs of riparian-obligate species, particularly for at-risk species. Following this guideline would preserve habitat for species associated with riparian forests (e.g., Mexican spotted owl and Chapline's columbine).

The restoration focus for timber harvesting and direction to maintain at-risk wildlife habitat features would reduce impacts at the local and short-term scale and would improve habitat over the life of the plan.

Specific areas could be temporarily disturbed during timber harvest, and at-risk plant and wildlife species could be injured or destroyed. Wildlife species could also be disturbed by human presence and use of machinery to harvest the timber.

Where timber harvest supplements other restoration and maintenance treatments at a scale that moves the ERUs toward desired conditions in the long term, habitat for at-risk plant and wildlife species would improve over the long term, as described under effects from natural resource management, above.

Effects from Wilderness, Special Management Areas, and Designated Areas

All alternatives would include the following designated areas (see table 2-1):

- White Mountain and Capitan Mountains as designated Wilderness
- Billy the Kid National Scenic Byway and Sunspot Highway National Forest Scenic Byway
- Dog Canyon, Rim, and Guadalupe Ridge as national recreation trails
- 12 inventoried roadless areas

Fifty-five WSR segments would be managed as eligible for designation in the National Wild and Scenic Rivers System under alternative A; 54 river segments would be managed as eligible under alternatives B, C, D, and E. Additionally, all alternatives would propose the Upper McKittrick RNA to preserve a unique mountain mahogany shrubland for research (see chapter 2, Elements Common to All Alternatives). Management guidelines for this RNA would generally reduce impacts, such as disturbance, on at-risk species and their habitats, particularly those associated with shrublands, such as the Peñasco least chipmunk and sparsely flowered jewelflower.

At-Risk Plant and Wildlife Species

Management guidelines for special management areas would generally reduce impacts on at-risk species and their habitats. This would be due to reduced surface-disturbing activities, access, and recreation in these areas.

Designated wilderness and RNA management would generally reduce impacts on at-risk wildlife species (such as Mexican spotted owls), such as disturbance from noise and human presence. It would also reduce impacts on all at-risk plant and wildlife species that occur within designated areas by reducing surface-disturbing activities, access, and recreation; however, ecosystem resilience may decline in designated wilderness areas over time due to the lack of habitat restoration and enhancement management (e.g., lack of mechanical vegetation management to reduce the possibility of large-scale, uncharacteristic wildfire, in the absence of historic disturbance regime).

Fifty-five WSR segments would be managed as eligible for designation in the National Wild and Scenic Rivers System under alternative A; and 54 river segments would be managed as eligible under alternatives B, C, D, and E. Interim management guidelines for eligible river segments for inclusion in the National Wild and Scenic River System would help protect river and stream habitats and the species that rely on them by preventing degradation of shorelines, water quality, and the free-flowing nature of the eligible stream segments. Maintaining their eligibility for designation could have beneficial impacts by providing habitat connectivity for aquatic species; however, because active natural resource management may be constrained or restricted in designated areas, the Forest Service could be unable to pursue activities such as habitat restoration and enhancement to move these areas toward desired conditions. This could lead to adverse impacts on at-risk plants and wildlife because habitats would remain or move toward departed conditions that may not provide ideal conditions for species.

The acres of critical habitat and Mexican spotted owl protected activity centers in WSR corridors would be similar between alternative A and alternatives B, C, D, and E (table 3-48). This designation would have positive impacts on these and other at-risk species that occupy riparian habitats (e.g., headwater catfish, Wright’s marsh thistle, and wood lily) by limiting the types of instream infrastructure and minimizing ground disturbance.

Table 3-48. Acres of Critical Habitat and Mexican Spotted Owl Protected Activity Centers in WSR Corridors

Habitat	Alternative A	Alternatives B, C, D, and E
Mexican Spotted Owl		
Critical habitat	17,200	16,500
Protected activity centers	6,600	6,600
New Mexico Meadow Jumping Mouse		
Critical habitat	300	300

Source: Forest Service GIS 2020; USFWS GIS 2020

Environmental Consequences for Wildlife, Fish, and Plants Under Alternative A

Alternative A, the no-action alternative, reflects current management practices under the 1986 Forest Plan, as amended and implemented. The 1986 plan follows a management area approach rather than a landscape-level management of the whole forest and does not include the species of conservation concern concept; however, species of conservation concern are included as part of the current analysis and would replace regional forester sensitive species if alternative A is selected. In accordance with the 2012 planning rule, each proposed species of conservation concern was evaluated in terms of its ability to persist in the planning unit (see appendix A).

The 1986 Forest Plan, as amended, lacks a description of desired conditions for many of the key ecological characteristics for species of conservation concern. This is because it was not explicitly developed using the coarse-filter, fine-filter approach (a key tenet of the species diversity requirements under the 2012 planning rule). This would make it hard to ensure projects are implemented in a consistent manner and that projects are moving toward a common set of desired conditions and long-term goals.

There are no specific plan components in the 1986 Forest Plan that are geared toward species-specific (fine-filter) wildlife, plant, and aquatic ecological conditions, such as guidance for rare endemic species, protections for cave dwelling mammals like bats, and measures that prevent the spread of certain nonnative, invasive plants, including such wildlife diseases as white-nose syndrome and chytrid fungus, and predators, such as bull frog; nevertheless, there are guidance documents, best management practices, and project-level design features that address all of these management issues. For example, the Supplement to the Final Environmental Impact Statement for Amendment of Forest Plans in Arizona and New Mexico is incorporated under current management.

The supplement updates the final environmental impact statement, which amended the 11 forest plans in the southwestern region for northern goshawk, Mexican spotted owl, and old-growth standards and guidelines in June 1996; it includes guidelines for management of habitat for the Mexican spotted owl and northern goshawk (Forest Service 2006). Current direction for nonnative, invasive plants is primarily focused on nonnative, invasive terrestrial plants, but the Forest Service would continue to work with partners following guidance for the removal of nonnative, invasive aquatic species on a site-specific basis.

Effects from Access and Recreation

Alternative A manages for a variety of developed and dispersed recreation experiences, while maintaining the current spectrum of opportunities. The types of impacts from the use of recreation facilities, dispersed camping, roads, and trails are described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives. Alternative A does not provide direction to mitigate resource damage from developed recreation sites nor travel management system construction and use nor direction regarding dispersed camping, such as whether to close, rehabilitate, or mitigate dispersed sites where resources are being damaged. Without plan components to address these problems, wildlife habitat would continue to be affected by these uses, as described in Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives.

Prohibiting road construction on unstable soils and slopes greater than 40 percent would maintain or enhance habitat for aquatic plant and wildlife species by avoiding impacts on water quality. Alternative A would close or decommission 100 miles of roads over the life of the plan. If the 100 miles of roads are decommissioned, impacts on wildlife would not occur over this area. Wildlife would eventually benefit from this objective due to increase habitat availability as vegetation regrows and the area eventually returns to its preexisting condition; however, actual closures have not equaled this amount at this time.

Effects from Natural Resource Management

Under alternative A, there are no objectives for vegetation management or for prescribed burning. Alternative A would continue to maintain current rates of planned and unplanned natural ignition and mechanical vegetation treatments. Treatments would affect plant and wildlife species, as described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives.

Management direction for wildlife habitat would be included under specific management areas (table 2-2), rather than a forestwide framework. Wildlife habitat management would focus on maintaining sensitive species, with special emphasis on the Mexican spotted owl and northern goshawk (see chapter 2, Elements Specific to Alternative A). This type of species-focused management would benefit certain at-

risk species, but the lack of ecosystem-level approach would limit the effectiveness of management to improve habitat conditions for a broader range of species.

Some vegetation treatments would be carried out in several of the management areas where the emphasis is on wildlife habitat (table 2-2 and figure 2-4); treatments such as burning oak, planting willows, creating meadow openings for habitat, and implementing wildlife infrastructure projects would move vegetation states within treated areas toward desired conditions but at a slower rate than most of the action alternatives. This would benefit some plant and wildlife species by improving habitat conditions over time, as described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives; however, improvements would likely be slow to arise and fragmented. This would be due to the lack of ecosystem-wide habitat objectives and forestwide objectives to improve terrestrial and aquatic wildlife habitat and connectivity. Plant and wildlife species in specific management areas may experience benefits, while those in other areas may not.

Prescriptive (restrictive) standards and guidelines in the current forest plan make it difficult to apply adaptive management, as understanding of management effects on ecosystems and wildlife changes. Adaptive management will be essential to effectively manage for climate change or any other changes in management that may be needed through changing and uncertain conditions or with new and better scientific information. Climate change has the potential to affect all wildlife and plant species, and it influences the likelihood of large-scale disturbance, such as fire and bark beetle outbreaks, across the landscape. Alternative A does not recognize climate change and offers limited guidance on management related to such disturbances as salvage logging and blow down.

Forest plan components to maintain and enhance fish habitat (see chapter 2, Elements Specific to Alternative A) would help improve the ability of riparian areas to support fish and aquatic or riparian plant and wildlife species (e.g., Wright's marsh thistle, wood lily, and Bonita diving beetle); however, the lack of objectives for riparian restoration and riparian management zones would make restoration projects less effective. This would be due to slow implementation and a fragmented spatial application. Habitat improvements for riparian species would be limited (see table 3-44 and table 3-45). This is because riparian and wetland ecosystems would continue to be departed from PFC, as described under riparian and wetland ecosystems.

Effects from Livestock Grazing and Rangeland Management

Alternative A would continue to manage individual allotments in the numerous management areas in the 1986 Forest Plan (see table 2-2). There would be no ecosystem desired conditions or landscape-level management approach for wildlife or plant species. Managing for grazing at the management area level does not provide for efficient and consistent direction for resources across the Lincoln NF, and this could lead to conflicting management. For example, some allotments span multiple management areas with different prioritized resource management.

Effects from Economic Extraction

Alternative A emphasizes timber management as a tool for providing forest products for local and regional industrial and individual needs, while meeting wildlife habitat needs. There is general guidance for salvage harvest from disturbance events (i.e., fire, windthrow, or insect disease mortality [see chapter 2, Elements Specific to Alternative A]). It focuses more on the enhancement of timber production than on an integrated approach that balances management with other resource values, such as wildlife habitat. The Forest Service would continue to follow existing laws, regulations, policies, and best management practices to address species viability concerns in areas affected by large-scale disturbance. Impacts from timber harvest on at-risk species and their habitats would occur (see Environmental Consequences for Wildlife, Fish, and Plants Common to all Alternatives).

Effects from Wilderness, Special Management Areas, and Designated Areas

Impacts from managing the designated wilderness, special management areas, and all 55 eligible WSR segments are described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives.

Under alternative A, the Guadalupe Escarpment is a WSA; however, it is not managed for wilderness. 6,200 acres of Mexican spotted owl protected activity centers on the Guadalupe Ranger District fall within this WSA. Any additional protections for the Mexican spotted owl would not occur, as no management activities would reduce any disturbance in the area.

Impacts from proposing the Upper McKittrick RNA are described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives. In addition to the proposal for the Upper McKittrick RNA, alternative A would carry forward the proposals for Haynes Canyon and William G. Telfer RNAs. Haynes Canyon contains 572 acres of Mexican spotted owl protected activity centers. Mexican spotted owls and other at-risk species that occur in this area would benefit from limited human disturbance and restrictions on surface-disturbing activities such as timber harvest. This would avoid tree cutting impacts that reduce habitat for Mexican spotted owls and other forest-dependent species, such as woodland snails, Goodding's onion, and Western spruce dwarf-mistletoe. While reduced disturbance could limit impacts on Mexican spotted owl breeding and habitat, limited vegetation treatments could leave their habitat less resilient to wildfire due to the lack of active management.

Environmental Consequences for Wildlife, Fish, and Plants Common to Alternatives B, C, D, and E

Effects from Access and Recreation

The acres of ROS areas and miles of roads and trails would be the same across all action alternatives, as summarized in table 3-47. Impacts on at-risk species from the use of recreation sites, dispersed camping, recreational caving, roads, and trails would occur (see Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives).

All action alternatives incorporate dispersed recreation plan components that would reduce impacts on at-risk wildlife. These include direction for trails that adversely affect cultural or at-risk species to be relocated where available, and dispersed camping sites should be rehabilitated or otherwise mitigated under certain conditions, such as when environmental damage is occurring. Under all action alternatives, the dispersed recreation direction to relocate motorized and nonmotorized trails that adversely affect at-risk species, where possible, is written as a guideline. This could result in reducing trails that adversely affect at-risk species where there are opportunities, compared with alternative A, where there are opportunities. Additional plan components would increase protection of riparian and aquatic habitat, as follows: requiring new forest roads to be designed and constructed to limit delivery of sediment and pollutants to waterbodies, mitigating or eliminating resource damage in riparian management zones, and accommodating aquatic species passage.

Standards or guidelines to design and construct roads to limit the delivery of sediment and pollutants to waterbodies and avoid damage to ecological resources in riparian management zones would reduce impacts on at-risk species associated with riparian and aquatic habitats (e.g., headwater catfish and woodlily; see chapter 2, Elements Common to All Action Alternatives). This would come about by reducing water quality degradation and potential impacts on hydrology. Accommodating aquatic organism passage when constructing, reconstructing, or maintaining roads and trails that intersect fish-bearing streams would also reduce impacts on aquatic species, such as the Rio Grande cutthroat trout, by allowing them to move to complete life history phases.

Emphasizing reconstruction and rehabilitation of existing roads over new road construction and avoiding constructing new facilities in environmentally sensitive areas would reduce the amount of new habitat loss and fragmentation for plants and wildlife. At the same time, it would reduce noise and habitat disturbance, which would reduce impacts. Managing vegetation, such as preventing vegetation degradation at developed recreation sites, would reduce the intensity associated with recreation and road and trail use by preventing habitat degradation.

The objective to decommissioning 75 miles of administratively closed roads within 15 years would eventually eliminate impacts on wildlife over these areas; this objective is similar to alternative A, which would decommission 100 miles of administratively closed roads over the life of the plan. Wildlife would benefit from this objective due to increased habitat availability as vegetation regrows and the area eventually returns to its natural unroaded state. Relocating motorized and nonmotorized routes would also reduce impacts on at-risk species by reducing habitat degradation and the potential for injury, mortality, and disturbance where routes currently cross into habitat.

A guideline to use appropriate decontamination procedures before entering any caves on the Lincoln NF, between cave visits, and after caving would be implemented to reduce the potential for spread of white-nose syndrome to bat species under all action alternatives. Compared with alternative A, this could help safeguard bat population persistence.

Effects from Natural Resource Management

All action alternatives include ecosystem-level plan components designed to maintain the diversity of plant and animal communities and support the persistence of native species in the plan area (see chapter 2, Elements Common to All Action Alternatives). This would be subject to the extent of Forest Service authority and the inherent capability of the plan area. The action alternatives would use a list of at-risk species that includes federally listed species and species of conservation concern, as described under affected environment. Using the ecosystem or coarse-filter and species-specific or fine-filter approach to maintaining species diversity would help maintain or restore ecological conditions and functions similar to those under which native species evolved. This approach would maintain biological diversity and habitats for most species in an area, while addressing ecological condition or additional specific habitat features for certain species with more specific habitat requirements.

Short-term impacts on at-risk species resulting from vegetation treatments as described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives would occur under all alternatives. The extent of impacts would generally correspond to the acres treated. The acres of mechanical thinning and prescribed treatments that would be carried out in terrestrial species' habitat types (upland ERUs) over the 10-year period following plan approval are summarized in table 3-17 and table 3-18, respectively. All action alternatives have direction to protect raptor nests by implementing protection measures.

All alternatives include objectives that would emphasize vegetation treatments and prescribed burning in forest types with frequent fires and piñon-juniper woodland that is highly departed from desired conditions (piñon-juniper grass, piñon-juniper evergreen shrub, piñon-juniper woodland, ponderosa pine forest, mixed-conifer frequent fire, and mixed conifer with aspen ERUs; see chapter 2, Common to All Action Alternatives). Achieving these objectives would move these ERUs toward more natural fire regimes and thus reference conditions. It would also increase the resiliency of at-risk species' habitat against potential climate changes by promoting early seral tree species regeneration and improving vegetation diversity. At-risk species associated with these ERUs, such as the Mexican spotted owl and piñon jay, would experience reduced potential for loss and modification of habitat due to wildfire, which is a major threat to many at-risk species (see appendix A).

Combining prescribed wildfire with mechanical thinning treatments under alternatives B, D, and E would likely move ERUs toward desired conditions and improve habitat conditions for at-risk species at a faster rate, because this is often the most effective approach to restoring forest structure and function.

On project completion, decommissioning and rehabilitating temporary roads that support ecosystem restoration, fuels management, or other short-term projects under all action alternatives would reduce disturbances and improve habitat conditions for at-risk species. This would come about by preventing or reducing unauthorized motorized use and establishment and spread of nonnative, invasive plants in these areas.

Under all action alternatives, objectives to restore and enhance terrestrial wildlife habitat, treat or remove invasive species, and improve habitat connectivity for terrestrial species (see chapter 2, Common to All Action Alternatives) would improve habitat conditions for at-risk species and increase resiliency of terrestrial habitat against potential climate changes. Impacts on wildlife, including at-risk species, would generally correspond to the amount of terrestrial wildlife habitat to restore or enhance during each 10-year period following plan approval. Alternative D differs from other alternatives; alternatives B, C, and E would include 50,000 acres in the wildlife habitat improvement objective, while alternative D includes 75,000 acres in the objective. The acres of restored habitat in each ERU are not known at this time. All action alternatives include objectives and direction to increase pollinator habitat. This would support native pollinator populations and could help shift plant communities to more diverse and resilient habitats, compared with alternative A.

All the action alternatives emphasize restoration that benefits riparian and wetland ecosystems and the species that rely on them (see chapter 2, Common to All Action Alternatives). Reducing nonnative fish in native fish populations and completing projects to connect habitat for aquatic and riparian species would improve habitat conditions for at-risk species associated with riparian and aquatic ERUs and increase the resiliency of these habitats against potential climate changes. Completing riparian ecosystem and wetland restoration projects and improving watershed conditions in discrete watersheds would also improve habitat connectivity and quality for at-risk aquatic and riparian species. The objectives for proposed projects and river miles for improvement, protection, or restoration would differ by alternative: at least two watersheds and 5 miles of aquatic habitat under alternatives B, C, and E and at least six watersheds and 10 miles of aquatic habitat under alternative D. The acres of ERUs proposed for restoration are not known at this time.

Eliminating non-riparian vegetation and reestablishing riparian vegetation species and habitat in riparian management zones would benefit at-risk species by improving native vegetation that provides such habitat features as cover and nursery sites. Short-term impacts on at-risk riparian and aquatic species would occur during riparian and wetland restoration projects (see Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives); however, prioritizing protective measures for riparian and wetland ecosystems would limit the potential for these impacts. Additionally, protecting large mature late seral trees from management that could degrade them as suitable habitat for at-risk species and ensuring the persistence of large, mature late-seral trees, communities, and forests would ensure that critical habitat features would remain for such species as the Mexican spotted owl.

Impacts from natural resource management on the New Mexico meadow jumping mouse would be limited because the Lincoln NF would follow USFWS guidance for resource management activities within New Mexico meadow jumping mouse habitat. Overall, implementing natural resource projects to promote movement of ERUs toward desired conditions would improve habitat conditions for at-risk species over the long term. To a greater degree than under alternative A, objectives, standards, and guidelines for the action alternatives would support achievement and maintenance of desired conditions;

thus, this would improve at-risk species habitat conditions. Other species that are not considered at-risk would also benefit from ecosystem-wide habitat changes.

Effects from Livestock Grazing and Rangeland Management

All alternatives maintain the same level of livestock grazing as the 1986 Forest Plan (alternative A), as amended (Forest Service 1986). Alternatives B, C, D, and E would include ecosystem desired conditions and objectives, standards, and guidelines to move rangelands toward desired conditions. These plan components provide range managers with a consistent, landscape-level management approach for allotment-level decisions. In addition, alternatives B, C, D, and E include plan components that would locate range infrastructure and livestock management practices, including salting or mineral supplementation outside of streams, springs, lakes, and wetlands. These additional guidelines are anticipated to improve grazing management and would provide some refuge for at-risk species in riparian and aquatic habitats, more than under alternative A.

Under alternatives B, C, D, and E, allotment-level decisions would consider at-risk species when determining grazing intensity and duration. The SCC species included in appendix A would be referenced for at-risk species on the Lincoln NF; if the allotment includes potential habitat for the Mexican spotted owl, New Mexico meadow jumping mouse, or other listed species, then the Forest Service would consult with the USFWS to eliminate or mitigate any impacts on the two listed species.

Impacts on the New Mexico meadow jumping mouse would be limited because the Forest Service would follow USFWS guidance for resource management activities in New Mexico meadow jumping mouse habitat. In occupied mouse habitat, such measures as exclosures and constructed cattle lanes (fenced lanes to constrict cattle to small areas), would prevent significant loss of their habitat. On the Lincoln NF there are only four allotments, 272 acres of which, or less than 0.2 percent of the total allotment area, are considered occupied New Mexico meadow jumping mouse habitat (USFWS 2019).

Effects from Economic Extraction

Impacts from timber harvest are described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives above. Alternatives B, C, and D would use timber harvest to supplement other management activities to move vegetation types toward desired conditions. This would result in overall beneficial effects for wildlife habitat where treatments occur. Alternative E has the largest amount of acreage projected for timber harvest and would focus on opportunities for the greatest dollar return for timber harvest. Alternatives B, D, and E would allow chemical treatments in addition to mechanical thinning and prescribed wildfire, whereas chemical treatments would not be allowed under alternative C. Alternatives B, D, and E would have greater short-term impacts on at-risk species due to the potential for injury or mortality associated with chemical treatments; however, the efficacy of treatments and thus the rate of habitat improvements would increase.

Effects from Wilderness, Special Management Areas, and Designated Areas

Impacts from managing designated wilderness are described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives.

Under the action alternatives, recommended wilderness would overlap critical habitat for ESA-listed species and Mexican spotted owl protected activity centers (table 3-49). Recommended wilderness management would generally reduce management activity impacts on ERUs and at-risk species habitats by reducing surface-disturbing activities, access, and recreation. Recommended wilderness management would minimize impacts on at-risk plants and wildlife associated with surface disturbance and human presence. They would also provide for habitat connectivity with little to no road construction or maintenance. Beneficial impacts would be greater than under alternative A; however, mechanical

vegetation management to help improve habitat conditions or minimize the possibility of large-scale, uncharacteristic wildfire impacts would be limited. Because of this, the chance for wildlife habitat loss from natural events such as wildfire would be increased, and ecosystems resilience would remain lower than more actively treated areas.

Ecosystem resilience may decline over time due to the lack of habitat restoration and enhancement management. The acres of ERUs, critical habitats, and Mexican spotted owl protected activity centers that would be in recommended wilderness areas are shown in table 3-49.

Table 3-49. Acres of Critical Habitat in and Mexican Spotted Owl Protected Activity Centers in Recommended Wilderness

Habitat	Alternative B	Alternative C	Alternative D	Alternative E
Mexican Spotted Owl				
Critical habitat	200	69,100	200	200
Protected activity centers	6,200	22,900	6,200	6,200
New Mexico Meadow Jumping Mouse				
Critical habitat	0	200	0	0

Source: Forest Service GIS 2020; USFWS GIS 2020

The acres of ERUs, critical habitat, and Mexican spotted owl protected activity centers in RNAs would be the same under all action alternatives, as summarized in table 3-50. Impacts from proposing the Upper McKittrick RNA are described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives. The action alternatives would not propose the Haynes Canyon and William G. Telfer areas (see appendix C for the rationale); therefore, the RNA restrictions would not apply. Compared with alternative A, plant and wildlife species within these areas could experience increased levels of impacts due to surface-disturbing activities, access, and recreation.

Table 3-50. Acres of Critical Habitat and Mexican Spotted Owl Protected Activity Centers in RNAs

Habitat	Alternatives B through E
Mexican Spotted Owl	
Critical habitat	1,237
Protected activity centers	720
New Mexico Meadow Jumping Mouse	
Critical habitat	0

Source: Forest Service GIS 2020; USFWS GIS 2020

Environmental Consequences for Wildlife, Fish, and Plants Under Alternative B

Effects from Access and Recreation

Alternative B balances access and recreation opportunities with natural resource protection more than the other alternatives. Guidelines to relocate motorized and nonmotorized trails that adversely affect at-risk species or riparian areas would reduce impacts on them, such as disturbance and habitat degradation (see Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives). Dispersed recreation impacts would be the same as those described under Environmental Consequences for Wildlife, Fish, and Plants Common to Alternatives B, C, D, and E.

Effects from Natural Resource Management

Alternative B has mechanical treatment and prescribed wildfire objectives to treat ERUs. These objectives would restore fire as a key ecosystem process in frequent fire ERUs, with a particular emphasis on

forested-frequent fire ERUs (mixed conifer with aspen, mixed conifer/frequent fire, and ponderosa pine; see chapter 2, Elements Specific to Alternative B).

During each 10-year period following plan approval, alternative B has objectives to mechanically treat 11,000 to 19,500 acres; it would treat 200,000 acres of the forested-frequent fire ERUs and the piñon-juniper woodland ERU with prescribed wildfire. These actions would move these areas toward natural fire regimes and desired conditions, which would improve habitat conditions for at-risk species and increase habitat resiliency against climate change. Using a variety of other treatments, such as treating nonnative, invasive plants or reseeding native species, to meet plan objectives would increase the efficacy of treatments and speed movement toward desired conditions. Habitat for at-risk species would likely improve at a faster rate compared with alternative A.

Achieving objectives under alternative B would improve terrestrial and aquatic plant and wildlife habitat and connectivity. This would be a result of objectives that emphasize vegetation treatments and prescribed burning in areas highly departed from desired conditions as well as restoration treatments that benefit water resources and riparian areas (See Chapter 2, Elements Common to All Action Alternatives and Elements Specific to Alternative B).

Proposed objectives that would potentially maintain or improve plant and wildlife species' habitats include:

- Improving a minimum of 12 miles of riparian areas considered to be functioning at risk or nonfunctioning over 10 years
- Restoring or enhancing at least 50,000 acres of terrestrial wildlife habitat over 10 years
- Reducing nonnative fish in native fish populations in at least four stream reaches over 10 years
- Completing at least five projects to improve habitat connectivity for aquatic and riparian species over 10 years
- Restoring or protecting 5 miles of aquatic habitat over 10 years
- Restoring or enhancing at least 20 acres of wetlands over 10 years

Objectives under alternative B would also provide direction to improve the WCF score for at least two 6th-level hydrological unit code watersheds over the life of the plan. Compared with alternative A, achieving this objective would improve habitat conditions for at-risk species in their ERUs and for other plant and wildlife species due to ecosystem-level improvements. Short-term impacts from implementing projects would occur as described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives.

Effects from Economic Extraction

Impacts would be the same as those described under Environmental Consequences for Wildlife, Fish, and Plants Under Common to Alternatives B, C, D, and E.

Wilderness, Special Management Areas, and Designated Areas

Impacts from managing designated wilderness are described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives.

Under alternative B, the Forest Service recommends 40,500 acres for wilderness designation (see figure 2-10). The 6,200 acres of Mexican spotted owl protected activity centers fall within the Guadalupe Escarpment WSA. Impacts would be as described under Environmental Consequences for Wildlife, Fish,

and Plants Common to Alternatives B, C, D, and E. Alternative B would provide greater protections on the Mexican spotted owl than alternative A.

Impacts from managing the Upper McKittrick RNA are described under Environmental Consequences for Wildlife, Fish, and Plants Common to Alternatives B, C, D, and E.

There are forest plan components for managing caves on the Lincoln NF; alternatives B, C, and D would also propose the Guadalupe and Snowy River Special Cave Management Areas to further protect sensitive cave resources. Additional direction for these areas would reduce impacts on species that rely on caves as habitats, such as for nesting or roosting sites than under alternative A. Examples of plan components are as follows:

- Twenty-five percent of caves known to contain sensitive or special status biological species, cultural resources, or paleontological resources will be monitored annually.
- Measures or mitigation for protecting caves should be incorporated into project plans for road construction, timber harvest, tree planting, blasting near caves, and any activity that could change cave temperatures and drainage patterns.
- Monitoring protocols should be done in accordance with sensitivities of each species.
- Prescribed burn plans should be developed to avoid or reduce smoke influences at or around caves.
- Logging, road construction, and other uses of heavy equipment should be avoided above or in the vicinity of a cave, if there is the potential for damage.
- New major infrastructure rights-of-way should not be issued.
- New facility construction should not introduce pollution to protect cave biotic values.

Environmental Consequences for Wildlife, Fish, and Plants Under Alternative C

Effects from Access and Recreation

Alternative C would emphasize resource protection over recreation and access more than the other alternatives (see chapter 2, Elements Specific to Alternative C). Alternative C would limit impacts on at-risk species by prioritizing land acquisitions that provide connectivity for terrestrial and riparian plants and wildlife over recreation access.

At-risk species would still be affected from recreation and use of roads and trails (see Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives); however, the intensity and extent would be reduced compared with alternative A due to emphasizing connectivity for land acquisitions.

Effects from Natural Resource Management

Alternative C would emphasize natural processes to move ERUs toward desired conditions (see chapter 2, Elements Specific to Alternative C). Management direction would limit the mechanical treatments objectives to the least amount of acres of all the alternatives. During each 10-year period following plan approval, prescribed wildfire could be used to treat at least 200,000 acres and mechanical treatments could be used to treat 6,500 to 12,500 acres spread across the forested-frequent fire ERUs and the piñon-juniper woodland ERU.

Compared with alternative A, achieving these objectives would improve habitat conditions for at-risk species associated with these ERUs; however, mechanical thinning would be less under this alternative;

therefore, it is likely that under this alternative, movement of ERUs toward reference conditions and habitat improvements for at-risk species would proceed at a slower rate. Increased habitat resiliency against climate change may still occur, but also at a slower rate. Short-term impacts on at-risk species, such as disturbance, would be of lower intensity and extent.

Similar to alternative B, achieving objectives under alternative C would improve terrestrial and aquatic plant and wildlife habitat and connectivity by having the same riparian areas and wildlife, fish, and plants objectives. Compared with alternative A, this would lead to greater protection and restoration of habitats for riparian and aquatic at-risk species.

Effects from Economic Extraction

Impacts would be the same as those described under Environmental Consequences for Wildlife, Fish, and Plants Under Common to Alternatives B, C, D, and E.

Effects from Wilderness, Special Management Areas, and Designated Areas

Impacts from managing designated wilderness are described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives.

Alternative C would propose the greatest number of acres as recommended wilderness (402,000 acres) and provide the greatest impacts. Impacts are as described under Environmental Consequences for Wildlife, Fish, and Plants Common to Alternatives B, C, D, and E and would provide greatest protections on the Mexican spotted owl than under alternative A.

Alternative C would propose the same RNA and two special cave management areas that are proposed under alternative B, and impacts from these designations would be the same. Such benefits as reduced disturbance to at-risk species that exist in or potentially use these areas, such as cave-dwelling species and shrubland plants, would be highest under this alternative. This is because alternative C proposes the most acres of recommended wilderness.

Environmental Consequences for Wildlife, Fish, and Plants Under Alternative D

Effects from Access and Recreation

Under alternative D, decommissioning administratively closed roads would be prioritized in riparian areas or to improve habitat connectivity. This focus would benefit terrestrial wildlife movement and riparian-dependent species.

Effects from Natural Resource Management

Alternative D would provide direction for the same prescribed wildfire and mechanical thinning objectives as under alternative B, and impacts would be the same as described for that alternative.

Alternative D emphasizes riparian and aquatic species protection and habitat improvement. Alternative D has objectives that would improve a minimum of 12 miles of riparian areas, which is same as alternatives B and C; however, these objectives would have more beneficial effects for aquatic and riparian species. It would do this by increasing objectives for connectivity projects (eight) for aquatic and riparian species, restored or protected miles (10 miles) of aquatic habitat, restored or enhanced acres of wetlands (40 acres), and improving at least six watersheds. Objectives under alternative D would also restore or enhance at least 75,000 acres of terrestrial wildlife habitat every 10-year period, an increase of 25,000 acres over the other action alternatives.

If achieved, the increase in the number of habitat restoration projects would potentially improve habitat conditions for at-risk species to a greater extent than under the other action alternatives; however, short-term impacts of implementing the projects would also increase.

Effects from Economic Extraction

Impacts would be the same as those as described under Environmental Consequences for Wildlife, Fish, and Plants Under Common to Alternatives B, C, D, and E.

Effects from Wilderness, Special Management Areas, and Designated Areas

Impacts from managing designated wilderness are described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives.

Alternative D would propose the same recommended wilderness areas, RNAs, and special cave management areas as alternative B with impacts the same as described under that alternative.

Environmental Consequences for Wildlife, Fish, and Plants Under Alternative E

Effects from Access and Recreation

More than the other alternatives, alternative E would provide direction to promote recreation at developed recreation sites, as well as prioritize land acquisition evaluations for recreation access (see chapter 2, Elements Specific to Alternative E). This would increase the potential for impacts, such as disturbance and habitat degradation, on at-risk species relative to other alternatives (see Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives). In addition, alternative E would focus on locating caves suitable for recreation. This could open some caves to recreation disturbance and displacement of bat species, if present, in the short term, and could increase the future potential for bat mortality from introduction and spread of *Pseudogymnoascus destructans*, the fungus causing white-nose syndrome. This could increase impacts on at-risk species and habitats, compared with alternative A; however, a permit system would still be required for cave access and could address at-risk species presence and disease prevention.

Effects from Natural Resource Management

Alternative E provides direction to promote the use of forest products and recreation access (see chapter 2, Elements Specific to Alternative E). Mechanical thinning and prescribed burning are the same as under alternative B.

Alternative E would have the same management direction for water resources and wildlife and fish habitat as alternative B; however, the riparian areas objective is less beneficial for aquatic and riparian species; it would have the lowest minimum miles (8 miles compared with 12 miles) of functioning at risk or nonfunctioning riparian areas to be improved each 10-year period. Habitat improvements as a result of achieving objectives for at-risk species and habitats would still occur, but to a lesser extent than under the other alternatives.

Effects from Economic Extraction

Under alternative E, the focus to provide economic benefit of timber harvest instead of primarily using timber harvest in combination with restoration and maintenance treatments would have similar effects as described under Environmental Consequences for Wildlife, Fish, and Plants under Alternative A. There would be an increase in acres projected for timber harvest. Timber harvest could potentially degrade wildlife habitat where timber harvests occur and could result in less-resilient forested landscapes overall.

Without a focus toward restoration and movement toward desired conditions, wildlife habitat may be at more risk to stressors such as uncharacteristic wildfire.

Effects from Wilderness, Special Management Areas, and Designated Areas

Impacts from managing designated wilderness are described under Environmental Consequences for Wildlife, Fish, and Plants Common to All Alternatives.

Alternative E recommends the smallest area (21,900 acres) for wilderness. Impacts from these recommendations would be smaller, relative to the other alternatives. Impacts from proposing the Upper McKittrick RNA would be the same as under alternative B.

Neither of the special cave management areas would be designated under alternative E. Habitat for at-risk species, such as the Guadalupe woodland snail and Carlsbad agave borer, that use caves as special habitat features would not be protected by these designations; as for alternative A, habitats would continue to be affected by disturbances associated with such activities as recreation, oil and gas development, and mining.

Cumulative Environmental Consequences for Wildlife, Fish, and Plants

The analysis area for wildlife, fish, and plants includes private, State, and other Federal lands in and next to the Lincoln NF. The cumulative analysis area for wildlife, fish, and plants is the context area, as described in the Lincoln NF ecological assessment and shown on figure 4 of that assessment (Forest Service 2019a, p. 59–60). This area is defined by the ecological sections and subsections from the National Hierarchical Framework of Ecological Units, which encompass the Lincoln NF. This assessment area was chosen because ecological units contain the range of ERUs in the plan area, and wildlife habitats are contained within ERUs (Forest Service 2019a).

The BLM field offices have completed land resource management plans to manage lands next to or near the Lincoln NF. In addition, there are a wide range of planning and land use strategies that address land use, including interface with public lands. They all suggest ways to foster more communication and collaboration between local governments and Federal land management agencies.

Local soil and water conservation districts have also written land use plans to promote responsible and effective use and management of soil and water resources in their districts. The State of New Mexico has also issued a statewide natural resources assessment and strategy and response plan that guides planning and implementation of natural resource management and restoration. It also provides strategies for working with and integrating resources across boundaries with Federal, tribal, and private landowners. Implementation of all of these plans, in combination with the Lincoln NF forest plan, contribute to the cumulative effects of species in and next to the Lincoln NF, including species that travel between multiple jurisdictions.

Many of the same activities that occur on National Forest System land are the same being conducted on lands next to or near the Lincoln NF. Land management activities include manual and mechanical cutting of vegetation, herbicide use, livestock grazing, recreation, prescribed and naturally ignited fire, and road construction and maintenance.

Timber harvest, wildfire suppression, thinning, and wildfires are the past activities that have had the greatest influence on the amount and distribution of forested habitat on National Forest System lands and on BLM-administered, state, and private timberlands. These activities have created a variety of successional stages, structures, tree species mixes, and forest patterns that have been neutral for some wildlife species, beneficial to some wildlife species, and detrimental to others.

Timber harvest on private, state, BLM-administered, or National Forest System lands may cumulatively affect the quantity and quality of wildlife habitat. The effects on wildlife are difficult to predict because they would depend on a wide variety of factors, such as whether habitat that is outside of historical conditions is restored, where wildfires and infestations of insects or diseases occur, and the type and location of vegetation treatments. If harvesting moves vegetation toward desired conditions for wildlife, the effects would be beneficial. This could result in better retention of very large size class trees.

In the wildland-urban interface, pre-commercial thinning, timber harvest, and prescribed burning would reduce stand densities, would increase the survival of retained trees, and could increase the rate at which very large trees develop.

On managed lands, active vegetation restoration actions could mimic natural disturbances in areas where natural disturbances are not compatible with multiple-use objectives of the forest plan or the objectives of other landowners. The impacts from these activities could affect connectivity and dispersal of species that are crossing jurisdictional boundaries. They also could add to disturbances during critical times, such as breeding season.

Additionally, activities in the uplands could increase the amount of sedimentation into stream courses and could affect species that rely on riparian and aquatic areas. The goal of any of these management activities on public lands is to improve the conditions of the landscape to provide for a healthy, resilient ecosystem. Overall, the activities should improve ecological conditions of the native wildlife in these lands.

Development of lands next to and on the Lincoln NF can alter habitat conditions for species and increase disturbance in areas that may have had little disturbance in the past. Activities associated with land development could also affect springs through water developments, sedimentation from road construction, and potential vegetation changes to clear land for construction or to protect structures from fire. Other landownerships may differ in the amount and type of treatment that is appropriate in ERUs next to the Lincoln NF.

Alternative energy projects, such as for wind farms and solar arrays, appear to be increasing in their technological advances as well as popularity; there are already wind and solar farms next to the Lincoln NF. These have been known to kill bird and bat species, and this could increase with further developments. Oil and gas development on the Lincoln NF is possible, but the potential is low; this type of development is occurring adjacent to the Lincoln NF, and may contribute to habitat loss and degradation as well as injury or mortality of plant and wildlife species.

Visitation has increased over the last 10 years, but it is unknown whether this trend will continue. There is a potential of increased disturbance from the increase in visitation. Caving and rock-climbing are popular recreation activities in some areas and may increase in the future; however, these activities require specialized training and equipment and they are not likely to increase as rapidly as other types of recreation.

Recreational cave and mine exploration on all landownerships can increase the rate that diseases spread, such as white-nose syndrome. There is a decontamination protocol in place for cavers on National Forest System lands, which should aid in slowing disease spread on those lands; however, diseases may continue to be spread elsewhere. Because both people and bats may carry diseases and travel long distances, disease can be spread across a wide area. Disease control requires a cooperative effort. Multiple agencies are monitoring bats, which will help support adaptive management and response to outbreaks.

Introducing aquatic invasive species or contaminants to waterbodies by recreational, agricultural, or industrial activities may have negative impacts on species associated with aquatic, wetland, or riparian habitats. The potential for introducing disease and aquatic nuisance species exists on all lands in the cumulative effects analysis area, often as an indirect result of water-based recreation. Many management agencies have increased inspections and public education in recent years in order to reduce these risks.

Climate change has occurred to some degree and will continue. It is projected to increase the frequency, severity, and duration of droughts (IPCC 2007; Seager et al. 2007). Climate change is likely to modify ecological conditions, processes, and ecosystem services in many regions and ecosystems (Westerling et al. 2006; Bowman et al. 2009; Flannigan et al. 2009), including the cumulative effects analysis area. This would be the result of altering precipitation patterns and the timing, quantity, duration, and distribution of available water.

The effects of climate change could be particularly profound for native fishes and aquatic ecosystems of the Rocky Mountains and Arizona-New Mexico Mountains. This is because those systems often lack resilience and they strongly depend on temperature and stream flow regimes that are already documented to be changing (Rieman and Isaak 2010). In addition, plants in the arid Southwest already are near their physiological limits for water and temperature stress (Archer and Predick 2008).

The ramifications of a changing climate for species are likely to include the following:

- Reduced snowfall or earlier snow melt in the spring
- Extended periods of drought or extended dry periods in the spring and summer
- More frequent and larger wildfires
- Increased insect- and disease-induced deaths
- Changes in site characteristics that promote type conversion or vegetation community changes

These changes cause seasonal ranges and food sources for wildlife to shift and can affect the timing of reproduction. Reduced snowpack and changes in precipitation can affect aquatic species by decreased stream flow and shifts in runoff patterns, which could affect spawning success. Forested tracts and remote habitats for all wildlife can also become isolated, reducing landscape connectivity and ecological condition for species with limited dispersal ability. The timing of spring green-up can also affect food availability for migratory birds or forage conditions for big game. Those species with highly specialized ecological condition requirements, at the edge of their range, currently in decline, or having poor dispersal abilities may be particularly at risk (National Fish Wildlife and Plants Climate Adaptation Partnership 2012).

Air Resources

Air quality is an important resource to protect national forests. Air pollutants, either by themselves or after chemical transformations in the lower atmosphere, can cause negative impacts on ecosystems, including changes in soil and water chemistry from acidic deposition, damage to sensitive vegetation due to chronic and elevated ozone exposure, and increased visibility impairment in scenic areas. High concentrations of air pollution also can cause adverse effects on the health of sensitive people who visit, recreate, or work on the Lincoln NF.

The characterization of air resources is generally described at an airshed level. An airshed is a geographical area where local topography and meteorology limit the dispersion of pollutants away from the area. Airsheds can be affected by stationary emission sources, which are sources authorized by permit and emit pollution through an identifiable stack, and mobile and area sources, which are emissions from a

number of locations too small, numerous, or difficult to be inventoried individually. Mobile sources include on-road and off-road vehicles and equipment, while area sources include fire and windblown dust.

The primary airshed evaluated in this analysis is the area within 186 miles of the Lincoln NF boundary to account for regional air quality effects. This is consistent with the area typically considered during effects analysis and for certain permitting requirements under the Clean Air Act (Forest Service 2019a). This is the distance at which large emission sources have the potential to affect sensitive areas, such as wilderness areas and national parks, and is used in prevention of significant deterioration permit application reviews when considering the effects of an action on sensitive areas. Thus, while the Lincoln NF is within only four counties, the Lincoln NF airshed covers most of New Mexico, plus all or portions of 36 counties in southwest Texas and part of the state of Chihuahua in Mexico (see figure 3-11). In addition to regional effects, this analysis considers localized effects for directly emitted air pollutants, primarily particulate matter, such as from fire and fugitive dust.

Affected Environment

Regulatory Considerations

National Ambient Air Quality Standards

The Clean Air Act, as amended, is the primary authority for regulating and protecting air quality in the United States. The U.S. Environmental Protection Agency regulates six criteria pollutants it considers to be key indicators of air quality: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead, and two categories of particulate matter (particulate matter less than 10 microns in diameter [PM₁₀] and particulate matter less than 2.5 microns in diameter [PM_{2.5}]). It enacted primary standards for these pollutants to protect public health and secondary standards to protect welfare characteristics such as visibility and plant and animal health.

Areas that exceed the national ambient air quality standards for a criteria pollutant, determined through a network of air monitoring stations collecting data over a number of years, are designated as nonattainment areas for that pollutant. The nearest nonattainment areas to the Lincoln NF are PM₁₀ and ozone nonattainment areas in Doña Ana County, New Mexico, approximately 100 miles west of the Guadalupe Ranger District (the southernmost unit of the Lincoln NF), and a PM₁₀ nonattainment area in El Paso County, Texas, immediately south of Doña Ana County (EPA 2020a). The Lincoln NF is not in a nonattainment area, meaning its air quality is meeting the national ambient air quality standards (EPA 2020a).

Protection of Class I Areas

The Clean Air Act amendment of 1977 created the prevention of significant deterioration permitting program to preserve the clean air usually found in pristine areas. Its purpose is to prevent violations of national ambient air quality standards and protect air quality and visibility in pristine areas. The amendment designated national parks larger than 6,000 acres and national wilderness areas larger than 5,000 acres established before 1977 as mandatory Class I areas that would be afforded additional protections from air quality impairment. Class I areas on or near the Lincoln NF are the White Mountain Wilderness (managed by the Forest Service) and Carlsbad Caverns National Park and Guadalupe Mountains National Park (both managed by the National Park Service; see figure 3-11). The Capitan Mountain Wilderness (managed by the Forest Service) is a Class II area because it was not added to the Wilderness Preservation System until 1980.

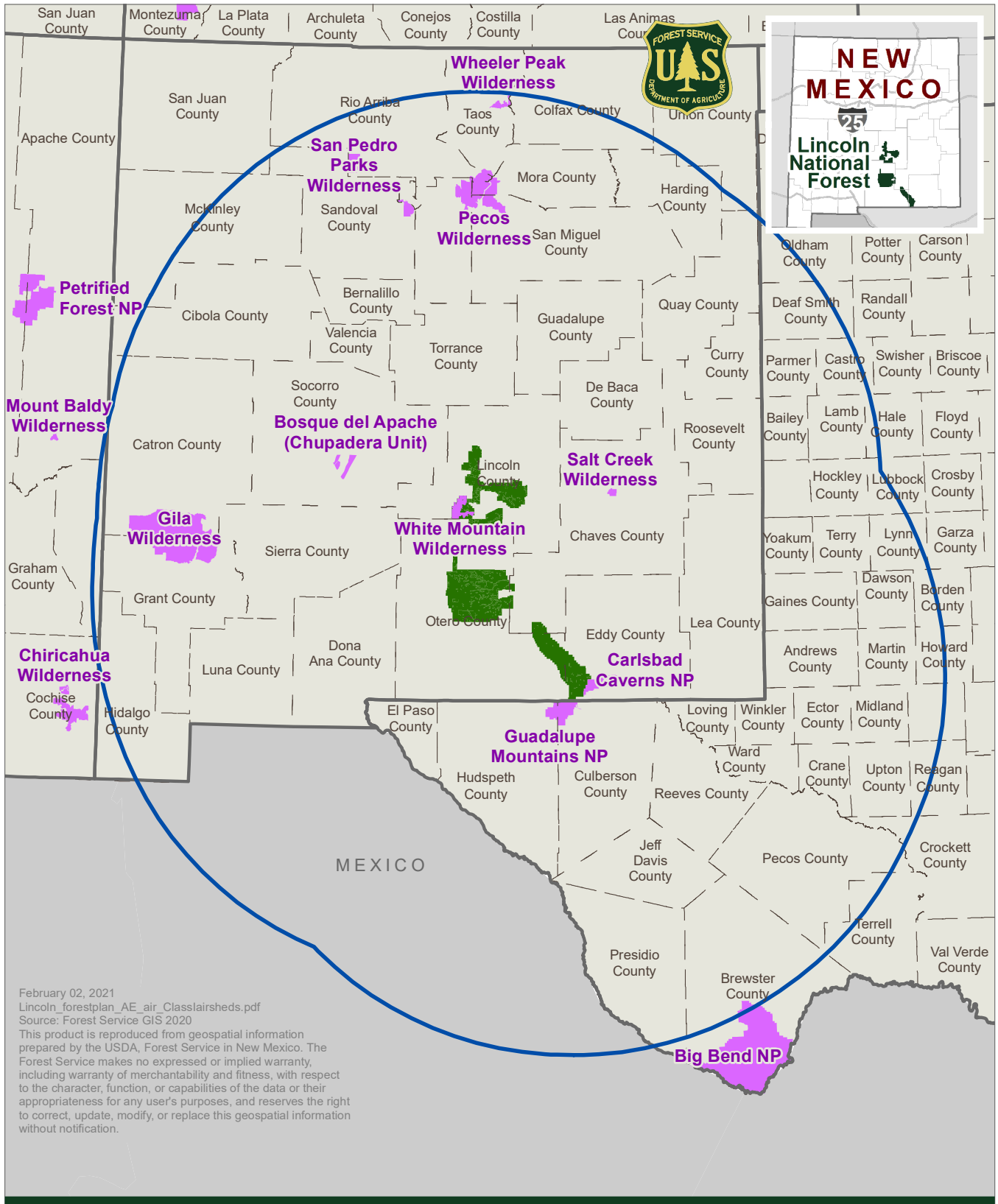
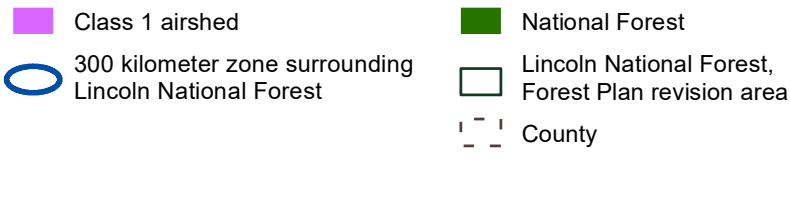


Figure 3-11 Class 1 Airsheds



The Regional Haze Rule was issued in 1999 with the goal of improving visibility in Class I areas to natural background visibility conditions by 2064. The rule requires states to develop state implementation plans that address regional haze in each Class I area in the state as well as in Class I areas outside the state that may be affected by emissions from within the state. These plans include reasonable progress goals for each affected Class I area. These goals include improving visibility on the 20 percent haziest (most impaired) days and ensuring that no degradation occurs on the 20 percent clearest (least impaired) days. The rule also requires continuing cooperation between the State of New Mexico and the Forest Service to coordinate implementation of a visibility protection program in the White Mountain Wilderness.

Forest Service regional staff review permit applications for new or modified major sources to determine if proposed actions are likely to cause or contribute to an adverse impact on visibility or other air quality-related values (such as impacts on soils, water, or vegetation from air pollutant deposition) on Class I areas and other National Forest System lands.

Smoke Management

The New Mexico Environment Department Air Quality Bureau administers smoke management to reduce the effects of fire on air quality and visibility. The Forest Service complies with the New Mexico State Smoke Management Program, which is described in the New Mexico Section 309(g) Regional Haze State Implementation Plan. New Mexico's administrative code (20.2.65 New Mexico Administrative Code, Smoke Management) stipulates that all burners must comply with requirements of the Clean Air Act and Federal Regional Haze Rule, as well as all city and county ordinances relating to smoke management and vegetation burning practices. There are specific requirements for prescribed wildfires and wildfires managed for multiple objectives that exceed 10 acres, which include registering the burn, notifying State and nearby population centers of burn date(s), visual tracking, and postfire activity reports (emissions tracking also applies to wildfires greater than 100 acres that are fully suppressed) (20.2.65 New Mexico Administrative Code, Smoke Management).

Current Conditions and Trends

Air Emissions

Data presented in the ecological assessment for the Lincoln NF describe the air pollutant emission sources in the airshed (Forest Service 2019a). The data indicate that most emissions originate outside the Lincoln NF counties, including counties to the northwest and southwest that contain large cities—such as El Paso, Texas; Albuquerque, New Mexico; and Juarez, Mexico—and counties to the east that contain a significant amount of oil and gas development. Trends analysis data project decreases in carbon monoxide and nitrogen oxide emissions and increases in sulfur dioxide and volatile organic compound (an ozone precursor) emissions between 2011 and 2025. Criteria pollutant emissions from mobile sources are generally decreasing in the airshed; however, these improvements are largely negated by increases in emissions from oil and gas production in the Permian basin and point sources in Mexico (Forest Service 2019a).

Particulate emissions throughout the airshed are dominated by windblown and fugitive dust and to a lesser extent by fires (wildfires, prescribed wildfires, and agricultural fires; Forest Service 2019a). Coarse particulate matter emissions (PM₁₀) and fine particulate matter (PM_{2.5}) emissions are expected to increase slightly across the airshed through 2025 (Forest Service 2019a). Higher temperatures and persistent drought, such as those predicted under climate change, may increase fire- and dust-related emissions and worsen this trend (Achakulwisut and Anenberg 2018).

Emission sources on the Lincoln NF are much more limited than those in the more developed portions of the airshed. These include motor vehicles, fugitive dust from travel on unpaved roads and trails, and fire.

Ambient Air Quality

There are no ambient air monitoring stations on the Lincoln NF. Except for one ozone monitoring station at Carlsbad Caverns National Park in Eddy County, monitoring stations in surrounding counties are in urban settings (Las Cruces and the El Paso-Juarez area) or in areas influenced by oil and gas development (Carlsbad and Hobbs), and they may not be representative of the conditions on the Lincoln NF. This is particularly true for air quality in the Smokey Bear and Sacramento Ranger Districts, which are farther away from the nonattainment areas described previously.

Monitoring data for 2017 through 2019 show exceedances of the 8-hour ozone standard in Doña Ana (2017–2019), Eddy (2017–2019), and Lea (2018) Counties; exceedances of the 24-hour PM₁₀ standard in Doña Ana and Luna Counties (2017–2019); and exceedance of the 24-hour PM_{2.5} standard in Doña Ana County (2017 only) (EPA 2020b). There were no exceedances of the 24-hour or annual nitrogen dioxide standards, the annual PM_{2.5} standard, or the annual PM₁₀ standards in these counties; the stations did not monitor for carbon monoxide or sulfur dioxide (EPA 2020b). The monitor at Carlsbad Caverns National Park showed exceedances of the ozone standard in 2018 and 2019, though the exceedances in 2018 were flagged as exceptional events, meaning conditions were influenced by factors such as high winds or wildfire (EPA 2020b).

Visibility

The White Mountain Wilderness is on the west side of the Smokey Bear Ranger District, and Guadalupe Mountains National Park is at the southern end of the Guadalupe Ranger District. Interagency monitoring of protected visual environments data for both sites indicate relatively good visibility conditions on the 20 percent clearest days and poorer conditions on the 20 percent haziest days. Visibility conditions at both sites are similar for the 20 percent haziest days but clearer for the White Mountain Wilderness on the 20 percent clearest days. The poorer visibility conditions on the 20 percent clearest days at Guadalupe Mountains National Park are likely due to its location near and downwind of the El Paso-Juarez metropolitan area.

Analysis of pollutants indicates that the haziest days at both sites are a result of ammonium sulfate (typically associated with industrial and mobile pollution), coarse mass (typically associated with windblown and fugitive dust), and organic carbon (typically associated with wildfire smoke) (Federal Land Manager Environmental Database 2020a). Conditions at Guadalupe Mountains National Park can be considered representative of conditions at Carlsbad Caverns National Park, given their similar location.

The general trend in visibility at White Mountain Wilderness is toward a moderate improvement in conditions on both the clearest days and the haziest days for the period of record (2001–2018). The trend in visibility at Guadalupe Mountains National Park shows similar improvements on the clearest days and no trend for the haziest days for the period of record (1988–2018). Visibility monitoring at Carlsbad Caverns National Park began in 2017, so there is not sufficient data to analyze trends (Federal Land Manager Environmental Database 2020a).

Deposition

Air emissions of nitrogen oxides and sulfur dioxide can lead to atmospheric transformation of these pollutants to acidic compounds, including nitric acid and sulfuric acid. Nitrogen compounds can act as a fertilizer, and its deposition onto land and water surfaces can result in negative ecological effects. Documented effects of nitrogen and sulfur deposition include acidification of lakes, streams, and soils; leaching of nutrients from soils; injury to high-elevation forests; changes in terrestrial and aquatic species composition and abundance; changes in nutrient cycling; unnatural fertilization of terrestrial ecosystems; and eutrophication of aquatic ecosystems. Nitrogen and sulfur deposition data have been collected at two National Atmospheric Deposition Program monitoring sites near the Lincoln NF—the Mayhill site near

the Sacramento Ranger District and Guadalupe Mountains National Park south of the Guadalupe Ranger District.

From 1984 to 2015, inorganic nitrogen deposition has increased slightly at the Mayhill site and shows no trend at the Guadalupe Mountains National Park site, while sulfur deposition has decreased significantly at both sites (Federal Land Manager Environmental Database 2020b). Higher overall nitrogen and sulfur concentrations at the Guadalupe Mountains National Park site compared with the Mayhill site are consistent with interagency monitoring of protected visual environments monitoring results discussed above. This suggests higher nitrogen and sulfur deposition in the southern part of the Lincoln NF. These conditions may be attributable to pollutant transport from Mexico and the El Paso-Juarez metropolitan area and nearby oil and gas development in the Permian basin.

Given that nitrogen emissions are expected to decrease in the Lincoln NF airshed over time (see Air Emissions, above), nitrogen deposition would also be expected to decrease in the plan area. Despite regulations for addressing sulfur emissions, the overall trend for increasing sulfur emissions in the Lincoln NF airshed suggests that sulfur deposition may increase in the plan area (Forest Service 2019a). These trends are for wet deposition. There are no monitors that measure dry deposition, nor are there monitoring data for mercury deposition or ground-level ozone (Forest Service 2019a).

Critical loads describe the thresholds of air pollution deposition below which harmful effects on sensitive resources in an ecosystem do not occur. Critical loads are based on scientific information about expected ecosystem responses to a given level of atmospheric deposition and may include long-term acidification of soils or surface waters, soil nutrient imbalances affecting plant growth, and loss of biodiversity, among other responses.

For the Lincoln NF, critical loads for nitrogen and acid deposition have been established based on a national-scale assessment, but site-specific data are lacking for a robust assessment (Pardo 2011; Pardo et al. 2011). Nitrogen critical load information is only available for lichens (one of the species most sensitive to nitrogen deposition). Modeling and limited sampling show exceedances of critical loads for lichens on 14 percent of the Lincoln NF; no similar information is available for herbaceous plants, fungi, forests, or for nitrate leaching. Data indicate no exceedance of acid critical loads on forested soils or surface water on the Lincoln NF. Critical load data are not available for mercury or ozone (Forest Service 2019a).

Summary

Table 3-51 summarizes current conditions and projected trends on air quality, visibility, and deposition, including critical loads. Air quality on the Lincoln NF is within regulatory levels for the national ambient air quality standards and is generally in good condition. The trend within the airshed, based on projected emission inventories, appears to be stable or improving for some pollutants while declining for others. Impacts from emissions along the U.S.-Mexico border are an area of known uncertainty in terms of the magnitude and subsequent impacts on air quality and the values dependent on air quality.

Research is limited related to critical loads on the Lincoln NF, and there is significant uncertainty regarding the magnitude of impacts on sensitive ecosystem resources from nitrogen deposition (indicated by the low reliability rating in the table); however, the rate of deposition of nitrogen appears to be decreasing based on projected emissions in the airshed, contributing to the projections for improving conditions.

Table 3-51. Summary of Conditions and Trends of Air Quality, Visibility, and Critical Load Deposition Measures and Reliability of Conclusions

Measure	Current Conditions	Trend	Reliability
National Ambient Air Quality Standards			
Carbon monoxide	Good	Improving	High
Nitrogen dioxide	Good	Stable to improving	High
Sulfur dioxide	Good	Declining	High
Lead	Good	Stable	High
Ozone	Good	Declining	High
PM _{2.5}	Good	Stable to declining	High
PM ₁₀	Marginal	Stable to declining	High
Visibility (2064 regional haze goal)	Departed	Stable	High
Critical Loads Deposition			
Nutrient nitrogen–Lichens	Low risk	Improving	Moderate
Nutrient nitrogen–Herbaceous plants and shrubs	Unknown	Improving	Low
Nutrient nitrogen–Mycorrhizal fungi	Unknown	Improving	Low
Nutrient nitrogen–Forests	Unknown	Improving	Low
Nitrate leaching	Unknown	Improving	Low
Acid deposition–Soils	Good	Improving	Low
Acid deposition–Surface water	Good	Stable to improving	Moderate
Mercury Deposition	Low risk	Stable	Low
Ozone Deposition	Unknown	Unknown	Not applicable

Source: Forest Service 2019a

Environmental Consequences for Air Resources

Methodology and Analysis Process

The potential impacts on air quality from management direction given in the no-action alternative (alternative A) are compared with those under the action alternatives (alternatives B, C, D, and E). There are several activities on the Lincoln NF that are sources of air pollutant emissions and have the potential to affect air quality and air quality-related values, such as visibility. Of these activities, prescribed wildfire and wildfire managed to meet resource objectives are the greatest sources of emissions with the potential to affect air quality in the airshed and visibility at Class I areas; therefore, these are discussed in greater detail. Because data are not available to quantify smoke emissions or other emissions under all alternatives, the effects from management actions are discussed qualitatively based on the level of proposed mechanical and prescribed wildfire treatments proposed under each alternative and the anticipated outcome of these treatments. Effects are assessed for the short term (within 10 years) and the long term (greater than 10 years).

Sources of ambient pollution, other than prescribed wildfire and wildland fire, produce emissions on the Lincoln NF that will not vary greatly by alternative. Because these would not vary by alternatives, they are described under Environmental Consequences for Air Resources Common to All Alternatives and not discussed by alternative.

Assumptions

- Prescribed wildfire will produce less smoke than wildland fires because the meteorological and fuel load conditions under which burns occur can be controlled. On a per acre basis, emissions from

unplanned or high-severity wildfire can be substantially higher than during wildland fire managed to meet resource objectives or prescribed wildfire (Wiedinmyer and Hurteau 2010; Hurteau 2017).

Indicators

- Changes in emissions of PM₁₀ and PM_{2.5} from wildland fire based on acres of treatment (short term) and expected outcomes (long term)
- Changes in emissions of other criteria pollutants from forest management actions and forest uses

Environmental Consequences for Air Resources Common to All Alternatives

Effects from Air Resources Management

Under all alternatives, the Forest Service would maintain air quality that meets or exceeds applicable Federal, State, and local standards and regulations by meeting its legal obligations to comply with the Clean Air Act, Regional Haze Rule, and New Mexico State Smoke Management Program. Alternative A provides guidance to “Comply with the Federal Clean Air Act in cooperation with other Federal, State and local agencies” (Forest Service 1986). Alternatives B, C, D, and E also have direction for the Forest Service to meet these legal obligations.

Effects from Access and Recreation, Livestock Grazing and Rangeland Management, and Economic Extraction

Under all alternatives, vehicles and equipment used on the Lincoln NF for administrative, consumptive, and recreational purposes would produce fuel combustion-related emissions of criteria pollutants regulated by the national ambient air quality standards. These emissions are not anticipated to increase substantially over current conditions or vary substantially across alternatives. Given that air quality on the Lincoln NF is in compliance with the national ambient quality standards and that these emissions are intermittent and dispersed, exhaust-related emissions would not have a substantial impact on air quality on the Lincoln NF, or affect visibility in Class I areas or in the Capitan Mountain Wilderness Class II area.

Under all alternatives, motorized use of roads and trails and other surface-disturbing activities would produce fugitive dust, primarily in the form of PM₁₀. The amount of dust generated depends on the property of the soils, including the silt content and moisture levels, weather conditions at the time of use, vehicle speeds, vehicle weights, and the amount of use. While finer particles (PM_{2.5}) can remain airborne for long periods and travel hundreds of miles, larger particles (PM₁₀) produce more localized and temporary impacts because they do not remain airborne as long as fine particles (EPA 2015). While fugitive dust is a known contributor to elevated PM₁₀ levels in the southwestern portion of the airshed, dust produced on the Lincoln NF is at a distance and direction that does not contribute substantially to these conditions.

Like combustion-related emissions, fugitive dust emissions are not anticipated to increase substantially over current conditions or vary substantially among alternatives. In addition, under all alternatives, dust abatement is required for construction and road projects to reduce fugitive dust and all alternatives contain objectives for reducing the potential for soil erosion that can lead to fugitive dust conditions. As such, administrative, consumptive, and recreational uses that generate fugitive dust are not anticipated to have a substantial effect on air quality, or affect visibility in Class I areas or in the Capitan Mountain Wilderness Class II area, where such uses are limited.

Effects from Natural Resources Management

Under all alternatives, mechanical treatment of vegetation would be used to reduce high concentrations of fuels in the forest understory, which, in turn, lowers the risk of severe wildfire. Operation of chainsaws

and chippers releases exhaust and particulates to the air, and burning the larger branches, twigs, and other woody debris generates smoke (discussed below). While the amount of mechanical treatments varies across alternatives in terms of acres treated, the emissions from individual treatments would be temporary, intermittent, and minor under all alternatives.

Smoke produced from wildland fire (prescribed wildfire and wildfire managed to meet resource objectives) would be the greatest source of emissions under all alternatives. Although several criteria air pollutants can be found in smoke, particulate matter is typically of most concern from a health and visibility standpoint and is the primary pollutant resulting from the combustion of fuels during wildland fire (NWCG 2018). Studies indicate that about 90 percent of smoke particles emitted during wildland fires are PM₁₀ and about 90 percent of the PM₁₀ are PM_{2.5} (NWCG 2018). PM_{2.5} poses the greatest risk to human health because the small size of the particles can cause respiratory and heart problems, particularly in sensitive populations (EPA 2020c). The larger particles in PM₁₀ are of less concern to human health, but they can be a localized source of reduced visibility. Carbon monoxide released during fire is generally a localized health concern that is more likely to affect the health and safety of fire personnel. Combustion also releases nitrogen oxides, which are chemical precursors to the formation of ozone.

Under all alternatives, wildland fires would continue to occur within the plan area and would be managed according to standards and guidelines set forth under each alternative. Smoke from wildland fires may travel large distances, impairing local and regional visibility and degrading air quality far from its point of origin, depending on topography and meteorological conditions, such as wind speed and direction. In the case of uncharacteristic wildfire, ambient concentrations of criteria pollutants may increase beyond the national ambient air quality standards, both locally and in distant locations under any alternative. The potential for wildland fires may increase over the life of the plan due to a predicted increase in drought and higher temperatures, with adverse effects on air quality and air quality-related values, including visibility in Class I areas and Class II areas managed as wilderness.

Under all alternatives, the Forest Service would comply with the New Mexico State Smoke Management Program for prescribed wildfire and for wildfires managed to meet resource objectives (New Mexico Administrative Code Title 20, Chapter 2, Part 65; FW-AIR-G 2 and 3), including use of emission reduction techniques to reduce adverse impacts on air quality. Emissions reduction techniques provide the Forest Service with tools to manage smoke levels and reduce the potential for exceeding national ambient air quality standards and affecting air quality-related values, such as visibility.

Environmental Consequences for Air Resources Under Alternative A

Effects from Natural Resources Management

Under alternative A, there would be no change to current management. There are no landscape-level objectives for mechanical treatments, prescribed wildfire, or managing wildfire to meet resource objectives, though these activities do occur. Impacts on air quality from these activities would be as described under Environmental Consequences for Air Resources Common to All Alternatives.

Over the long term, impacts on air quality and air quality-related values from wildland fire, particularly uncharacteristic wildfire, would continue. With no objectives to reduce fuel loads or move vegetation communities toward desired conditions at a landscape level, the potential for uncharacteristic fire would continue to affect air quality and air quality-related values.

Environmental Consequences for Air Resources Common to Alternatives B, C, D, and E

Effects from Natural Resources Management

Alternatives B, C, D, and E would provide forestwide management of vegetation communities toward desired conditions, including fire regime, and provide objectives for mechanical thinning and prescribed burning. This would focus treatments on reducing adverse effects from uncharacteristic wildfire, thereby reducing fire-related impacts on air quality and air quality-related values over the long term compared with alternative A, which has no similar objectives. As noted in the Fire and Fuels section, while all action alternatives would decrease the risk of uncharacteristic wildfire over the long term compared with alternative A, this decrease would be greatest under alternatives B, D, and E and least under alternative C.

Environmental Consequences for Air Resources Under Alternative B

Effects from Natural Resources Management

Alternative B would mechanically treat between 11,000 and 19,500 acres and include at least 200,000 acres of prescribed wildfire over 10 years. Short-term impacts on air quality and air quality-related values from mechanical treatments and prescribed wildfire described under Environmental Consequences for Air Resources Common to All Alternatives may be greater than under alternative A, which does not specify an objective. Long-term impacts would be as described under Environmental Consequences for Air Resources Common to Alternatives B, C, D, and E.

Environmental Consequences for Air Resources Under Alternative C

Effects from Natural Resources Management

Alternative C would mechanically treat between 6,500 and 12,500 acres and include at least 200,000 acres of prescribed wildfire over 10 years; however, chemical treatments would not be used under this alternative. Short-term impacts on air quality and air quality-related values from mechanical treatments and prescribed wildfire described under Environmental Consequences for Air Resources Common to All Alternatives may be greater than under alternative A, which does not specify an objective; however, short-term impacts would be less than described for alternative B, as half as many acres would be mechanically treated. Long-term impacts would be as described under Environmental Consequences for Air Resources Common to Alternatives B, C, D, and E.

Environmental Consequences for Air Resources Under Alternative D

Effects from Natural Resources Management

Short-term impacts on air quality and air quality-related values under alternative D would be the same as described under alternative B. This is because the same acres of mechanical treatment and prescribed wildfire would occur. Long-term impacts would be as described under Environmental Consequences for Air Resources Common to Alternatives B, C, D, and E.

Environmental Consequences for Air Resources Under Alternative E

Effects from Natural Resources Management

Short-term impacts on air quality and air quality-related values under alternative E would be the same as described under alternative B. This is because the same acres of mechanical treatment and prescribed wildfire would occur. Long-term impacts would be as described under Environmental Consequences for Air Resources Common to Alternatives B, C, D, and E.

Cumulative Environmental Consequences for Air Resources

The cumulative effects analysis area is the Lincoln NF airshed (figure 3-11). The time frame for assessing cumulative effects on air quality is 10 years.

Activities on the Lincoln NF that affect air quality and air quality-related values include those described under Environmental Consequences for Air Resources Common to All Alternatives, namely vehicle and equipment use associated with administrative, consumptive, and recreational uses of the Lincoln NF; travel on unpaved roads and trails and other surface-disturbing activities; and wildland fire. Emission sources outside the Lincoln NF that contribute to cumulative effects include vehicle travel on adjacent and nearby roads and highways, agricultural activities (which produce fugitive dust and exhaust gases), industrial facilities that release point-source pollutant emissions, and smoke from prescribed wildfire or wildland fires on land under private or other agency jurisdiction (including prescribed wildfire programs on lands managed by the BLM, Bureau of Indian Affairs, MacGregor Range, Holloman Air Force Base, Fort Bliss, and the White Sand Missile Range). Soil disturbance from residential and commercial development, energy production and development, road construction, and other sources of windblown dust also contribute to cumulative effects. The cumulative effects of past and present actions have resulted in the air quality conditions on the Lincoln NF and in the airshed described in the affected environment.

The sources outside the plan area that are most likely to affect air quality and air quality-related values on the Lincoln NF, particularly on the White Mountain Wilderness Class I area and the Capitan Mountain Wilderness Class II area, are wildland fire, fugitive dust, and mobile and industrial sources that contribute to decreased visibility. These latter sources also contribute to nitrogen and sulfur deposition that affect the health of forest soils, surface water, and vegetation.

Prescribed wildfires would continue to be applied under the direction of the Federal, State, or local land management agencies after consideration of such variables as weather, type and condition of fuels, duration, and acreage to be treated. Prescribed wildfires authorized by the New Mexico Environment Department Air Quality Bureau are based partly on the potential for cumulative effects from smoke with other activities planned during the same time; therefore, the potential for significant cumulative effects from planned ignitions is largely avoided or, in some cases, mitigated by adhering to the smoke management program in the state implementation plan. Likewise, air emissions from industrial sources are regulated under permits by the State and local environmental agencies; therefore, if new significant sources of this kind are proposed, the increment of pollutants would be reviewed by regulators, and mitigation and monitoring would be required to ensure continued attainment of the national ambient air quality standards on the Lincoln NF.

While emissions concentrations, including particulate matter, on the Lincoln NF are within attainment of the national ambient air quality standards, climatic conditions, such as drought and wind, can cause dust and particulate emissions associated with fire to vary significantly in extent over time. While wildfires are not considered in the assessment of attainment of national ambient air quality standards because they are not planned actions, they could contribute to cumulative effects on air quality and visibility improvements in the Forest Service-managed White Mountain Wilderness Class I area and the Capitan Mountain Wilderness Class II area.

Fire and Fuels

Affected Environment

Historically, wildfires played a natural ecological role in the landscape of the Southwest. Some vegetation communities were well adapted to wildfires through periodic occurrence; others were dependent on fire frequency to maintain a suitable pattern, structure, composition, and ecological function (Forest Service 2019d). Fire frequency, fire severity, and fire regimes have all changed profoundly over the past century due to mismanagement of vegetation communities, wildfire suppression efforts, and a changing climate. In many ecosystems across the Lincoln NF, a changing climate has the potential to significantly affect the frequency and severity of wildfires (Forest Service 2019a).

In this section, “wildland fire” refers to both wildfire (unplanned ignitions) and prescribed wildfire (planned ignitions). With new research, the Forest Service has a better understanding of the importance of wildland fires’ effects on the health of the landscape and its influence on beneficial or negative impacts on values such as water quality, air quality, habitat, recreation areas, and communities. This better understanding has changed management strategies since the original 1986 Forest Plan.

Fire Regime

Fire regimes describe the natural role fire plays across a landscape (Agee 1993). A fire regime incorporates fire frequency and severity, but it also includes fire predictability, fire size, weather and climate, and spatial patterns of vegetation communities (Heinselman 1981; Forest Service 2019a). The two important factors for determining fire regimes are vegetation communities and weather and climate patterns (Forest Service 2019a).

Table 3-52 shows the fire return intervals by ERUs on the Lincoln NF, demonstrating a general trend after 10 years; these trends are based on a comparison of current estimated fire return intervals. Table 3-53 includes the fire return interval departure and trends for ERUs.

Ecosystems throughout the Lincoln NF are fire dependent, and each ecosystem has a characteristic fire regime integral to ecological functions and processes (Forest Service 2019a). Different fire regimes have differing levels of expected fire behavior and frequency. Fire frequency varies with elevation, aspect, vegetation type, and climate. For example, ponderosa pine forests have a historical fire frequency of 5 to 35 years, but they generally experience a lower severity (mortality of their overstories) than other pines; the wet mixed conifer with aspen component is driven by a mixed severity regime with a historical frequency of 35 to 250 years (Forest Service 2019a; 2019e).

Ecosystems in the Southwest have largely departed from historical conditions, resulting in changes in fire frequency, severity, size, and distribution (Forest Service 2019e; 2019f). A desired fire regime, in some areas, in the Southwest is one with low-severity fires with varying frequency depending on the vegetation community (Forest Service 2019a).

Fire Frequency

Fire frequency is the number of fire events that occur within an identified area (such as a geographic region or a vegetation community) during a specified time period (Forest Service 2019a). Fire frequency and fire history can be determined through the study of dendrochronology (tree ring), providing temporal and spatial records of past fire activity (Swetnam et al. 1999).

Table 3-52. Fire Return Intervals by ERUs on the Lincoln NF

ERU	Forest Acres by ERU	Historical Fire Regime Class	Historical Fire Regime Subclass	Historical Fire Interval (years)	Historical Fire Severity	Current Estimated Fire Interval (years)	Current Estimated Severity
Spruce-fir forest	11,034	V	Va	200–400	Stand Replacement	29	Stand Replacement
Mixed conifer with aspen	35,568	III	IIIa	< 50	Mixed Severity	501	Stand Replacement
Mixed conifer-frequent fire	163,674	I	I	0–35	Low Severity	86	Mixed Severity
Ponderosa pine forest	123,156	I	I	0–35	Low Severity	70	Mixed Severity
Ponderosa pine-evergreen oak	8,661	I	I	0–35	Low Severity	N/A	Mixed Severity
Piñon-juniper evergreen shrub	53,976	III	IIIb	50–100	Mixed Severity	335	Mixed Severity
Juniper grass	9,755	I	I	0–35	Low Severity	41	Mixed Severity
Piñon-juniper woodland *	319,105	I	I	0–35	Low Severity	103	Mixed Severity
Piñon-juniper grass	165,432	I	I	0–35	Low Severity	118	Mixed Severity
Gambel oak shrubland	3,589	II	II	0–35	Stand Replacement	N/A	Mixed Severity
Mountain mahogany mixed shrubland	52,528	III	IIIb	50–100	Mixed Severity	109	Stand Replacement
Chihuahuan Desert scrub	19,526	III	IIIId	200+	Mixed Severity	64,065	Stand Replacement
Montane/subalpine grassland	11,230	II	II	0–35	Stand Replacement	73	Stand Replacement
Semi-desert grassland	65,888	II	II	0–35	Stand Replacement	51	Stand Replacement
Colorado plateau/Great Basin grassland	425	II	II	0–35	Stand Replacement	501	Stand Replacement

Source: (Forest Service 2019a)

* Piñon-juniper woodland was assessed in similar comparison with piñon-juniper grass; the piñon-juniper woodland community across the Lincoln NF more similarly matches that of the piñon-juniper grass community.

Table 3-53. Fire Return Interval Departure and Trends for All ERUs under All Alternatives

ERU	Current Departure	Predicted Trend for Fire Return Interval (10 Years)				
		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Spruce-fir forest	High	Slowly Toward	Slowly Toward	Slowly Toward	Slowly Toward	Slowly Toward
Mixed conifer with aspen	High	Away	Moderately Toward	Away	Slowly Toward	Very Slowly Toward
Mixed conifer-frequent fire	Moderate	Away	Moderately Toward	Very Slowly Toward	Moderately Toward	Slowly Toward
Ponderosa pine forest	Moderate	Slowly Toward	Moderately Toward	Slowly Toward	Moderately Toward	Slowly Toward
Ponderosa pine-evergreen oak	Moderate	Away	Moderately Toward	Slowly Toward	Moderately Toward	Slowly Toward
Piñon-juniper evergreen shrub	High	Away	Moderately Toward	Slowly Toward	Moderately Toward	Slowly Toward
Juniper grass	Moderate	Slowly Toward	Quickly Toward	Moderately Toward	Quickly Toward	Moderately Toward
Piñon-juniper woodland*	Moderate	Away	Moderately Toward	Slowly Toward	Moderately Toward	Slowly Toward
Piñon-juniper grass	Moderate	Away	Quickly Toward	Moderately Toward	Quickly Toward	Moderately Toward
Gambel oak shrubland	High	Away	Away	Away	Away	Away
Mountain mahogany mixed shrubland	High	Away	Slowly Toward	Static	Slowly Toward	Static
Chihuahuan desert scrub	High	Away	Away	Away	Away	Away
Montane/subalpine grassland	Moderate	Away	Slowly Toward	Static	Slowly Toward	Static
Semi-desert grassland	Moderate	Away	Moderately Toward	Static	Moderately Toward	Slowly Toward
Colorado plateau/great basin grassland	High	Away	Away	Away	Away	Away

Source: (Forest Service 2019a)* Piñon-juniper woodland was assessed in similar comparison with piñon-juniper grass; the piñon-juniper woodland community across the Lincoln NF more similarly matches that of the piñon-juniper grass community.

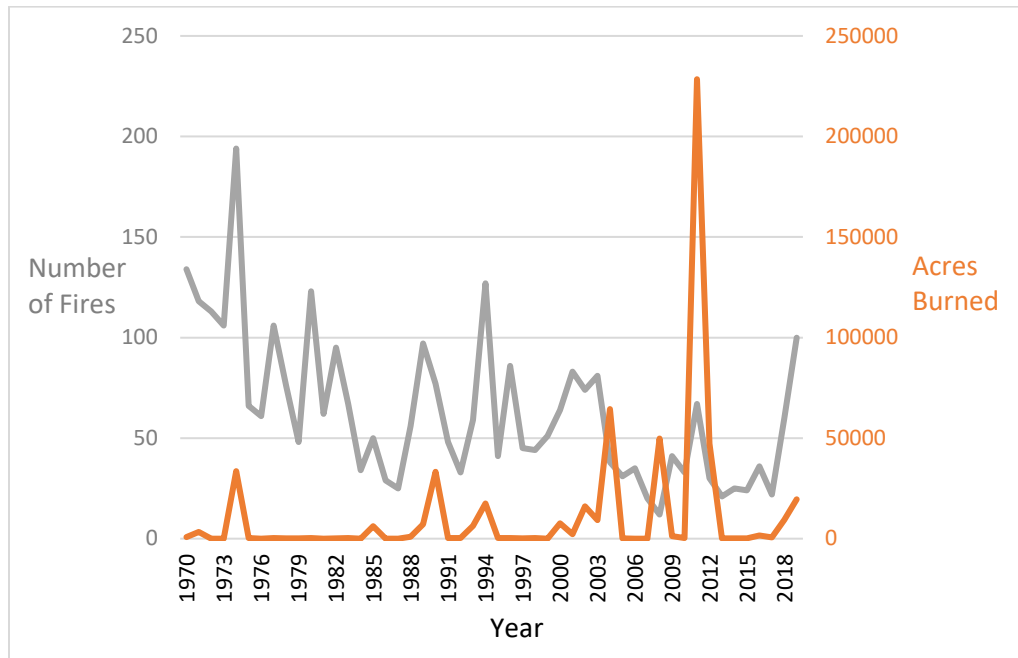
Starting in the 1870s, intensive unmanaged grazing and selective high-grade logging became prevalent throughout the southwestern United States. Grazing changed the composition of the forests by removing grasses that historically carried low-intensity fires through the forests; logging changed the composition and structure of the forests themselves. Compounding these adverse changes, subsequent wildfire suppression reduced the frequency and extent of fires, which allowed dense tree regrowth (Romme et al. 2009).

The resiliency of some vegetation communities, such as ponderosa pine forests, is dependent on fire as a frequent disturbance process (Forest Service 2019a). Management directives, such as overgrazing, selective high-grade logging, and wildfire suppression, changed the frequency of wildfires by changing the composition and structure of fuels. The combination of dense, homogeneous forests and a shift toward less fire-resistant species resulted in crown fires and an increase in fire severity. Although fires were historically less frequent, the severity of the fires became increasingly high (Forest Service 2019g).

Changes in climate also affect fire frequency in the Southwest. Trends in wildland fire and climate from 1974 to 2004 show an increase in large wildland fire frequency and an increase in the length of fire seasons (figure 3-12). Climate change is potentially linked to changes in the timing of spring snowmelt and an increase in spring and summer air temperatures (Westerling et al. 2006). Fire frequency is regulated by late-melting snowpacks and frequent summer rains (Romme et al. 2009). Early snowmelt can increase drying of vegetation and surface fuels, increasing the risk of more frequent wildland fire frequency (Westerling et al. 2006).

Changes in fire frequency in the Southwest have led to wildland fire being a system stressor, when historically it would be considered a system driver. When fires are too frequent, plants may be killed before they mature or have a chance to reproduce. When fires are too infrequent, plant reproduction may decrease, species composition may be affected, and excessive fuel loading occurs (Forest Service 2019e).

Figure 3-12. Wildfire Occurrence on the Lincoln NF from 1970 to 2019



Source: FAMWEB 2020

Fire Severity

Fire severity can be defined as the effect of fire on an ecosystem, the length of flame, and the depth of char class in soils. Fire severity is also based on the amount, degree, and location of organic matter that fires consume; changes in ash and soil color; a decrease in protected forest floor; and level of vegetation damage or morbidity (Ryan and Noste 1985; Neary et al. 2005; Omi and Martinson 2002). Fire severity can be used to determine postfire recovery of vegetation communities (Ryan and Noste 1985). There is the potential for an increase in fire intensity and severity throughout the Southwest based on fire climatic conditions (Forest Service 2019f).

Fire severity is dependent on fuel loading, moisture, forest structure and composition, humidity, wind, and temperature. Increased fuel loads, higher temperatures, and low moisture lead to higher fire intensity and more widespread fires (Forest Service 2019e). Conversely, cooler temperatures and higher moisture can result in less-severe fires (Forest Service 2019g). High fire severity or stand-replacement fire regimes exist on the Lincoln NF and other forests in the Southwest. The range and distribution of stand-replacement fire regimes vary by vegetation type (ERUs).

Fire Season and Size

The fire season in the Southwest usually starts in March or April (the Guadalupe Ranger District fire season starts in February, which is earlier than the mountain districts) with spring winds drying the forests to the point of extreme fire danger; it continues through mid-July with the coming of the monsoon season. On the Lincoln NF, large fires typically occur April through June, and large fire growth is largely determined by wind events (Forest Service 2019a).

An increase in fire size corresponds with an increase in the cost for wildfire suppression. According to the Forest Service, Federal land management agencies currently spend more than \$1 billion per year on western fires (Forest Service 2019a). Extended lengths of the fire season also contribute to financial stress on the agency, reducing budgets for preventative management efforts.

Departure from the Natural Regime

Historically, forest stands on the Lincoln NF were dominated by fire-tolerant Douglas-fir and ponderosa pine with a more open structure and spacing. This allowed a frequent, but less severe, fire regime (Forest Service 2019h).

ERUs on the Lincoln NF have departed from natural fire regimes; some are moderately departed, and others are highly departed. Because of the interruption of the natural fire regimes and the impacts of past management activities, most of the vegetation communities are highly departed from reference conditions (Forest Service 2019g). As a result, fire regimes now have differing levels of expected fire behavior and frequency (Forest Service 2019f).

Wildfire suppression, logging, and grazing all altered the vegetation structure and composition, contributing to increases in fire severity and frequency (Forest Service 2019a). Beginning around the turn of the twentieth century and continuing into the 1980s, high-grade logging removed much of the accessible merchantable timber (Forest Service 2019g). These past management activities favored marketable wood products at the expense of herbaceous species, which altered the fire regime by altering the fuels composition. Additionally, wildfire suppression altered the structure of natural ecosystems, which resulted in a departure from natural fire regimes (Forest Service 2019a).

As a result of past management activities, fuels loads, in the form of dead, woody material and living trees, built up due to extensive wildfire suppression (Forest Service 2019g). These high fuel loads are difficult to manage because the dry southwestern climate has a very slow decomposition rate, increasing

existing fuels loads (Brown et al. 2003; Stephens 2004). Increased fuels loads contributed to altered fire regimes, which lead to the increased probability for crowning, torching, and spot fires; this has led to an increase in resistance to control (Forest Service 2019g, 2019e).

Fire regimes that have departed from historical and desired conditions, with overstocked, dense forest stands and excessive forest floor fuel loading, have increased the risk of uncharacteristically severe fires, threatened communities and infrastructure, and made wildland fire management less effective and more dangerous (Forest Service 2019g, 2019e).

Resources at Risk

The wildland-urban interface is the matrix where structures or other human development meet and intermingle with wildland fuels (Forest Service 2019g). These areas may include critical communications sites, municipal watersheds, high-voltage transmission lines, and other structures that, if destroyed by fire, would result in impacts on surrounding communities (Forest Service 2019f).

Fires with an uncharacteristic size, frequency, and severity pose risk not only to infrastructure, but they also are a public safety risk (figure 3-13; Forest Service 2019b). Current management efforts focus on fuels reduction in the wildland-urban interface (Forest Service 2019a).

As residential developments increase adjacent to National Forest System boundaries, it is important to promote the development of community wildfire protection plans. The surrounding counties (Lincoln, Eddy, Chaves, and Otero Counties) have developed community wildfire protection plans that identify priority on treatment areas and development of hazardous fuels reduction projects (Forest Service 2019b). These actions can result in communities that are fire adapted, potentially preventing the loss of life and property (Forest Service 2019g).

Fire and Fuels Management

Fire is an integral component in the function and biodiversity of many natural habitats and organisms, and most vegetation on the Lincoln NF has evolved under fire's influence (Forest Service 2019g). When fire is removed from fire-adapted vegetation communities, the system loses its integrity, resilience, and functionality. Departure has resulted in changes to vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuels composition; fire frequency, severity, and pattern; and other associated disturbances (for example, insect and disease mortality, grazing, and drought; Forest Service 2019f). There is a need for restoration of fire on the landscape and restoration of fuel conditions that support natural fire regimes. Fire regimes can be improved by managing the fuels through mechanical or prescribed wildfire treatments and managing the frequency of the fires (Forest Service 2019g).

Wildland fire management goals and outcomes (Forest Service 2019g):

- To have fire behave similarly to reference conditions
- To have wildland fires play a natural ecological role
- To use wildland fires to achieve ecosystem sustainability
- To increase fires' positive impacts on values at risk
- Wildland fire activities should be used to move ecosystems toward more natural fire regimes.
- Forest Service policy requires every wildfire response to include some level of protection as an objective.

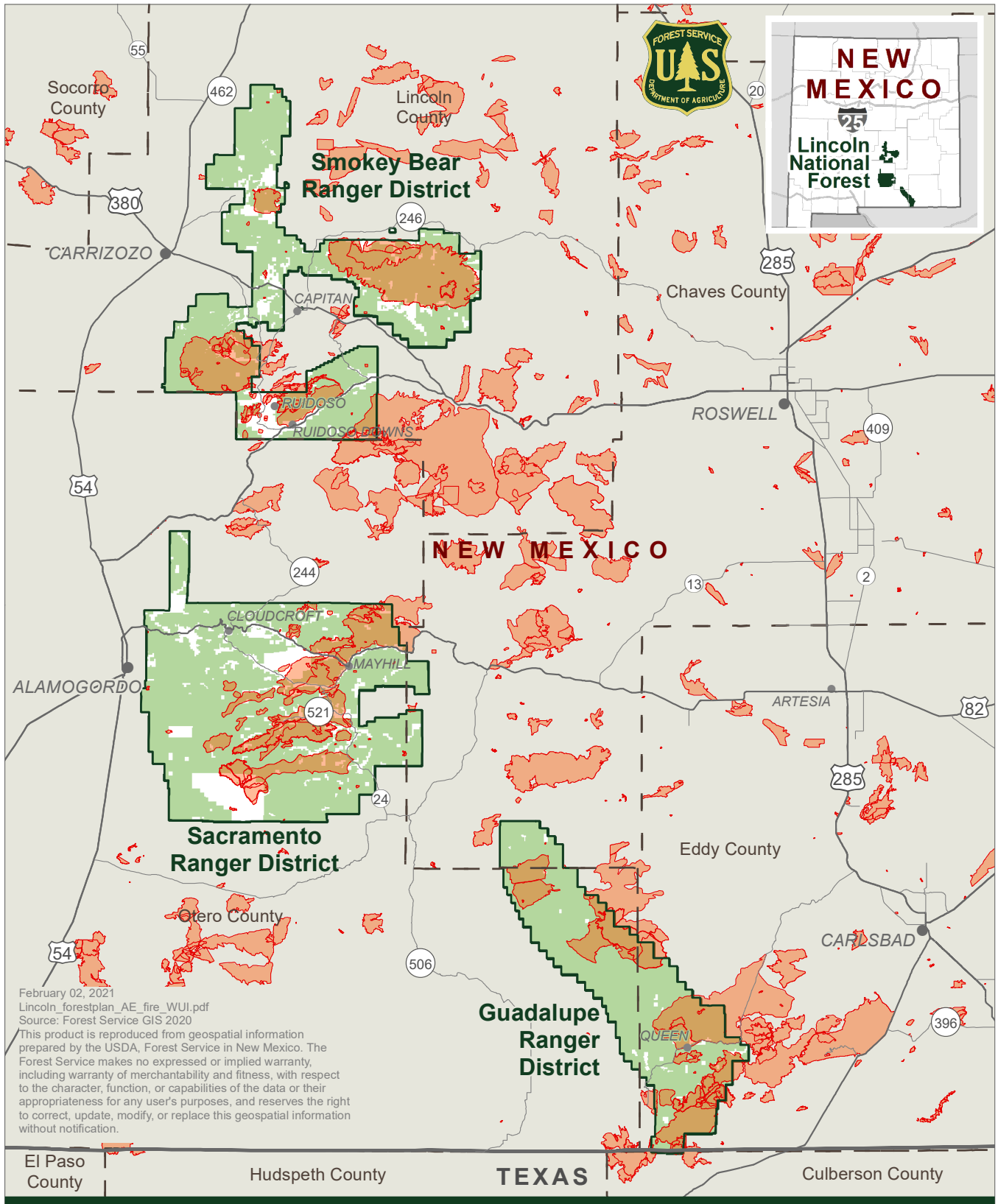
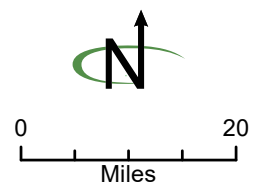


Figure 3-13 Historic Fire Perimeters

- Historic fire perimeter
- National Forest
- County
- Private or other
- Lincoln National Forest, Forest Plan revision area



- The Forest Service is to use wildfire risk assessments.
- Multiple resource management objectives must drive management standards.

Wildland fire management is the use of fire as a tool to manipulate vegetation for the purpose of changing the fire characteristics when it burns. Fuels management should focus on reducing the fire hazard, minimizing the risk of loss of life, and reducing the risk of damage to property or ecosystem function. By reducing fuels, through mechanical restoration, and implementing forest ecosystem restoration, there is a reduced risk of fire hazard. Manipulation of vegetation, or fuels management, changes the characteristics of fire behavior and the severity by changing the amount, configuration, and spacing of live and dead vegetation (Forest Service 2019g). All mechanical fuels manipulation would be conducted for the sole purpose of preparing stands/areas for fire, either as prescribed or wildfire. Fire is the tool of choice, and all other fuel management is to restore the landscape for the reintroduction of fire.

Fuel management goals and outcomes (Forest Service 2019a):

- Fuels management maintains and enhances the composition, structure, and function of forest, brush, and grassland ecosystems.
- Fuels reduction activities should be used as a management tool when feasible.
- The Forest Service should use fuels reduction treatment, predominantly uneven-aged forest management, prescribed burning, and, in some cases, management of natural ignitions for beneficial resource objectives.
- The Forest Service should reduce fuels and change fuel composition as a proactive measure to reduce the spread and severity of wildland fire.

Through restoration of natural fire regimes with fuels management, forests move closer to desired conditions where the structure, composition, and function return to reference conditions. This builds a more resilient landscape (Forest Service 2019e).

Wildland Fire Decision Support

The size and complexity of wildland fire management challenges have grown over the past several decades as changes to fuel density and composition combined with altered fire regimes interact with changing climate conditions and an ever expanding wildland-urban interface. To address these complex issues, the Forest Service has implemented wildland fire decision support that uses geospatial information system data to provide critical information for wildfire responders and managers to facilitate effective resource use along with monitoring of conditions and short-term fire forecasting to improve wildland fire management decisions (O'Connor et al. 2016).

Part of the spatial analysis includes the development of potential operational delineations that identify potential control lines that could be used to help contain wildfires, such as roads, trails, ridgelines, and recent fuel treatments. These delineations also incorporate other information, including values at risk, topography, and vegetation. Having this spatial data allows fire managers to understand the difficulty of suppression, the likelihood of a given control line's effectiveness, and the ecological effects fire could have under a range of conditions (Caggiano 2018).

The five potential operation delineations include:

1. Protect: Current conditions are such that highly valued resources and assets are at high-risk of loss from unwanted wildfire. The primary protection objective is to reduce adverse effects on values at risk. The response should be commensurate with values at risk.

2. Restore: Current conditions are such that highly valued resources and assets are at moderate risk of loss from wildfire. Wildfire should be used to increase ecosystem resilience and provide ecological benefits when conditions allow.

3. Maintain: Current conditions are such that highly valued resources and assets are at low risk of loss from wildfire, and many natural resources may benefit from fire. Due to the low risk, wildfires are expected to be used as often as possible to maintain ecosystem resilience and to provide ecological benefits when conditions allow.

4. High complexity: Current conditions are such that highly valued resources and assets are at high-risk of loss from wildfire depending on ignition location and weather conditions. Steep terrain, lack of roads or trails, and dense understory have limited fuel treatments and make prescribed burning difficult. Fire-sensitive highly valued resources and assets are intermixed with fire-tolerant highly valued resources and assets, often with mixed landownership. Mitigation action and clear communication with potential operational delineation stakeholders will be necessary to address current fire hazards.

Environmental Consequences for Fire and Fuels

The 1986 Forest Plan does not provide adequate direction to address communities at risk from wildland fires nor treatment of the wildland-urban interface. Additionally, the 1986 Forest Plan does not provide vegetation desired conditions and fire regime. The forest plan needs to be revised for wildland fire management for the following reasons:

- There is a need for plan components that recognize fire-adapted ecosystems, the role of fire on the landscape (including in wilderness), and its use as a management tool.
- There is a need for plan direction that allows Lincoln NF managers the flexibility to manage unplanned wildfires to meet resource objectives.
- Changes to the proposed forest plan include incorporating resource desired conditions and management areas, as well as updating objectives, standards, guidelines, suitability, and monitoring requirements.

Additional planning is required before on-the-ground projects and activities take place. Activities such as prescribed wildfires are designed to move the Lincoln NF toward desired conditions and to meet forest plan objectives. Plan decisions (desired conditions, objectives, standards, and guidelines) and other plan direction (management areas and monitoring) would be followed when planning or implementing site-specific projects and activities.

Methodology and Analysis Process

The section is organized by the issue topics identified during scoping and subsequent alternatives development that are most applicable to wildland fire management. Project-specific analysis would provide more in-depth analysis when implementing the plan.

Assumptions

- Forest Service Manual 5140 – Hazardous Fuels Management and Prescribed Fire and Interagency Prescribed Fire—This planning and implementation procedures guide will continue to direct management of wildland fires.
- Acres of prescribed burning proposed in each alternative still depend on weather conditions, sociopolitical factors, additional National Environmental Policy Act planning and analysis, funding, and availability of wildland fire management resources.

- Not implementing restoration activities, such as prescribed burning, will result in further departure from desired conditions.

Indicators

- Ability to manage fire for ecological benefit
- Ability to manage fire to protect life, property, and other values at risk
- Ability to manage fire safely

Environmental Consequences for Fire and Fuels Common to All Alternatives

Effects from Natural Resource Management

Under all alternatives, objectives for wildland fire and mechanical treatment would be used as a restoration tool to manage fire safely, including the threat to the wildland-urban interface. Use of this tool would also move fire-adapted ecosystems toward desired conditions for ecological benefit.

Alternatives comply with policies and regulations that dictate implementation and management of wildland fire, to protect life, property, and other values at risk. Under all alternatives, wildland fire management would strive to meet or exceed applicable Federal, state, and local standards and regulations for air quality. Most importantly, under all alternatives, the safety of firefighters and the public is the first priority. Proposed management under all alternatives would provide long-term, indirect benefits to fire-adapted vegetation communities.

Beneficial ecological effects from fire consist of the acceleration of nutrient cycling, an increase in soil fertility, and improved plant productivity. Short-term effects of fire include the removal of vegetation that subsequently increases soil erosion and sedimentation. When fire severity is high, it can create water-repellent soils that then decrease water infiltration, which may result in flash flooding events that can be a public and user safety hazard downstream.

All alternatives would implement a wildland fire decision support system, including a wildland fire decision support system spatial analysis to assist fire managers. This system would allow flexibility in managing wildland fires while managing to protect values at risk and preserve safety.

Firefighter and public safety are the priority in every wildland fire management activity under all alternatives. Wildfires within the wildland-urban interface can pose a threat to communities and infrastructure/improvements, such as power lines, communication towers, developed recreation sites, adjacent private land, and structures. Under all alternatives, wildland fire management activities would minimize the risk of loss of life, damage to property, or degradation of ecosystem function with varying degrees of magnitude, depending on acres treated and management objectives.

Environmental Consequences for Fire and Fuels Under Alternative A

Effects from Natural Resource Management

Alternative A would not make any changes to the existing plan. Alternative A would ensure the management of fire and fuels would continue as it has since 1986.

Alternative A emphasizes recreation and access over wildland fire management for ecological benefits. The potential risk of human-caused ignition as a result of increased access was determined as a potential impact under alternative A. The use of human-caused ignitions for ecological benefit would not be allowed under alternative A.

Alternative A would provide direction for prescribed wildfire in specific management areas and for specific management directives. It would not, however, provide forestwide directives for mechanical thinning or prescribed burning. This would not manage fire as effectively for the ecological benefit.

Alternative A would continue to monitor air quality at the minimum level necessary to comply with the Federal Clean Air Act in cooperation with other Federal, state, and local agencies (USDA Forest Service 1986).

Under alternative A, all unplanned ignitions would receive an appropriate management response. Human-caused ignitions would be suppressed utilizing the appropriate management response. Protection of life, property, and other values at risk from wildland fire would be the priority. Damage to property would be minimized by aggressive suppression of fires in or near developments, or fires that may spread to developed areas (Forest Service 1986).

While the Forest Service would use the potential operational delineations analysis and attempt to manage fires under a flexible, adaptive system, alternative A would prioritize wildfire suppression as defined in the 1986 Forest Plan. Under alternative A, wildfire suppression would be identified geographically in three categories (Forest Service 1986):

- Immediate suppression
- Expanded suppression
- Expanded suppression with the option to use unplanned ignitions for resource benefits

Figure 3-14 shows the geographic locations of the different suppression zones across the Lincoln NF. These zones determine what level of suppression action is needed. Amendment 16 of the 1986 Forest Plan provides guidance to evaluating all planned and unplanned ignitions for coordination with other resource activities while still assigning priority to necessary fire and fuels management projects over other project work (Forest Service 1986).

These suppression zones supersede any flexible or adaptive management decisions offered under the potential operational delineations process and the wildland fire decision support system the Forest Service would implement over the life of the plan. This would reduce opportunities to manage wildland fire for ecological benefit or other beneficial conditions and would increase the potential for large, uncharacteristic wildland fires under alternative A. Selection of alternative A would result in a continued departure from desired conditions for frequent fire ERUs. Wildland fire would function in its natural ecological role at site-specific areas and not at a landscape scale. There would be progress made, but the rate would not be sufficient to reduce the threat of uncharacteristic wildfire or to protect communities at the same rate as the action alternatives.

Environmental Consequences for Fire and Fuels Common to Alternatives B, C, D, and E

Effects from Natural Resource Management

The action alternatives would provide forestwide management of vegetation communities toward desired conditions, including fire regime. All action alternatives would provide objectives for mechanical thinning and prescribed burning in frequent fire ERUs (table 3-17 and table 3-18). This would focus treatments to reduce adverse effects from uncharacteristic wildfire and assist with wildland-urban interface concerns. The vegetation management objectives for the ponderosa pine and mixed conifer ERUs would increase the rate toward desired conditions of open stand structure, as noted in the Upland Vegetation Communities section.

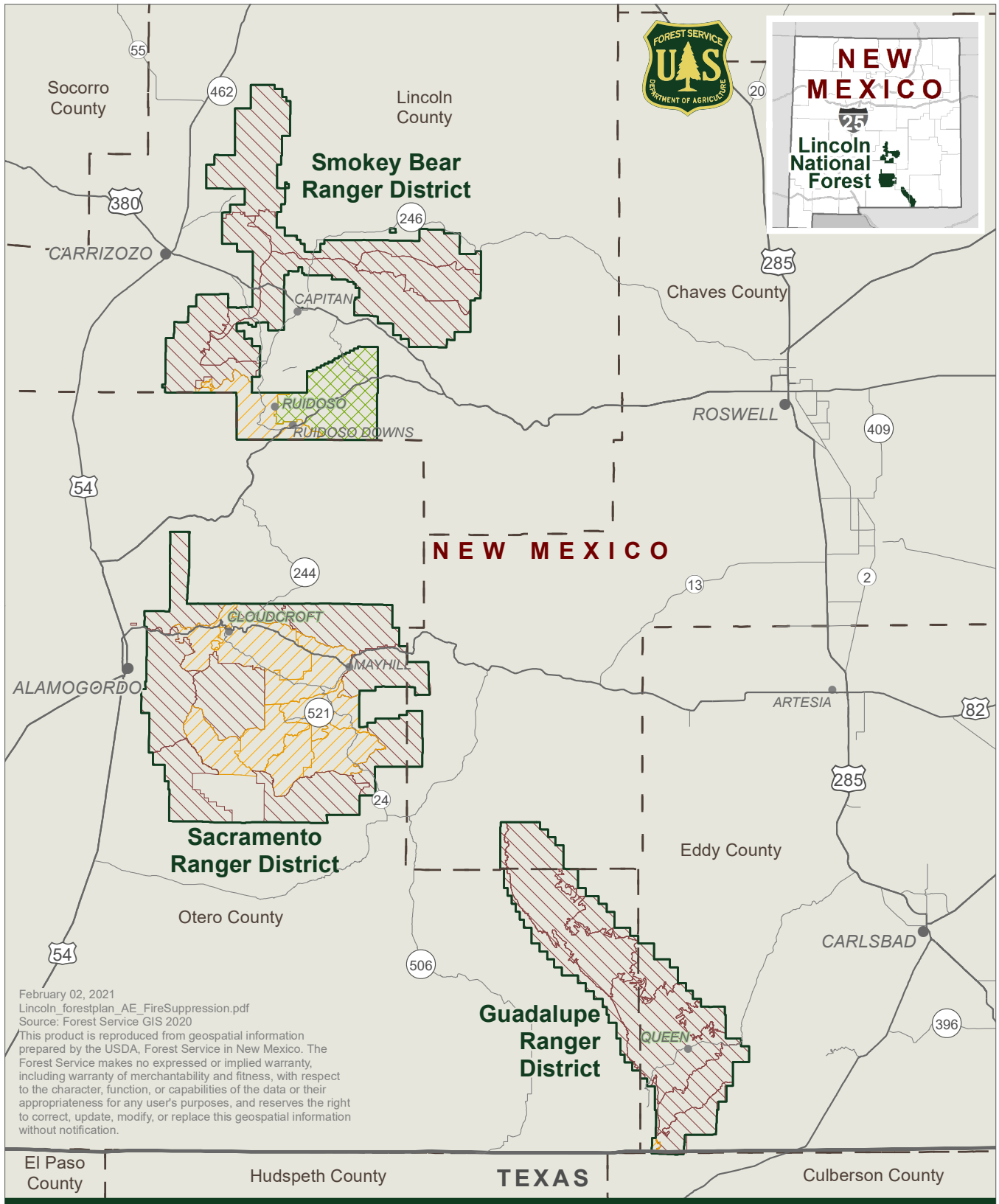





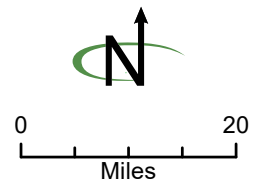


Figure 3-14 Wildfire Suppression Zones

-  A. Immediate suppression
-  B. Expanded suppression, with optional unplanned ignitions for resource benefits
-  C. Expanded suppression
-  Lincoln National Forest, Forest Plan revision area
-  County



All action alternatives would transition from the use of suppression zones to a wildland fire decision support system that implements the potential operations delineation zones of wildland fire management. This system allows fire managers flexibility when managing a wildland fire, including which resources are at risk, where the ERUs would benefit from fire, and which features to use when containing the fire. This would move ERUs toward desired conditions, while preserving the safety of firefighters and the public and protecting infrastructure and values at risk. This management system would also decrease the risk of uncharacteristic wildfire compared with alternative A.

All action alternatives allow wildland fire to function as its natural ecological role on a landscape scale and across administrative boundaries, burning with a range of intensity, severity, and frequency under conditions where safety and values at risk can be enhanced, mitigated, and protected. They also would allow ecosystems and watersheds to function in a healthy and sustainable manner, resulting in indirect ecological beneficial impacts.

Environmental Consequences for Fire and Fuels Under Alternative B

Effects from Natural Resource Management

Alternative B includes objectives to mechanically treat 11,000 to 19,500 acres and include at least 200,000 acres of prescribed burning over 10 years of the frequent fire ERUs and the piñon-juniper woodlands. This mix of mechanical treatments and the prescribed burn objectives would provide for resilient ecosystems by reducing the potential for uncharacteristic wildfire. As compared with alternative A, this alternative would result in a decrease in departure of vegetation, as noted in the Upland Vegetation Communities section. This alternative would take a more aggressive, forestwide approach to reducing fire behavior and would thus move more acres to lower fire hazard more quickly than alternative A.

Effects from Wilderness and Special Management Areas

Alternative B would recommend 40,500 acres for wilderness designation. The limitation on vegetation treatments due to the restricted use of mechanized and motorized equipment could increase the risk of uncharacteristic wildfire in the recommended wilderness and surrounding area. Many of these recommended wilderness areas lack recent mechanized vegetation treatments, which could result in more departed conditions than the vegetation community forestwide. As a result, vegetation conditions in these areas could be more vulnerable to uncharacteristic wildfire events compared with alternative A.

Environmental Consequences for Fire and Fuels Under Alternative C

Effects from Natural Resource Management

Alternative C would decrease the intensity of restoration treatment objectives and emphasize natural processes to move vegetation communities toward desired conditions. This alternative would accept a larger risk across larger areas, such as allowing for more managed fire. The emphasis of natural ignitions playing a bigger role in ecosystems at the landscape level would be greater than under the other alternatives. As a result, larger areas would have the potential to trend toward the desired condition and function.

Alternative C would emphasize allowing natural processes to move vegetation communities toward desired conditions. Accordingly, it would include objectives to mechanically treat only 6,500 to 12,500 acres over 10 years of the frequent fire ERUs and the piñon-juniper woodlands. Limiting the acres of thinning would result in an increased risk of uncharacteristic wildfire events, compared with alternative B, but still decreased compared with alternative A.

Effects from Wilderness and Special Management Areas

Since alternative C recommends the most acreage of wilderness (402,000 acres), the limitation on vegetation treatments due to the restricted use of equipment is greatest and could increase the risk of uncharacteristic wildfire in the recommended wilderness and surrounding area the most out of all alternatives. As a result, vegetation conditions in these areas could be more vulnerable to uncharacteristic wildfire events compared with alternative A.

Environmental Consequences for Fire and Fuels Under Alternative D

Effects from Natural Resource Management

Same as described under alternative B.

Effects from Wilderness and Special Management Areas

Same as described under alternative B.

Environmental Consequences for Fire and Fuels Under Alternative E

Effects from Natural Resource Management

Same as described under alternative B.

Effects from Wilderness and Special Management Areas

Alternative E would recommend only 21,900 acres for wilderness designation, the least of all action alternatives. The limitation on vegetation treatments would affect only a small proportion of the overall Lincoln NF (2 percent), so increases to the risk of uncharacteristic wildfire would be minimal and similar to alternative A.

Cumulative Environmental Consequences for Fire and Fuels

Forest Service-managed lands on the Lincoln NF and adjacent Federal, State, tribal, county, and privately owned land surrounding the Lincoln NF are considered the cumulative effects analysis area. Ongoing and planned actions on and near the Lincoln NF would influence fire and fuels management effectiveness. The time frame for cumulative environmental consequences for future action is 10 to 15 years.

The cumulative effects analysis does not quantify the effects of past actions; current conditions were used to understand cumulative effects of past management actions. Past management practices, throughout the broader landscape, have resulted in forest conditions that are departed from the 1986 base year. Actions taken outside the Lincoln NF include adjacent communities preparing community wildfire protection plans and Federal and state-funded hazardous fuel reduction projects.

Past management has resulted in an abundance of smaller and younger trees across the landscape, a buildup of fuels, and the occurrence of more continuous fuels than were historically present. Wildland-urban interface treatments and fuel reduction projects on lands of other ownership would support wildland fire management efforts on the Lincoln NF. Indirect beneficial impacts can be expected when a wider use of wildland-urban interface and fuels reduction projects are used across the landscape.

The importance of fuels treatments and wildland fire management is recognized by most State and Federal agencies, adjacent landowners, and the general public. Current and proposed wildland fire management of the cumulative environmental analysis area utilize wildland fire for resource benefits, prioritizing highly departed vegetation communities. This would have beneficial cumulative impacts on wildland fire management by restoring natural fire regimes.

Proposed wildland fire management activities on the Lincoln NF are consistent with those proposed on adjacent lands and would reduce the potential for cumulative effects from uncharacteristic wildfires. The goal of adjacent agencies is to lower the risk of uncharacteristic wildfire within the plan area. These efforts would contribute to landscape restoration on a large scale, with a focus on achieving vegetation desired conditions and restoring more natural fire regimes.

Future wildland fire occurrence across the landscape would be more effective with the combination of treatments undertaken by various jurisdictions. Use of prescribed wildfire to reduce wildland fire hazard and adverse ecological damage would have beneficial indirect impacts. Positive cumulative impacts from wildland fires would reduce uncharacteristic wildfire risk and increase resilience.

As communities continue to grow into the wildland-urban interface, coordination with adjacent landowners, agencies, and the general public would reduce the chance of inaction impacts, such as an increased risk of loss of life and homes, degradation of the ecosystem, and increased suppression costs. Vegetation management and prescribed burning would reduce uncharacteristic wildfire effects and enhance the resiliency of values at risk. Increasing the area treated across the landscape would have a beneficial influence on fire behavior and potentially reduce the spread and intensity of wildfires.

Impacts from wildland fire smoke would continue over time until fuel loads are returned to desired conditions. Smoke impacts are a result of multiagency prescribed burning and potentially large summer wildfires. Public tolerance of smoke is low. Continued coordination and education of the community on the benefits of managed wildland fire by State and Federal agencies would reduce social impacts of wildland fire management actions. Smoke impacts are the highest during a wildfire event, second highest under a first entry of a prescribed burn.

The cumulative environmental consequences of the proposed wildland fire and vegetation management efforts would contribute to moving vegetation communities toward desired conditions. Multijurisdictional reintroduction of wildland fire would improve landscape-scale effects, such as natural fire regimes. Fuels management treatment, combined with present and foreseeable future actions by multiple jurisdictions, would have positive cumulative effects. There are no anticipated negative cumulative effects from vegetation treatment and wildland fire management actions from management on adjoining lands.

Scenery

Affected Environment

The Lincoln NF offers a wide diversity of settings, from conifer-covered mountains and piñon-juniper woodlands rising from high desert plains to spectacular canyons. People are drawn to the Lincoln NF area for its panoramic views, cooler high-elevation climate, and unique recreational opportunities. The Lincoln NF offers dark night skies and provides the visual backdrop to many communities and homes. The Lincoln NF area has a variety of scenic settings with mesas, canyons, peaks rising from deserts, meadows, and grasslands. The Lincoln NF also has many prehistoric and historic sites that add richness of character and culture.

The scenic characteristics of the Lincoln NF are important for setting the sense of place that the Lincoln NF offers visitors. Scenery provides the backdrop and the setting for the entire Lincoln NF while defining its character, and it contributes substantially to the experiences people have and seek on the Lincoln NF. It includes the ecological features and human elements of the Lincoln NF, which combine to give an area identity and contribute to a sense of place. Scenery varies depending on existing natural features, including vegetation, water features, landform and geology, cultural features, and human alterations (for example, buildings, structures, and manipulations of the land or vegetation).

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. Some off-forest roads and many National Forest System roads, trails, and recreation sites have high public concern for viewing scenery. This is especially true for those along the Sunspot and Billy the Kid National Scenic Byways, the Guadalupe Backcountry Byway, the White Mountain and Capitan Mountains designated wilderness areas, and the Guadalupe Escarpment WSA. A high concern for viewing scenery means that users expect to see a natural-appearing landscape.

Perennial streams and 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 Lincoln NF. The water, landform, and vegetation attributes provide for a unique and outstanding scenic quality with variety, unity, vividness, intactness, order, uniqueness, pattern, and balance.

Most noticeable changes to scenic conditions across the landscape occur through natural processes such as wildfires or flooding. These natural disturbances 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 in the Sacramento Mountains have resulted, at certain elevations, in large areas of aspen that provide beautiful golden fall colors intermixed with green conifer-covered mountains. Other factors that continue to affect the sustainability of the scenic character of the Lincoln NF include drought conditions affecting vegetation and water features, nonnative invasive plants affecting native vegetation, tree encroachment on meadows and other forest openings, and conifer encroachment on aspen.

The Forest Service recognizes the importance of scenery and currently manages the scenic resources through the SMS, which is structured to emphasize natural-appearing scenery, but recognizes scenery more broadly as the visible expression of dynamic ecosystems functioning within places that have unique aesthetic and social values. The SMS recognizes that, in addition to naturally occurring features, positive scenery attributes associated with social, cultural, historical, and spiritual values, including human presence and the built environment, can also be valued elements of the scenery.

Visual Quality Objectives

The current forest plan states that all lands on the Lincoln NF are managed to achieve some level of visual or scenic quality. The standards to which they are managed are defined as VQOs. Management area standards and guidelines assign VQOs for each management area, often summarizing the acres for each VQO occurring within the management area. Table 3-54 summarizes acreage of each VQO from the visual resource inventory.

This system has since been superseded by the Forest Service SMS, which was introduced in 1995 and is described in *Landscape Aesthetics: A Handbook for Scenery Management* (USDA Forest Service, Agricultural Handbook No. 701). This handbook outlines the process of scenery management and describes a systematic approach for determining the relative value and importance of scenery in national forests. The handbook also introduces the concept of SIOs, a tool that scenery resource specialists can employ to document acceptable limits of visual change to the existing setting.

Existing scenic integrity is the current state of the landscape, considering previous human alterations, and indicates the intactness and wholeness of the scenic character. Previous human alterations often disrupt the character of the 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.

SIOs define the level of integrity or the alteration allowed to maintain scenic integrity. Table 3-55 provides an intersection between the VQOs reported in the 1986 Forest Plan and the SIO values defined under the SMS. The plan area includes preservation VQOs, corresponding to very high SIOs. High SIO values correspond to a landscape character that is “natural or unaltered.” The existing acreage for each SIO is thus based on the acreage reported by the Forest Service in the 1986 Forest Plan for the corresponding VQO, as presented in table 3-54. Existing scenic integrity for the Lincoln NF, based on corresponding VQO acreages, is illustrated in figure 2-3.

Table 3-54. Visual Quality Objective Definitions and Acreage Summary for the Existing Lincoln NF Plan

Visual Quality Objective	Definition	Acres	Forestwide Percent
Preservation	Provides for ecological change only.	104,885	10
Retention	Human activities are generally not evident to the casual visitor.	112,623	10
Partial Retention	In general, human activities may be evident but must be subordinate to the characteristic landscape.	313,117	29
Modification	Human activities may dominate the characteristic landscape but must, at the same time, use naturally established form, line, color, and texture. Human activities should appear as natural occurrences when viewed from the foreground or middle ground.	345,009	32
Maximum Modification	Human activity may dominate the characteristic landscape but should appear as natural occurrences when viewed as the background.	209,420	19

Source: Forest Service GIS 2020

Table 3-55. Visual Quality Objectives and Scenic Integrity Objectives Comparison Table

VQO	Explanation	SIO
Preservation	The valued scenery appears natural or unaltered. Only minute visual disturbances to the valued scenery, if any, are present.	Very High
Retention	The valued scenery appears natural or unaltered, yet visual disturbances are present; however, they remain unnoticed.	High
Partial Retention	The valued scenery appears slightly altered. Noticeable disturbances are minor and visually subordinated to the valued scenery.	Moderate
Modification	The valued scenery appears moderately altered. Visual disturbances are codominant with the valued scenery.	Low
Maximum Modification	The valued scenery appears heavily altered. Disturbances dominate the valued scenery being viewed.	Very Low

Forest Service 1974, 1995

Environmental Consequences for Scenery

Methodology and Analysis Process

Probable management activities related to alternatives A, B, C, D, and E are used to evaluate or predict short- or long-term effects, or both, on scenery on the Lincoln NF. These management activities are evaluated in relation to their effects on scenic character and scenic integrity. To make broad comparisons between alternatives, this programmatic analysis describes impacts related to access and recreation, the amount of developed recreational facilities and opportunities for dispersed recreation, natural resource management, economics, livestock grazing, and wilderness and special management areas. As such, this section is organized by the issue topics identified during scoping and subsequent alternatives development that are most applicable to scenery. Project-specific analysis would provide more in-depth analysis when implementing the plan.

Assumptions

Scenery is not expected to be a primary driver in selecting one alternative over another. This is because predicted impacts between alternatives with regard to scenery are not dramatically different. Differences between alternatives are small because:

- Scenic quality across all alternatives is anticipated and assumed to increase as vegetation restoration treatments over the long term improve the visual landscape. As such, the capacity for improving scenery resources would ultimately be limited by the ability to maximize restoration treatments.
- All alternatives, including alternative A, are expected to achieve desired conditions for scenery.
- All projects implemented on the Lincoln NF will require a site-specific analysis of their potential impacts on scenery resources and verification of the need for mitigation to meet or exceed desired conditions.
- None of the alternatives contains specific objectives to reduce scenic character and integrity, but resource activities can affect and reduce scenic character and integrity over the short term. The short-term and long-term environmental consequences to scenery as a result of resource projects and activities would be evaluated at the time of the site-specific decision.

Indicator

- Changes to scenic integrity from anticipated management activities associated with each alternative.

Environmental Consequences for Scenery Common to All Alternatives

There is the potential for management activities to affect the existing landscape and scenic integrity under all alternatives. Management activities affect scenic resources by altering the appearance of the landscape and include both short-term effects (generally lasting 1–2 years) and long-term effects (generally lasting more than 2 years). Short-term and long-term effects would be identified during the project-level analysis based on the potential effects of the specific activities proposed.

While long-term effects on scenery can persist for years on the landscape, short-term effects on scenery are usually noticeable after project completion and are seen as temporary contrasts to the surrounding natural landscape. Management activities, although they may have some short-term impacts on scenery, also may begin to move the landscape toward the desired scenic character. Effects that move the landscape toward the desired scenic character are often realized over a long period or cumulatively and

lead to the lasting sustainability of valued scenery attributes. Project mitigation or design would consider scenic resources under all alternatives; it is assumed that, through site-specific project design or mitigation, the landscape would move toward scenery desired conditions under all alternatives.

Effects from Access and Recreation

Road Maintenance, Construction, and Decommissioning

The maintenance of open roads can involve activities that appear unnatural on the landscape. Similarly, decommissioning administratively closed roads can include berms and trenches that appear like raw piles of earth or can be as extreme as moving large mounds of earth and removing trees and other vegetation along an unneeded road. This activity can be unsightly in the short term; however, within a few years, road decommissioning is typically beneficial to scenery resources by recontouring slopes to mimic natural landforms and rehabilitating and revegetating exposed soils typically noticeable on cut and fill slopes created during road construction.

Recreation

Recreation, both developed and dispersed, would continue in all alternatives. Developments for recreation are evident, such as roads, trails, and campground and trailhead facilities. These developments are appropriate for the recreation opportunity spectrum settings. The recreation opportunity spectrum incorporates the naturalness of scenery as one of the variables of the setting characteristics. When facilities are designed to blend with the surrounding landscape, they have minimal effects on scenery. Additionally, recreation facilities that conform to the cultural landscape are also appropriate in high scenic integrity areas.

Effects from Natural Resource Management

All five alternatives (A, B, C, D, and E) would allow for mechanical treatments (thinning and commercial harvests) while offering opportunities for fuelwood collection. Mechanical treatment that targets vegetation conditions to reduce the risk of uncharacteristic wildfire, manage nonnative invasive plants, or improve watershed conditions would change the short-term scenic character where it occurs. Scenery would be affected in the short term following each of these activities, but the long-term scenic quality would improve over the landscape. Short-term effects on scenery from these types of activities include unnatural-appearing slash piles, stumps, bare soil, and scars on remaining vegetation. Depending on the intensity of the treatment, it can result in a forest that looks moderately altered in the short term. The long-term effects can be beneficial to the scenic character. Mechanical treatments typically shift forested lands to a more open vegetation mosaic and provide increased visual access, and they may make scenic attributes more resilient to uncharacteristic large-scale disturbance. Often variety, texture, and color are enhanced, along with improved wildlife habitat, vegetation, and watershed conditions.

Activities from prescribed wildfire would create short-term effects on the scenic character in the form of burned, blackened vegetation and charred ground surface that are generally considered less attractive but are not necessarily indicative of human alteration. Grasses and other vegetation typically resprout within one or two growing seasons after a burn, depending on when the burning occurs and the moisture conditions during the growing season. Burn control lines may be evident along maintenance level 1 and 2 travel routes and may detract from a natural appearance. In the long term, prescribed burning usually increases the diversity of texture, color, vegetative size classes, and distribution across the landscape. In the short and long term, prescribed burning often creates the appearance of more uniform ground cover, which is a preferred scenic setting in some landscapes.

Effects from Wilderness and Special Management Areas

Each alternative provides for the retention of existing designated wilderness, scenic byways, national recreation trails, and inventoried roadless areas. Management of these areas generally maintains the scenic character identified as part of their designation.

Environmental Consequences for Scenery Under Alternative A

Effects from Access and Recreation

Although alternative A would close, decommission, or restore roads and travel ways identified for such action through scoping and public involvement, it would not provide guidance to address dispersed recreation, which would continue under current management throughout the Lincoln NF. Impacts from dispersed camping and associated trails are occurring in riparian areas and near waterways. Ongoing impacts from vehicular travel in riparian areas would continue under alternative A, resulting in long-term, localized effects on visual quality.

Effects from Natural Resource Management

Alternative A provides management area-specific goals, objectives, standards, and guidelines for visual quality using the visual management system. The plan guidance and direction are not relevant for the new SMS now being used. The 1986 Forest Plan has not been amended to incorporate scenic integrity objectives and still relies on the visual management system. As such, the existing scenic integrity analysis (which included a SMS inventory completed in 2013) would not be used under alternative A. Continued management under the 1986 Forest Plan (as amended) would not allow for management that incorporates the current scenic management objectives.

This alternative does not reflect the same emphasis on restoration and improved ecological desired conditions as the action alternatives. Plan direction for visual resources under alternative A would not incorporate ecosystem management concepts into scenery management, making it difficult for managers to plan projects and work toward an improved scenic resource condition. For example, healthy, fire-resistant vegetation (i.e., vegetation conditions allowing fires to move through the landscape without doing major damage and that recover relatively quickly from fire) is important for long-term scenic quality and scenic character resilience; however, the visual management system in the existing plan does not allow short-term impacts from vegetation management, even if there are long-term benefits.

Visual quality objective maps would continue to be used during project planning. The VQO maps do not reflect changes in visitor use patterns, do not incorporate views from trails, do not reflect current public opinion (especially concerns about community backdrops and scenery), and do not reflect an ecosystem management landscape context. Additionally, VQOs do not recognize the cultural importance of some human modifications, including historic sites, well-designed buildings (such as visitor centers), and human-made features such as campgrounds; therefore, VQOs do not provide adequate guidance for protecting the scenic quality or moving toward desired conditions over the life of the plan.

Vegetation management through mechanical treatments and prescribed wildfire would occur across all alternatives, although under alternative A there would be no objectives for a specific amount per year; prescribed burns would be implemented on a project-by-project basis based on available funds and opportunities under current management. This would result in fewer improvements to existing visual resources or the scenic integrity.

Effects from Economic Extraction

Alternative A would not provide guidance on forest products and timber suitability and, as a result, timber production would continue under current management. There would be no improvements to existing visual resources or the scenic integrity from the continuation of current timber production practices under this alternative.

Effects from Wilderness and Special Management Areas

Under alternative A, 20,200 acres fall within the Guadalupe Escarpment WSA. This WSA would not be managed for wilderness; therefore, it would not receive the additional protection of scenery that would result from wilderness designation.

Environmental Consequences for Scenery Common to Alternatives B, C, D, and E

Effects from Access and Recreation

Road and Recreation Infrastructure Maintenance

Alternatives B, C, D, and E would emphasize the reconstruction and rehabilitation of existing roads over new road construction. Moreover, they would direct the closure and restoration of temporary roads that support ecosystem restoration, fuels management, or other short-term projects to more natural vegetation conditions upon completion of those projects. Compared with alternative A, these enhanced measures would allow for better protection of scenery.

Recreation

The Forest Service would manage dispersed recreation through plan components, which would prescribe the relocation, where possible, of motorized and nonmotorized trails that adversely affect riparian areas. Dispersed camping sites would also be rehabilitated or otherwise mitigated under all action alternatives where site conditions are no longer consistent with the area's scenic integrity objective and/or environmental damage is occurring. Dispersed recreation often occurs along riparian areas and within the view of motorized travelers along these routes. Dispersed recreation areas that incur a high amount of human activity tend to be altered, with trampled soils and vegetation, litter, and trees that have been cut or damaged. Relocation, where possible, of motorized and nonmotorized trails would reduce human alteration and improve the scenic quality of these areas for recreational drivers and other forest users. Over the long term, these improvements would provide better scenic integrity compared with alternative A. The exception would be Alternative E, which emphasizes increased recreation and access that may result in more impacts on scenic integrity.

Alternative E focuses most on promoting recreational uses at developed recreation sites. This alternative differs from the other alternatives in that it allows more human activity to be visible on the landscape. While alternative E would also follow the travel analysis plan for decommissioning roads, it would also emphasize recreational access. Compared with alternative A, increased human presence under this alternative could result in diminished high-quality scenery at recreation sites and occasionally along road and trail vistas. This is because this alternative would allow for increasing evidence of human alteration such as vegetation trampling and removal.

Effects from Natural Resource Management

Under all action alternatives, the SMS would be fully implemented, including desired conditions, objectives, standards, guidelines, and management approaches, to manage scenic resources. The conversion from the visual management system to SMS in the action alternatives aligns with current Forest Service policy and is consistent with a shift to ecosystem management benefits and principles and

ecological restoration. Activities such as prescribed wildfire and large-scale vegetation management activities to restore ecosystem functions are examples of management activities that provide long-term benefits. These activities may have visually dominant effects in the short term (which may be inconsistent with adopted scenic integrity objectives), yet typically provide for more positive scenic elements that are generally considered more attractive, such as variety, larger trees, and healthier, more resilient vegetation over the life of the plan.

Implementation of the SMS and proposed scenic integrity objectives would be based on the existing scenic integrity analysis that was completed in 2013. A description of each SIO proposed is summarized below. A map of the SIOs is provided in figure 2-3. Table 3-56 contains a breakout of proposed SIOs by acreage.

Table 3-56. Forest Acres under SIOs Compared with Alternative A

VQO (No Action)	SIO (SMS Implementation)	Percentage of Forest under Alternative A	Percentage of Forest under proposed plan Revision
Preservation	Very High	10%	9%
Retention	High	10%	40%
Partial Retention	Moderate	29%	48%
Modification	Low	32%	2%
Maximum Modification	Very Low	19%	1%

Source: Forest Service GIS 2020

Very High Scenic Integrity

Areas of very high existing scenic integrity would include two wilderness areas and inventoried roadless areas that have seen little human influence and make up about 9 percent of the Lincoln NF. These large areas of the Lincoln NF 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 nonmotorized trails.

High Scenic Integrity

Most of the Lincoln NF 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. Although roads and trails are evident, they serve as the viewer platform, offering opportunities and access to view scenery. Some prescribed burning, livestock grazing structures, or other low-impact facilities may be noticeable as well, but these also borrow from landscape elements.

Moderate Scenic Integrity

About 48 percent of the Lincoln NF currently falls into the moderate scenic integrity category. 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 recreational developments, such as campgrounds, visitor centers, trailheads, and picnic areas, are noticeable; but, these 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 that appears slightly altered. Some other activities that have slightly altered the landscape include fuels reduction activities and wildlife habitat improvements.

Low Scenic Integrity

About 2 percent of the Lincoln NF is in the low scenic integrity category. Low scenic integrity, or landscapes that appear moderately altered, is characterized by more intensive vegetation management and small developed communication sites and utility corridors (figure 2-3). 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; vegetation type changes; or architectural styles outside the landscape being viewed.

Communication sites and utility corridors occur throughout the Lincoln NF and begin to dominate the landscape when viewed, but they are smaller in scale and have less right-of-way clearing than other larger-scale similar activities. Although dominant on the landscape in some areas, reclaimed mining activities with minimal landform alterations and revegetation are beginning to borrow from surrounding landscape features.

Very Low Scenic Integrity

In about 1 percent of the Lincoln NF, landscape features are dominated by developments such as large electronic sites, major utility corridors, ski areas, and mining activity. These developments add uncharacteristic forms, lines, and colors to the landscape. These areas are of very low existing scenic integrity.

While acreages of scenic integrity objectives are the same across all action alternatives, alternative C has 402,000 acres of recommended wildernesses and two special cave management areas. Alternatives B and D each have 40,500 acres of recommended wilderness and the same two special cave management areas. The portion of the Guadalupe Cave Management Area located in the Guadalupe Escarpment WSA would be managed to preserve a very high SIO, and the Snowy River Cave Management Area would be managed to preserve a moderate SIO. These areas would lead to additional opportunities to experience unaltered landscapes. Decommissioning of 75 miles of administratively closed roads within 15 years is similar to decommissioning 100 miles under alternative A. It would create similar access limitations in these less-accessible areas and make it more difficult for the public to experience and enjoy the scenery as under alternative A.

Alternatives B, C, D, and E would also incorporate guidance for considering best environmental design practices to advance environmentally sustainable design solutions, such as those in the Sustainable Recreation Site Design Guide. Additionally, facilities would adhere to scenic integrity objectives and not be located in areas of very high and high scenic integrity, unless they are designed to blend with the general landscape. Compared with alternative A, adherence to this guidance would result in improvements to the landscape's scenic integrity throughout the Lincoln NF.

Alternatives B, C, D, and E all contain objectives for mechanical thinning of various vegetation communities. Mechanical thinning objectives over a 10-year period would range from 6,500 to 12,500 acres under alternative C and 11,000 to 19,500 acres under alternatives B, D, and E. Restoration of aspen communities would also address ungulate browsing through the construction of barriers. Moreover, wildland fire could be used to move ecosystems toward more natural fire regimes, with an objective for 200,000 acres of prescribed burning over 10 years. Wildland fire would result in blackened and scorched vegetation that may be visible in project areas following treatments. While these resource management actions would result in short-term visual impacts on the landscape, they would serve to restore the Lincoln NF to a more natural variable state that improves ecosystem health and function over the long term. Compared with alternative A, this would result in more beneficial effects on scenic integrity objectives.

Effects from Wilderness and Special Management Areas

Alternatives B and D have 40,500 acres identified as recommended wilderness. Alternative C has 402,000 new recommended wilderness, the most of any alternative. Alternative E has 21,900 acres identified as recommended wilderness. The recommended wilderness would increase high value scenery areas on the Lincoln NF. Compared with alternative A, these alternatives would increase the scenic integrity on the Lincoln NF through reduced resource use, which would decrease or limit impacts on the scenic character in these areas by limiting human alteration.

Managing 19 areas as recommended wilderness would marginally increase the cost and reduce the ability of the Forest Service to implement forest health improvement projects that would benefit long-term scenic quality. It would increase the complexity of wildland fire management because of restrictive standards and guidelines for wilderness, especially those with regard to motorized and mechanized uses. In turn, more careful planning would be necessary. This would be most problematic in recommended wilderness areas that have highly departed from desired conditions and are characterized by heavy fuel loads and vegetation densities. It would be moderately problematic in recently burned areas that currently have lower fuel loads but may need future vegetation treatments to maintain desired conditions.

Cumulative Environmental Consequences for Scenery

Several past, present, and reasonably foreseeable plans and actions have contributed or would contribute to the cumulative setting with regard to scenic resources. These include ongoing invasive plant management, restoration and habitat improvement projects, management of scenic byways, climate change, and ongoing land management actions of non-Federal entities. Thus, potential impacts from implementation of the revised forest plan are considered cumulatively within the context of the following plans and actions:

- South Sacramento Restoration and Smokey Bear North Habitat Improvement projects
- Planned activities along scenic byways such as Billy-the-Kid, Sunspot, and the 30-mile Guadalupe Backcountry Byway
- Climate change-induced, atypical temperatures and rainfall patterns
- Increasingly severe seasonal wildfires
- Ongoing regional development

The Forest Service is currently in the planning phases of the South Sacramento Restoration Improvement project and the Smokey Bear North Habitat Improvement project is currently in the implementation phase, both of which will result in landscape improvements that contribute, on a cumulative level, to enhanced natural landscapes and scenic resources under all alternatives. The Forest Service is also in the process of developing a management strategy for treating nonnative, invasive plants across the Lincoln NF, which will result in an integrated nonnative, invasive plant management plan. Implementation of these plans will contribute to beneficial impacts on the scenic integrity on the Lincoln NF under all alternatives. Implementation of the revised forest plan would contribute cumulatively to beneficial impacts from these habitat improvement projects.

There are three scenic byways that intersect the plan area. The Billy-the-Kid and Sunspot scenic byways are both designated national scenic byways and administered by the State of New Mexico Department of Transportation. Recent wildfires have affected the scenic resources along the Lincoln NF's portion of the Billy-the-Kid National Scenic Byway; the area is slowly recovering from these wildfires. Along the 16-mile Sunspot Highway National Forest Scenic Byway, which extends from Cloudcroft to Sunspot, conifer encroachment is a dominant characteristic of the visual landscape. Restoration activities are planned along

portions of the roadway, which are expected to restore stands of aspen. This would contribute to beneficial impacts on the scenic integrity on the Lincoln NF under all alternatives. Implementation of the revised forest plan would also contribute cumulatively to these beneficial impacts.

The 30-mile Guadalupe Backcountry Byway is managed by the BLM and travels through the transition from cholla cactus in the Chihuahuan Desert west of Carlsbad up into the pine forest of the Guadalupe Escarpment. While scenery along the byway is of mostly high value, a portion of the byway is also located along the Capitan Reef of the Permian basin and passes through an area of producing oil and gas wells. The Lincoln NF portion of the byway is predominantly located in a scenic area characterized by the presence of piñon-juniper, rock outcroppings, canyons, and bluffs. Fuel treatments in this area would affect visual resources. Overall, impacts from planned activities along scenic byways are not expected to contribute cumulatively to impacts on the scenic character and integrity resulting from the proposed plan under any alternative.

There is general agreement among climate modelers that the southwestern United States is experiencing a warming and drying trend that will continue well into the latter part of the twenty-first century. While some models predict increased precipitation for the region, researchers expect the overall balance between precipitation and evaporation would still likely result in an overall decrease in available moisture. Temperatures are predicted to rise by 5 to 8 degrees Fahrenheit by the end of this century, with the greatest warming occurring during winter months. Some climate model results also suggest a fivefold increase in unusually hot days by the end of the century (Forest Service 2019h). The Lincoln NF climate change vulnerability assessment found that considerable portions of ecosystems in the plan area and characteristic plant communities in and near the Lincoln NF are at risk of ecological departure due to climate change, at present and in the future. Spruce-fir forest, ponderosa pine-evergreen oak, piñon-juniper grass, and ponderosa pine forest are the most vulnerable, while mountain mahogany mixed shrubland, piñon-juniper evergreen shrub, and semi-desert grassland are the least vulnerable to climate change (Forest Service 2019h).

Natural resources and settings would be vulnerable to adverse effects of atypical temperatures and rainfall patterns from climate change under all alternatives. Some associated effects include drought, an increased number and intensity of wildfires, increased insect and disease outbreaks affecting vegetation, and decreased water yield and availability. While the Lincoln NF is anticipated to begin implementing forest management strategies that address the processes of climate change through adaptive management that supports resilient ecosystems, the ongoing effects of climate change, such as insect infestations that visibly alter the extent and composition of forest cover, are expected to continue and contribute cumulatively to landscape change. When insect and disease outbreaks occur at epidemic levels, tree mortality with standing and fallen dead trees would reduce the scenic quality under all alternatives, especially when the mortality dominates scenic vistas. Defoliation of trees from insects and disease would also affect the scenic quality because scenic views change while trees are defoliated.

Severe wildfires would remove forest vegetation and diminish the scenic quality of the landscape, especially when a wildfire burns at an uncharacteristic scale or severity. When fires burn at high intensities over large areas, as is more likely during severe drought and increased temperatures, heavy runoff from extreme storms may remove soils and reduce surface vegetation, which would reduce the quality of scenic vistas. All these climate-induced changes, when taken together, can adversely affect scenery and the landscape integrity on the Lincoln NF over time. Alternatives B, C, D, and E would reduce climate-induced effects compared with alternative A.

Landowners who do not manage for scenery may have noticeable differences in levels of development across boundaries that could affect the scenic quality in areas such as scenic byways. Since most private

lands and other ownerships do not have regulations for scenic resource management, the effects of ongoing developments adjacent to National Forest System lands can sometimes have negative effects on scenic resources across the continuous landscape. This would occur under all alternatives. For example, the State of New Mexico manages State trust lands to optimize the economic benefit for the trust beneficiaries (including schools, universities, hospitals, and public institutions). While these lands permit public access, they are not managed like other public lands, such as national forests or national parks. As these lands are managed, leased, or auctioned, scenic resources may or may not be considered.

Forest visitors often view scenery as a single landscape with little discernment between landownerships. Sometimes management activities occurring at ownership boundaries can be quite noticeable if the change in form, line, color, or texture of the activity follows ownership boundaries rather than a natural landscape feature. If activities on private lands are designed to lessen impacts on scenic resources, the difference between private lands and National Forest System lands is less apparent. Under all alternatives, the regional, county, and community plans' inclusion of scenic or aesthetic resources or open space character help promote the management and value of scenic resources across ownership boundaries in the cumulative consequences analysis area. The forest plan would contribute cumulatively to these beneficial impacts.

With ongoing regional development, scenic resources are often degraded incrementally as numerous individual projects with relatively minor effects occur or are approved. As projects add buildings, utility lines, and mines to a landscape, there is an immediate decline in scenic quality that increases with every new proposed development. The loss of quality scenery and viewing opportunities on or surrounding Lincoln NF would result in adverse cumulative impacts on the scenic quality at the regional scale; however, implementation of the revised forest plan would not contribute measurably to adverse cumulative impacts from ongoing regional development. The Lincoln NF contains portions of the Sacramento Mountains, as well as the Jicarilla, Vera Cruz, Capitan, and Guadalupe Mountains. These mountainous areas offer scenic opportunities from roadways, including three scenic byways, and trails that connect throughout the Lincoln NF. There are also other Federal, State, and private lands that provide remarkable scenery and viewing opportunities throughout the region. Some management on adjacent lands complements Forest Service scenery management, including lands managed by Mescalero Apache Reservation near Ruidoso and surrounding lands managed by the BLM, which uses a visual resource management system. Counties with open space or scenery-related language in guiding documents or plans also complement scenery management of the Lincoln NF across ownership boundaries.

Cultural Resources

Cultural resources are the present expressions of human culture and the physical remains of past activities, such as buildings, structures, districts, landscapes, archaeological sites, and objects. For this analysis, cultural resources will be defined as current known historic properties in the three ranger districts located on the Lincoln NF ("the plan area"). The historic properties discussed here consist of cultural, historic, and prehistoric resources and are often referred to as sites.

The land within the boundary of the Lincoln NF contains cultural resources that demonstrate human occupation and use for approximately the past 12,000 years. Native Americans with Pueblo and Athapaskan ethnic affiliations and groups ancestral to these ethnic affiliations have occupied and used the plan area over this entire time span. Euro-Americans and others have also occupied and used the plan area over approximately the past 500 years. The plan area generally has been under the management of the Forest Service for more than 100 years, since 1906. Native American, Hispanic, and Anglo-American

traditional communities continue to use the plan area for economic, social, and religious purposes (see also Areas of Tribal Importance and Tribal Uses).

Information presented here is summarized from the Lincoln NF, Forest Plan Assessment Report, Volume II: Socioeconomic Resources (Forest Service 2019b), which should be referenced for a more detailed discussion of cultural resources.

Affected Environment

NEPA requires a consideration of “important historic, cultural, and natural aspects of our natural heritage.” This includes the necessity of independent compliance with the applicable procedures and requirements of other Federal and State laws, regulations, and executive orders. The principal Federal law addressing cultural resources is the National Historic Preservation Act (NHPA) of 1966, as amended (54 U.S.C. 300101 et seq.) and its implementing regulations found at 36 CFR 800.3. These regulations, commonly referred to as the section 106 process, describe the procedures for identifying and evaluating historic properties, for assessing the impacts of Federal actions on historic properties, and for project proponents consulting with appropriate agencies to avoid, reduce, or minimize adverse effects. Historic properties are cultural resources that meet specific criteria for listing on the National Register of Historic Places (NRHP).

The Forest Service meets its obligations under NHPA through the Forest Service Region 3 amended programmatic agreement (Forest Service 2014a) as well as additional program alternatives, including programmatic agreements and program comments per 36 CFR 800.14. Federal undertakings that may result in an adverse effect on historic properties are resolved as stipulated in the programmatic agreement. The Archeological Resources Protection Act of 1979, as amended, provides enforcement and legal remedies for all unauthorized removal of archaeological resources from Federal land.

Among other mandates, section 110a of NHPA (54 U.S.C. 306101(a) and 306102) requires Federal agencies to develop a program that ensures historic properties under the jurisdiction or control of the agency are identified, evaluated, and nominated to the NRHP. It also requires that they be maintained in a way that considers the preservation of their historic, archaeological, architectural, and cultural values.

The Lincoln NF is rich in historically and culturally significant properties. Table 3-57 lists acres inventoried by district. As of January 1, 2015, approximately 396,360 acres in the plan area have been inventoried, or 36 percent of its total area. Because the vast majority of inventory in the plan area has been conducted for section 106 compliance projects, the amount and location of inventory in each district are not a result of systematic sampling; rather, they reflect the extent of land management activities performed over the past four decades.

Table 3-57. Inventory of Lincoln NF Cultural Resources by District

Inventory of Cultural Resources	Smokey Bear District	Sacramento District	Guadalupe District	Totals
Acres inventoried using current survey standards	112,882	160,985	54,653	328,520
Acres inventoried using previous survey standards	16,000	39,390	12,944	68,334
Total acres inventoried	128,882	200,375	67,597	396,854
Total acres by district	423,416	548,865	288,539	1,094,639
Percentage of Lincoln NF inventoried	30%	37%	23%	36%

Source: Forest Service 2019b

A total of 3,424 cultural resources have been recorded in the plan area as of January 1, 2015. The density of sites varies widely across the four districts due to a variety of factors. On average, the density is 5.6 sites per square mile surveyed. In general, prehistoric resources compose the largest category with 2,500 sites; additionally, there are 661 historic sites and 263 sites with a historic and a prehistoric component (Forest Service 2019b).

Historic properties are defined under section 101 of NHPA (54 U.S.C. 300308) as any district, site, building, structure, or object included on, or eligible for inclusion on, the NRHP, based on their importance to local, regional, or national history. The main four NRHP criteria for eligibility are the following:

- Event—The property must make a contribution to the major pattern of American history.
- Person— The property is associated with significant people of the American past.
- Design and construction—This concerns the distinctive characteristics of the building by its architecture and construction, including having great artistic value or being the work of a master.
- Information potential—This 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 at least one of the following in order to be eligible: location, design, setting, materials, feeling, workmanship, or association. The plan area contains properties and characteristics that are of cultural and historical importance to both Native American and Euro-American peoples. Those characteristics of the plan area that are of cultural and historical importance to Native Americans are described in Areas of Tribal Importance and Tribal Uses.

Of the 3,435 cultural resources recorded in the plan area, approximately half have had evaluations made of their eligibility for listing on the NRHP. Many cultural resources 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 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. The Lincoln NF has a total of 23 formally listed NRHP historic properties and 1,209 eligible properties. These include multiple properties that are listed under one title, such as “Lincoln Phase Sites,” and are counted as one (table 3-58).

Table 3-58. National Register Historic Places: Listed Properties on the Lincoln NF

Properties Listed on the National Register of Historic Places	Description of Properties
El Paso and Southwestern Railway Water Supply System	Also known as the Bonito Pipeline, this is a 50-mile-long, metal-wrapped, wood stave pipeline extending from the South Fork of Bonito Creek to Coyote, New Mexico.
The Jicarilla Schoolhouse	The property is a standing one-room schoolhouse built in 1907 from hand-hewn logs to serve the Jicarilla Placer Mining District as a community center, church, gathering place, and school.
Wizard’s Roost	The property consists of a complex of rock pile features situated at an elevation of 10,000 feet near Sierra Blanca; it is believed to be a solstice alignment observatory or shine from the Late Archaic or early Mogollon period.
Aguayo Homestead	This is a 1917 three-room adobe homestead located in the White Mountain Wilderness with the remains of a root cellar, and several outbuildings.

Properties Listed on the National Register of Historic Places	Description of Properties
Lincoln NF lookout towers	These include a selected group of fire lookout towers and associated structures, many of which were constructed by the Civilian Conservation Corps in the 1930s.
Lincoln Phase Sites	These are three sites, including the Nogal Mesa Kiva site, with the remains of masonry room blocks and associated potsherds and lithic artifacts, along with several mounds representing the remains of three or more pueblo rooms.
Corona Phase Sites	This nomination includes three sites in the Jicarilla Mountains containing numerous slab-outlined rooms, lithics, sherds, and ground stone.
The Hopeful Lode	This nomination includes Parsons Mine, a complex associated with the Nogal Mining District; it contains the remains of an ore separator, three boilers, a collection pond, cyanide waste dumps, foundations, four adits, and two prospective pits. Historic photographs from 1910 depict over a dozen wooden structures.
Mexican Canyon Trestle	This was built in 1899 as part of the Alamogordo and Sacramento Mountain Railroad and used until the 1940s when railroad logging was abandoned in the area. The trestle is 323 feet long and rises 52 feet above Little Mexican Canyon adjacent to the village of Cloudcroft, New Mexico.
National Solar Observatory (Sacramento Peak Observatory)	The Sacramento Peak Observatory is eligible for listing in the NRHP as a historic district with 63 contributing resources. Initiated in 1947, major telescopes were constructed at the site in 1953 (now called the Evans Solar Facility) and 1969 (the Vacuum Tower Telescope and since renamed as the Dunn Solar Telescope). The observatory hosted solar scientists from around the world; for many years, it was the premier facility for the study of the sun.
Mesa Ranger Station Barn	The Mesa Ranger Station Barn is eligible for listing in the NRHP as an example of a late nineteenth- and early twentieth-century historic building. The barn was constructed utilizing Civilian Conservation Corps labor. It follows the USDA, Forest Service Region 3 Standard Ranger Station Barn Plan C-1 Bungalow with a board and batten façade. The barn is the only remaining building located on the site of what was once the historic Mesa Ranger Station.
Rock shelters of the Sacramento Mountains	These are three rock shelters dating primarily to Archaic and Jornada Mogollon periods; they include Fresnal Shelter, which contains early cultigens, and perishable artifacts like sandals and basketry.
Hay Canyon Logging Camp	This property 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 that are associated with railroad logging sites of the Sacramento Mountains.
Hubbell Canyon Log Chute	This property contains two log chutes constructed with logs that have since decayed that are associated with railroad logging sites of the Sacramento Mountains.
Wills Canyon Spur Trestle	This property consists of a wooden railroad trestle with five bents spanning approximately 236 feet.

Properties Listed on the National Register of Historic Places	Description of Properties
Mayhill Administrative Site	This is a Civilian Conservation Corps complex built in the 1930s on top of a prehistoric site. The complex features 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 camp was converted to a World War II prisoner of war camp from 1943 to 1946.
Last Chance Canyon Apache – U.S. Cavalry Battle Site	This site contains the remains of an Apache camp that was destroyed during an engagement in the winter of 1869 between the Apache and U.S. Cavalry; additionally, this property is considered a traditional cultural property (TCP) by the Mescalero Apache, but no formal nomination has been done.
Dark Canyon Apache Rancheria – Military Battle Site	This site contains the remains of an earlier Apache camp and U.S. military items. The site was the scene of an undocumented engagement in which the Apache camp was presumably destroyed. Additionally, this property is considered a TCP by the Mescalero Apache, but no formal nomination has been done.
Ring Midden Sites of the Guadalupe Mountains	These are three sites with multiple ring middens and associated artifact scatters, including brown ware pottery, lithics, tools, and ground stone.
Sitting Bull Falls Recreation Area	This is a Civilian Conservation Corps-constructed rustic masonry complex with a dam, picnic shelter, and group picnic shelter constructed in 1940 with rough-cut limestone and sandstone from Last Chance Canyon.
Rock Art Sites of the Guadalupe Mountains	These are five sites that date from the Late Archaic to the Protohistoric period with several containing small but intricate paintings of prehistoric hunting.

Source: Forest Service 2019b

Contemporary Native American and nonnative local communities have traditional ties to a variety of resources and locations in the plan area, including ancestral sites, landscapes, buildings and structures, industrial sites, and resources. These are not necessarily enumerated or recorded in these inventories, but they are of concern from a cultural resource management perspective.

TCPs are a subset of historic properties. TCPs are historic properties that are in the main or in part eligible for listing on 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).

As with other inventories based on supporting section 106 compliance activities, there has been no systematic attempt to inventory TCPs in the plan area. The Forest Service may not know specific locations of resources or the traditional importance of some areas. In some cases, Native Americans may be reluctant to share knowledge of areas of traditional importance outside their own communities based on maintaining cultural values and religious perspectives. There are many previously recorded and unrecorded historic properties in the plan area that may be eligible for listing on the NRHP as TCPs. Property types that are potential TCPs include, but are not limited to, village sites, shrines, rock shelters, caves, rock art, springs, mountains, mountaintop localities, geological formations, quarries, plant collection areas, and trails.

Inventories for characteristics and properties of importance to nonnative communities have 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, 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.

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. 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, logging, 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 on 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 categories noted during visits by cultural resource monitors, having been observed in 2 percent of recording events (Forest Service 2019b).

Ongoing effects of climate change on cultural resources may be occurring from drought, wildfire, more severe and frequent flooding and erosion, and changes in habitat distribution and water availability. Flooding and erosion may be affecting the physical integrity of structures and archaeological sites. Changes in habitat distribution, springs, and water availability also could affect Native American traditional uses.

Environmental Consequences for Cultural Resources

This section describes the effects of the proposed revised plan and alternatives on cultural resources. Management of cultural resources is an important part of Federal land management policy and practice.

Methodology and Analysis Process

Impacts on cultural resources are assessed by applying the criteria of adverse effect, as defined in the implementing regulations for section 106 (36 CFR 800). Actions that alter, degrade, or otherwise affect the integrity and condition of a property have a high potential to adversely affect the values that contribute to the traditional, cultural, scientific, or historical value of the property. Actions that protect, limit, or otherwise avoid impacts on the integrity or condition of the historic property would protect and maintain the values that contribute to its traditional, cultural, scientific, or historical values.

The criteria of adverse effect provide a general framework for identifying and determining the context and intensity of potential impacts on other categories of cultural resources, such as any Native American or other traditional community, cultural, or religious practices or resources.

Potential environmental consequences are not evaluated on a site- or project-specific basis in this planning level analysis. Alternatives are assessed on a qualitative basis, based on past studies and observations. This section is organized by the issue topics identified during scoping and subsequent alternatives development that are most applicable to cultural and historic resources. Project-specific analysis would provide more in-depth analysis when implementing the plan.

Assumptions

- The nature and types of potential impacts anticipated do not vary greatly between the alternatives
- Under section 106 of the NHPA, projects implemented on the Lincoln NF would continue to require a site- or project-specific analysis of their potential impacts on cultural resources.

- TCPs are historic properties under section 106 of the NHPA; the identification of additional tribally significant resources may require tribal consultation.
- Inventories of cultural resources are incomplete and past inventories may be geographically biased toward project-oriented undertakings. Additional identification and consultation efforts would be needed in most cases for subsequent implementation actions.
- The designation of specific roads, trails, and areas for motorized vehicle travel are not considered during plan revision because these have been addressed in the separate environmental analysis for public motorized travel planning on the Lincoln NF.
- Desired conditions, objectives, standards, and guidelines defined for cultural resources would guide future planning of projects and activities on the Lincoln NF.

Indicators

Indicators used to examine potential impacts on cultural and historic resources are defined for the management activities associated with the key issues defined in the forest plan. Generally, these indicators can be compared qualitatively or quantified in acres of land use allocations. Indicators include:

- Access and recreation: extent of potential ground disturbance; development and use of recreational facilities; and changes in access
- Natural resource management: extent of potential ground and site disturbance based on treatment types or lack of treatment; changes in character and setting
- Livestock Grazing: extent of surface disturbance from livestock, livestock concentration and associated structures
- Economic development: extent of land available for energy, mineral, utilities, communication, and transportation activities and the potential for ground disturbance and alterations to setting
- Wilderness and special management areas: extent or acres of land in wilderness and special management areas

Environmental Consequences for Cultural Resources Common to All Alternatives

The types of environmental consequences associated with all alternatives are similar in the potential to cause adverse effects on cultural resources. The alternatives are broad in scope and do not indicate specific project-level impacts, which would be addressed through the section 106 process. Management actions associated with the key issues all have the potential for affecting cultural resources, primarily through ground disturbance and alterations to setting.

The greatest potential threats to cultural resources are those activities not initiated by agency actions: wildfire, erosion, looting, vandalism, trespass, and dispersed recreation.

Effects from Access and Recreation

Access and recreational use can impact cultural resources in the long term through direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to the setting, and access leading to unauthorized collection or vandalism. The potential for impacts on cultural resources would increase as population and recreational use increase or are concentrated and facilities are maintained. The impact of repeated uses or visits over time could also increase the intensity of impacts due to natural processes. Repeated visits to sites can also create social trails, directing more people to cultural sites. Increased access could damage resources through vandalism and unauthorized collection.

Additionally, ground disturbance as a result of dispersed recreational use and dispersed camping may have the potential to cause adverse effects on cultural resources. The Lincoln NF camping corridor extends up to 300 feet from National Forest System roads. Often, popular modern camping spots, such as saddles, gentle slopes, water sources, and locations with scenic views, in some cases were also popular for early humans and constitute sites that may be disturbed.

Effects from Natural Resource Management

Vegetation management can be compatible with cultural resource preservation and achieving desired conditions. Many of the proposed management actions would reduce the potential for erosion of cultural sites, maintain and improve soil health, maintain or restore the historic setting, and protect plant resources that may be important to Native American communities. Vegetation that does not meet desired conditions may be a bigger threat to cultural resources. Undesirable conditions have the potential to cause long-term impacts from erosion and wildfire. Erosion caused by a lack of grasses and understory associated with thick tree canopy can cause loss and destruction of cultural resources and the associated character and setting of those resources.

Mechanical treatments, however, could permanently affect cultural resources and temporarily restrict access to resources for cultural purposes during treatment. Ground-disturbing mechanical vegetation treatments could modify the spatial relationships of artifacts and site features and displace, break, or damage artifacts.

Additionally, use of fire as a treatment could damage flammable cultural resource artifacts and features, cause spalling and staining of rocks, and distort the analysis of an artifact's date and function. Any form of vegetation management that may affect cultural resources would be reviewed in compliance with relevant cultural resources laws and regulations.

Effects from Wildland Fire Management

Management actions associated with wildfire suppression can lead to adverse effects on cultural resources, including the construction of fire lines through sites, burning of perishable materials resulting from suppression ignition, and other effects associated with the suppression of wildfire.

Effects from Livestock Grazing

Livestock grazing is associated with ongoing, long-term, incremental impacts on cultural resources on or near the ground. Livestock grazing, trampling, and vehicle use reduce vegetation cover and disturb the soil, which accelerates erosion and weathering. Cultural resources can be directly impacted by the modification, displacement, and loss of artifacts, features, and middens, resulting in the loss of valuable cultural resource information on the site function, date of use, subsistence, past environments, and other research questions. Construction or removal of ranch fencing, corrals, and tanks could impact the integrity of cultural resources.

Cultural resources are often located near permanent and intermittent water sources that may be attractive to livestock. As such, impacts on cultural resources are most likely to occur in these areas. In most cases, the dispersed nature of livestock grazing can cause disturbance that is spread lightly over large areas. In areas where livestock congregate and trail, cultural resource sites could be impacted by short-term removal of vegetation cover, increased soil compaction, and some mixing of artifacts and contextual relationships.

Effects from Economic Extraction

Surface-disturbing activities are associated with economic uses of Forest Service land. The physical integrity and setting of cultural resources may be altered based on surface and subsurface disturbance

related to mining of locatable and salable materials, oil and gas development, timber harvest and associated infrastructure, and access/maintenance roads. Potential impacts on cultural resources are ground disturbance, erosion, and intrusions to the setting; access leading to unauthorized collection or vandalism; and interference with traditional cultural uses and access.

Utility corridors, such as those for power lines and fiber optics typically disturb linear areas that are more difficult to reroute or adjust to avoid cultural resources. Standard archaeological mitigation measures applied to excavation result in some loss of archaeological data and could diminish tribal connections to sites of traditional cultural importance.

Remediation and cleanup of legacy mining sites through the Comprehensive Environmental Response, Compensation, and Liability Act is generally not subject to the standard section 106 process. These sites are often highly polluted with lead, contaminated soils, and tailings requiring removal and remediating physical site hazards. Mining impacts on historic mining structures and features can be addressed through cooperative working relationships.

Effects from Wilderness, Special Management Areas, and Designated Areas

Designated wilderness and special management areas may incidentally protect cultural resources from ground-disturbing and access-related impacts and alterations of the setting; however, limiting activities such as mechanical vegetation treatments may affect activities and opportunities to address the impacts of thick tree cover leading to a lack of ground cover, erosion, and wildfire potential.

Under alternative A, 55 WSR segments would be managed as eligible for designation in the National Wild and Scenic Rivers System; 54 river segments would be managed as eligible under alternatives B, C, D, and E. These standards would limit stream modifications and construction along these waterways. This would avoid or reduce potential ground-disturbing and setting impacts on cultural resources, which are often associated with river corridors.

Environmental Consequences for Cultural Resources Under Alternative A

Effects from Access and Recreation

Alternative A is the no-action alternative or the 1986 Forest Plan as amended. This alternative reflects current management practices and provides a baseline for analyzing the other alternatives. Under alternative A, each management area has specific standards and guidelines for recreation that cover visual quality objectives, recreation opportunity spectrum classes, and trail management. These guidelines allow for dispersed camping within corridors extending 300 feet from a system road. This has resulted in cumulative ground disturbance to sites from years of driving compaction, increased erosion, alteration of the character and setting, litter, and the creation of campfire rings. Additionally, access to recreation, such as rock climbing, has caused compaction, erosion, and likely artifact collection to existing rock shelter resources.

Effects from Natural Resource Management

Mechanical treatment and prescribed burn are techniques that can be applied to move forests toward desired conditions. Alternative A does not contain a forestwide management plan including these techniques to move the Lincoln NF to a desired condition; therefore, the Lincoln NF may be at more risk of high-intensity fire and the associated damage to cultural resources.

Effects from Wilderness, Special Management Areas, and Designated Areas

Designated wilderness and special management area designations would remain unchanged under alternative A. Impacts are identified above under Environmental Consequences for Cultural and Historic Resources Common to All Alternatives.

Under alternative A, 20,200 acres fall within the Guadalupe Escarpment WSA. This WSA would not be managed for wilderness. This does not provide any additional protection of cultural resources from ground-disturbing and access-related impacts and alterations of the setting; however, not limiting activities such as mechanical vegetation treatments, may provide opportunities to address the impacts of thick tree cover leading to lack of ground cover, erosion, and wildfire potential on cultural resources as discussed above.

Environmental Consequences for Cultural Resources Common to Alternatives B, C, D, and E

Effects from Access and Recreation

The Forest Service would manage dispersed recreation through guidelines and standards, which would prescribe the relocation, where possible, of motorized and nonmotorized trails that adversely affect riparian areas. Dispersed camping sites would also be rehabilitated or otherwise mitigated under all action alternatives where cultural resources are adversely affected. These plan components would increase protections of cultural resources compared with alternative A by removing or avoiding adverse effects and limiting disturbance.

Effects from Natural Resource Management

All action alternatives emphasize moving the Lincoln NF to desired conditions using a variety of methods, including vegetation treatment, prescribed burning, and timber production, and they provide direction for nonnative species management, stream channel restoration, and watershed restoration objectives. All alternatives emphasize an increase in prioritizing soil protection, maintenance, and restoration after vegetation treatment projects and human disturbance. Active management geared toward a desired condition may reduce risks, such as high-intensity fire, erosion, and the associated change or loss of setting and character, to cultural resources. Less active management of natural resources may increase those risks. Emphasis on more access and increased multiple-use opportunities increases the risk of direct and indirect impacts on cultural resources. Furthermore, all alternatives emphasize increased collaboration with tribes and rural historic communities. This collaboration may help preserve cultural resources as well as the associated setting and character.

Mechanical vegetation treatments range from 6,500 to 12,500 acres under alternative C and 11,000 to 19,500 acres under alternatives B, D, and E. Depending on the specific tools and types of equipment used to remove plants, mechanical techniques could increase surface and near-surface disturbance compared with alternative A, including displacement of archaeological materials over short vertical and horizontal distances, artifact damage, or destruction of features. Repeated treatments in the same areas could have additive effects. Significant displacement of soils containing buried, intact archaeological deposits could affect the scientific values of sites. Buried archaeological deposits may not be detected during prework inventories unless there are surface exposures. Treatments requiring heavy ground disturbance, such as tilling to create brown strips or to clear ground for green strips, would have greater potential effects on archaeological resources.

Prescribed wildfire treatment of at least 200,000 acres is proposed under the action alternatives. Compared with alternative A, an increase in the nature and types of impacts from prescribed wildfire treatments could occur due to the loss of combustible artifacts and features to fire and damage through

chemical and thermal alteration of bone, rock art, stone, and ceramic artifacts. The physical or chemical characteristics of materials that have scientific information potential could be altered by heat and fire.

Effects from Wilderness and Special Management Areas

The Guadalupe Escarpment WSA, as currently amended in the 1986 Forest Plan, is included as a recommended wilderness area for all action alternatives. Additionally, all action alternatives would propose the Upper McKittrick RNA. The total recommended wilderness varies among the alternatives from 21,900 acres to 402,000 acres. Compared with alternative A, recommended wilderness and special management area management under the action alternatives may have the potential to increase protections of cultural resources by limiting disturbances associated with access; however, these designations may also restrict certain Forest Service management practices that may reduce the potential for impacts from erosion or high-intensity fires. Alternative C would have the greatest acreage of recommended wilderness increasing protection of cultural resources more than the other alternatives.

Cumulative Environmental Consequences for Cultural Resources

The archaeological record shows that occupation and use of land within and surrounding this plan area began decades, centuries, or millennia prior to the establishment of the Lincoln NF. Cultural resources on the Lincoln NF provide critical information within the greater cultural landscape. Negative effects such as the loss or degradation of cultural resources have happened in the past and probably will happen in the future under all alternatives. These resources are worth protecting, as they help paint a more concise picture of early inhabitants of North America and provide culturally important links to tribal communities today.

Cultural resources have been, and continue to be, adversely affected by human presence. These intentional and unintentional impacts include, but are not limited to, recreational uses such as camping and other activities on sites, erosion from decades of wildfire suppression leading to increased canopy cover and decreased understory, past mineral exploration and mining, residential and other development, communication sites on sacred mountains, land exchanges, and intentional vandalism and looting that damaged or destroyed cultural resources.

Monitoring data indicate project activities, such as those related to mechanical treatment, prescribed burns, and increases in dispersed nonmotorized recreation, may result in unplanned or inadvertent adverse impacts, such as ground disturbance, erosion, unauthorized collecting, and vandalism to cultural resources in rare cases. Such unplanned or inadvertent adverse impacts are addressed and mitigated on a case-by-case basis. It is the goal that incidental unplanned or inadvertent impacts from the implementation of undertakings are offset by the benefits of ecological restoration to the long-term protection of cultural resources resulting from the undertakings. Furthermore, undertakings such as specialized Forest Service management through prescribed wildfire and mechanical treatment, the development of new recreation areas, or other projects on the Lincoln NF will be managed through the section 106 process on a case-by-case basis.

Certain trends, such as erosion, wildfire, looting, and vandalism, present serious threats to cultural resources. These impacts cannot always be avoided through tribal consultation or the section 106 process. Certain Forest Service management activities within the action alternatives strive to mitigate such risks by actively managing the Lincoln NF. With the completion of the section 106 process for site-specific implementation action, it is the intent that no additional cumulative impacts will result from any alternative.

Areas of Tribal Importance and Tribal Uses

The Mescalero Apache Tribe, Hopi Tribe, and Pueblo of Zuni have occupied and used the lands that comprise the Lincoln NF. Their use of these lands and the surrounding area began with the earliest human occupation of the Western Hemisphere and persists to the present day. Tribal interests on the Lincoln NF include economic rights, resource uses, and access to areas of cultural importance for contemporary communities. The Mescalero Apache, Hopi, and Zuni continue practicing the traditional uses as well as more contemporary cultural activity on the Lincoln NF to sustain their cultural identity and continuity.

Information presented here is summarized from the Lincoln NF, Forest Plan Assessment Report, Volume II: Socioeconomic Resources (Forest Service 2019b), which should be referenced for a more detailed discussion of areas of tribal importance and tribal uses. The Mescalero Apache Reservation lies between what are now the Smokey Bear and Sacramento Ranger Districts. The tribe has deep cultural and economic ties with the Lincoln NF lands and resources in the plan area. Visitors to the reservation are attracted to the fine art, handicrafts, foods, forest activities, cultural events, and recreation opportunities associated with the Lincoln NF and its resources.

Affected Environment

The Forest Service maintains a government-to-government 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. The Lincoln NF developed a consultation program in the late 1990s and continues to build and enhance its working relationship with these tribes. The Forest Service maintains that consultation with the tribes should occur at the early stages of project planning and design, and tribal perspectives, needs, and concerns, as well as traditional knowledge, should be incorporated into project designs and decisions. The Forest Service works closely with the Mescalero Apache Tribe because this tribe considers the plan area as ancestral lands and their reservation is adjacent to the Lincoln NF. The Smokey Bear Ranger District is located on the north side of the Mescalero Apache Reservation, and the Sacramento Ranger District is located on the south side of the reservation.

Tribes have used and continue to use lands managed by the Forest Service for a variety of traditional, cultural, and religious activities. Places and areas used by tribes have been identified on every unit of the Lincoln NF. Over time, these activities have included, but are not limited to, collecting plants, stone, minerals, pigments, and feathers; hunting game and birds; religious pilgrimages; and visiting shrines and springs. In addition, plant products, including firewood, timber, and other building materials, and special forest products (Christmas trees, teepee poles, transplants, and wildings) are important resources available from the Lincoln NF. Gathering firewood and Christmas tree cutting are often family events. Other wood products, such as lumber, posts, poles, and traditional building materials (teepee poles), are culturally and economically important as well. The Forest Service has an agreement with the Mescalero Apache Tribe authorizing the tribe to remove as many as 4,400 trees per year to use as teepee poles for ceremonial purposes. The Mescalero Apache Tribe and the Lincoln NF work closely to ensure that the trees removed by the tribe provide a beneficial effect on the overall forest health.

Locations of cultural and religious significance have been identified through consultation. Some of these include places with long-standing known cultural use, locations of buried human remains repatriated under the Native American Graves Protection and Repatriation Act, locations where ceremonial objects have been retired, locations of contemporary ceremonies, and locations where specific forest products are gathered for ceremonial use. The Forest Service has formally documented three of these site-specific locations as TCPs, which are eligible for the NRHP (see Cultural Resources section). Other locations remain minimally documented, but they likely meet the criteria of a TCP. Existing information regarding

TCPs is based on published sources and the results of Forest Service project-level consultation conducted over the last 15 years.

In addition to specific noted locations, tribes sometimes regard entire mountain ranges as sacred and viewed as an integral part of a tribe's cultural landscape. The importance of place names in Mescalero Apache culture may stem from the fact that the Apaches relay their history through oral tradition rather than written means. 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 three tribes—and most prominently, the Mescalero Apache—also rely on the Lincoln NF for products for personal, traditional, and ceremonial use. 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 are important because tribal members may rely on the nuts for income. Juniper, piñon, oak, and ponderosa pine firewood are other forest products that tribal members widely collect for personal and ceremonial use.

The importance of traditional cultural sites and characteristics of the plan area for maintaining the identity of traditional communities is well documented. The opportunity for tribal members to conduct traditional and cultural activities in an atmosphere of solitude and privacy can be measured by the likelihood they will encounter other parties while such practices are underway. In this sense, wilderness designations may provide an increased potential for tribal members to enjoy necessary solitude and privacy; however, with the designation of wilderness areas, there is also the potential for restrictions on access for tribal members to reach their locations of tribal importance and use. Tribal consultation is necessary in the planning process to develop strategies for tribes to maintain access to areas of tribal importance and use while maintaining opportunities for solitude and privacy.

The Forest Service continues to consult with the Mescalero Apache, Hopi, and Zuni on the effects of individual project undertakings subject to NHPA to determine whether there are tribal resources that may be historic properties and affected by proposed undertakings (see Cultural Resources section). The Forest Service prefers to avoid any adverse effects on historic properties, but when they may occur, Forest Service staff work closely with the tribes, the State Historic Preservation Officer, and Tribal Historic Preservation Officers to resolve adverse effects in compliance with all Federal laws and regulations.

In addition to affecting access and use of the Lincoln NF for traditional activities, the Mescalero Apache are an adjacent community and landowner with similar land management issues and concerns as the Forest Service. Some of these include changes in landownership, degradation of land health and watershed conditions, changing technologies and energy development, population growth, urban pressures, expanding recreation use, and the development of private lands.

Forest health is of great concern to the Mescalero Apache Tribe due to the extensive boundary between the Lincoln NF and the Mescalero Apache Reservation. Lincoln NF staff and the 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, wildland fire management, habitat improvement, and tribal youth engagement in natural resource management. Under the Tribal Forest Protection Act (Public Law 108-278), the tribe has proposed work and entered into contracts and agreements with the Forest Service to reduce threats on Federal lands adjacent to Indian trust land and Indian communities.

The Mescalero Apache Tribe operates the Ski Apache recreation area on National Forest System land under a special-use permit. Ski Apache offers skiing in the winter and hiking, mountain biking, and zip lines in the summer. Through planning and consultation, the Forest Service has been assisting the Mescalero Apache Tribe in rebuilding Ski Apache following the Little Bear Fire. The Forest Service staff have worked closely with Ski Apache to authorize the reconstruction of ski area infrastructure. In addition, the Forest Service and Mescalero Apache Tribe have been working on building mountain bike trails and zip lines to increase developed recreational use of the area.

The ownership and development of adjacent private land has led to a greater reliance on the national forests and reservation lands for economic, social, and recreational uses. Increased populations and urbanization outside of the national forest bring additional users. The population of those living inside official national forest boundaries is also increasing due to the development of private inholdings on the Lincoln NF. Some of these lands, once used for ranching, are now being subdivided for sale and development. Development, whether within or adjacent to the national forest, creates similar concerns for neighboring tribal communities. These include increasing use of the Lincoln NF 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. The Mescalero Apache Tribe has expressed concerns on these issues and others related to forest management.

Ongoing climate change effects on tribal resources may be occurring from drought, wildfire, more severe and frequent flooding, erosion, and changes in habitat distribution and water availability. Changes in habitat distribution, springs, and water availability also could affect tribal traditional and contemporary uses. The Forest Service 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 clean water, maintain biodiversity, and supply forest products to traditional Native American practitioners (Forest Service 2019b).

Environmental Consequences for Areas of Tribal Importance and Tribal Uses

This section describes the potential effects of the proposed revised plan and alternatives on areas of tribal importance and tribal uses. The Mescalero Apache continue traditional use of the Lincoln NF for a variety of purposes, including sustaining their cultural identity. Preservation of opportunities to access and use forest resources and places has the ability to provide indigenous communities with an important connection to their ancestors who may have sustained themselves in the same landscapes, places, and sacred sites for a variety of subsistence, cultural, or ceremonial uses.

Methodology and Analysis Process

The range of management activities proposed in the alternatives for the draft land management plan are used to evaluate the potential effects on areas of tribal importance and tribal use. The kinds of resource management activities allowed under the prescriptions are reasonably foreseeable future actions to achieve the goals and objectives of the land management plan. Many of these goals and objectives can be met through collaboration with tribes, including stewardship contracting under the Tribal Forest Protection Act.

This effects analysis focuses on general environmental consequences on plan-area basis resulting from the alternatives, rather than site-or project-specific impacts. Tribal use and importance could fall within the economic and natural resource management issues identified during scoping. The effects on areas of tribal importance and tribal use in this section are organized by the indicators of effect identified below.

Assumptions

- Decisions in the selected alternative (desired conditions, objectives, standards, guidelines, special areas, suitability, and monitoring) will form an outline for planning or implementing site-specific projects and activities; however, the section 106 process of NHPA would be completed for any undertaking that may affect TCPs.
- Analysis and impacts on places of importance to Native Americans from site-specific actions would be addressed, and government-to-government consultation would be conducted at the time implementation decisions are being considered.
- Members of federally recognized tribes would continue to access, use, and conduct religious pilgrimages and ceremonies at known and confidential TCPs and sacred sites, and collect and use Lincoln NF resources for traditional or tribal uses.
- All applicable laws, policies, and regulations will be followed when planning or implementing site-specific projects and activities, including the Tribal Forest Protection Act, which gives special consideration to tribally proposed stewardship contracting and other projects aimed at reducing threats in areas mutually agreed to by both tribes and the Forest Service.
- Native American tribes may be interested in recovering ownership of lands or specific resource locations that were part of their original land base and, therefore, may be concerned about committing lands to other uses.
- Changes to the transportation system that have the potential to affect the access and use of areas of importance would be analyzed at the project-level planning.
- Unplanned ignitions are analyzed at the time of the start and documented in the Wildland Fire Decision Support System. Management response to a wildfire is based on objectives appropriate to conditions of the fire, fuels, weather, and topography to accomplish specific objectives for the area where the fire is burning. Effects on known tribal areas and cultural resources are considered when determining the objectives and management response to a wildfire.
- Acres treated by fire and mechanical methods are cumulative over the life of the plan.
- Changes in land use, access, or methods of forest treatment could affect opportunities for solitude and privacy for tribal traditional and cultural activities. Increases in wilderness designation could increase the potential for solitude and privacy but also impose limitations on the necessary access for tribes to reach areas of tribal importance and use.

Indicators

- Access to traditional cultural places and gathering traditional resources expressed in changes to the National Forest System roads, or other actions that may affect access to traditionally used resources and locations.
- Availability, abundance, and sustainability of traditionally used locations and resources, including a qualitative analysis of acres and areas restored and treated by mechanical and nonmechanical methods (fire) that may benefit traditionally used resources and areas identified by tribes and rural historic communities. The number of acres, areas, or both that are designated or proposed as management areas that enhance, maintain, or protect the availability, abundance, and sustainability of lands and resources traditionally important to tribes and rural historic communities.
- Opportunities for solitude and privacy for tribal traditional and cultural activities. These are assessed in consultation with tribes on the proximity of land uses under each alternative that could

potentially affect necessary solitude and privacy for traditional cultural practices, ceremonies, and sacred sites.

Environmental Consequences for Areas of Tribal Importance and Tribal Uses Common to All Alternatives

All alternatives recognize the value of traditional and cultural uses and their relationship to the Lincoln NF. This is because the tribal use of these lands and the surrounding area began with the earliest human occupation of the Western Hemisphere and persists to the present day. Potential threats to areas of tribal importance affected by programmatic planning can be activities not initiated by agency actions: wildfire, looting, vandalism, and dispersed recreation outside established recreation areas. Many concerns that the Mescalero Apache Tribe faces cross jurisdictional boundaries. The Forest Service would continue to consult with tribes to avoid, minimize, or resolve potential impacts under all alternatives.

Access for Gathering Traditional Resources

The alternatives do not address changes in access to existing National Forest System roads, which is separate from the forest planning process. Tribal consultation is necessary to identify areas used for traditional cultural activities and to maintain access through system roads, as well as through trail access and designated motorized access. Changes in access may also hinder the ability for tribes to visit and use areas of importance.

Availability, Abundance, and Sustainability of Traditional Resources

Differing management practices designed to promote the availability, abundance, and sustainability of plant species are found in all alternatives. Some of these areas may provide opportunities for tribal use, such as resource collection of traditional plant species and religious pilgrimages to sites and springs. Additionally, all alternatives retain existing designated wilderness. Each alternative provides sustained multiple uses, products, and services in an environmentally acceptable manner, including timber production, livestock forage, recreation, and leasable and locatable minerals. It is possible that some of these alternatives may prove to be more effective in preserving plant species used for traditional resource gathering and that other alternatives may risk damage to these same plant species because of targeting of dense growth for fuels reduction, incidental loss, mechanical treatment, fire, or increased erosion.

The lands of the Lincoln NF are located in a fire-adapted ecosystem. Many of the traditionally used plants may increase productivity in response to fire. Increasing the acres where fire may be used would potentially increase the productivity of traditionally used forest resources and the availability of those resources across the landscape.

Opportunities for Solitude and Privacy for Tribal Traditional and Cultural Activities

Changes in public recreational access and intensity of use have the potential to compromise tribal solitude and privacy.

Environmental Consequences for Areas of Tribal Importance and Tribal Uses Under Alternative A

Access for Gathering Traditional Resources and Natural Resource Management

Alternative A manages for a variety of developed and dispersed recreation experiences that also consider tribal access and use, such as gathering traditional resources, hunting, religious pilgrimages, visitation of protected burials, and other important sites. It provides a system of trails and roads for motorized access use, while protecting other resources. This access is integral for tribes to be able to use areas important to them. Alternative A includes an objective to decommission 100 miles of National Forest System roads

over the life of the plan; however, this objective has not been reached. Additionally, alternative A maintains the current designated wilderness and does not recommend the addition of additional management areas. As such, alternative A would not provide the potential protection that the other alternatives would provide with the additional recommended wilderness.

Under alternative A, timber management is emphasized as a tool for providing forest products for local and regional industrial and individual needs. There are no other objectives for vegetation management and no objectives for prescribed burning; therefore, this alternative would not move the Lincoln NF toward desired conditions. This has the potential to affect areas of tribal use. This is because areas of tribal importance may be subject to high-intensity fire or impacts associated with increased canopy cover, which in turn affects the potential for tribal uses, such as resource collection. This alternative also provides direction for rehabilitating and maintaining riparian conditions, including the use of native species during restoration; however, it lacks clarification on where to prioritize riparian restoration, contains no objectives for riparian restoration, and does not establish riparian management zones. Maintaining riparian conditions with an emphasis on native species restoration may have positive impacts for tribal use of native plants and areas of tribal importance, such as springs.

Availability, Abundance, and Sustainability of Resources for Tribal Use

The purpose of the 1986 Forest Plan is to provide for multiple use and sustained yield of goods and services from the Lincoln NF. The economic focus for the 1986 Forest Plan was on timber and grazing, while providing guidance for mining. The no-action alternative manages available timber land to provide a sustained yield of quality timber. Additionally, under alternative A, livestock grazing management is managed on the individual allotment level rather than with a forestwide plan. On a project-by-project or allotment-by-allotment basis, these economic practices may have the potential to affect areas of tribal use and importance, specifically traditional plant resources and character and the setting of areas of tribal importance.

Environmental Consequences for Areas of Tribal Importance and Tribal Uses Common to Alternatives B, C, D, and E

The action alternatives represent different management emphasis within a similar framework. The potential for subsequent impacts would vary and would be assessed on a site- and project-specific basis.

Access for Gathering Traditional Resources and Natural Resource Management

The action alternatives include multiple planning components that may potentially have impacts on areas of tribal importance and tribal use. They emphasize sustainable recreation and recommends a sustainable recreation program. In addition, plan language recognizes and provides for continued traditional and cultural uses for area tribal populations. This direction would enhance support for access to forest products with traditional cultural and medical uses (i.e., medicinal plants, piñon nuts, and teepee poles), and limit the potential for adverse impacts on communities dependent on these resources; however, where roads are decommissioned and wilderness protections area are designated, there may be some reduction in existing access, including access to areas of tribal importance.

Additionally, all action alternatives emphasize an increase in guidance for fostering relationships, enhancing partnerships, and bettering communication between parties with a variety of use interests in the plan area. Compared with alternative A, an emphasis on partnership between the Forest Service and federally recognized tribes that have traditional uses on the Lincoln NF may lead to increased benefits for tribal use and awareness of areas of tribal importance. Consulting with tribes early and often is the best and most effective way to gather information related to potential sacred sites, TCPs, or other resources that federally recognized tribes hold as sacred or important to tribal identity or values. All action

alternatives recognize and provide the traditional uses important for the unique cultural and social fabric for tribes.

Availability, Abundance, and Sustainability of Traditional Resources

Alternatives B, C, D, and E provide direction on nonnative, invasive plant management in multiple vegetation types and for the benefit of native and at-risk species. They also increase management direction on soil protection, maintenance, and restoration after vegetation treatment projects or in areas of human disturbance. Additionally, all action alternatives provide for vegetation treatments and prescribed burning in frequent fire forest types and piñon-juniper woodlands that are highly departed from desired conditions, including historical fire regimes.

These approaches vary among alternatives, as some emphasize more mechanical treatment and others emphasize more of a hands-off approach. Compared with alternative A, these management approaches may help improve the conservation of plant species used for traditional tribal uses; they also may provide enhanced maintenance of a traditional setting and character of areas that have been used by tribes throughout their history in the region for purposes such as religious pilgrimages, traditional resource gathering, and ceremonies.

Cumulative Environmental Consequences for Areas of Tribal Importance and Tribal Uses

The use of resources and places important to traditional communities began decades, centuries, or millennia prior to the establishment of the Lincoln NF. As such, the distribution of resources and areas of tribal importance and tribal use in many cases crosses current jurisdictional boundaries. In addition, activities conducted on lands adjacent to the Lincoln NF can also affect access to resources; the availability, abundance, and sustainability of resources; and the opportunities for tribal use on the Lincoln NF.

Current and previous Forest Service management activities, public resource procurement, recreational use, and natural processes have affected the access and use of areas of tribal importance. Tribes view sacred sites and TCPS as interconnected places and features of the religious and traditional landscape that maintain valuable uses into the present. Under all alternatives, effects on these places and features may directly or indirectly affect the access and use by the tribes to conduct ceremonial and traditional practices on other sacred sites or areas of tribal importance that are part of their traditions they continue to use.

Some past impacts on access and the availability of TCPs, sacred sites, and traditionally used resources include, but are not limited to, past mineral exploration and mining, residential and other development, communication sites on sacred mountains, recreational uses such as camping and other activities in or on TCP caves and buttes, land exchanges, and intentional vandalism and looting that damaged or destroyed cultural sites and areas of tribal importance and use. Past impacts would persist under all alternatives.

Under all alternatives, negative effects, such as the loss or degradation of sacred sites, TCPs, and other resources that are important to tribes or provide for tribal use, have happened in the past and probably will happen in the future. As time progresses, this loss results in fewer resources available to future tribal generations to learn about and connect with their cultural, religious, and spiritual practices, values, and identities. As such, it is imperative to work with the tribes that have traditionally used the land in order to avoid and mitigate impacts on areas of tribal importance.

All forest plan alternatives would continue the necessary prerequisite of tribal consultation on a government-to-government basis. Implementation of a new forest plan would seek to avoid, or at least significantly reduce, impacts on areas of tribal importance. This could reduce cumulative impacts relative to alternative A. No additional cumulative impacts on areas of tribal importance and tribal uses are

anticipated directly as a result of any proposed alternative; however, many potential impacts on tribes cross jurisdictional boundaries. With any proposed forest plans, it is important to maintain tribal consultation through government-to-government relationships to negate the potential for cumulative impacts that could negatively affect tribes and their traditional uses on the Lincoln NF.

Sustainable Forestry and Forest Products

Affected Environment

Forest plans provide long-term direction for the management of timber resources, and they generally prescribe sustained yield from scheduled harvesting and the development and implementation of a fuelwood management program, all while considering other resource needs (Forest Service 1986). Recently, direction has shifted toward resource restoration to provide wood products as a by-product of other management objectives rather than managing for timber resources as a primary objective.

Departure

Most of the Lincoln NF is in moderate to high departure from reference conditions, resulting in abnormally dense stands, shifted species compositions, changes in natural distribution and abundance of insects and disease, and altered fire regimes (Forest Service 2019f, 2019g). An increase in forest restoration projects helps sustain forest and watershed health, prevent uncharacteristic wildfire, reduce insect and disease outbreaks, improve or maintain wildlife habitat, and contribute to local economies (Forest Service 2019a).

Stand structure and composition

Stand density and structure have departed as a result of past management (Allen et al. 2002). Current stand conditions are generally overly crowded with trees that are young and mid-aged—often with moderate to high levels of dwarf mistletoe and root rot—that create conditions more prone to insect outbreaks and greater susceptibility to crown fire (Forest Service 2019e). Tree densities have at least tripled, patch/group size has increased, and structural diversity has decreased (Forest Service 2019g). Additionally, the composition of the tree stands has shifted to shade-tolerant species like white fir rather than the previously fire-resistant, shade-tolerant species like ponderosa pine (Forest Service 2019a).

Insects and diseases

The abundance and distribution of the Southwestern dwarf mistletoe and Douglas-fir dwarf mistletoe have increased. These pathogens are particularly damaging to the ponderosa pine and Douglas-fir. Further spread of these pathogens may be slowed through restorative actions that lower stand densities (Forest Service 2019f, 2019g).

The current dense, crowded stands have increased the potential for bark beetle activity and contribute to higher mortality levels when drought-related outbreaks develop (Forest Service 2014b, 2019g). By thinning overstocked stands to mimic historical distributions and changing species composition and cover toward desired conditions, the stands can better withstand drought and insect attack (Forest Service 2019f). In addition, group selection regeneration can remove high-severity pockets of disease.

Fires

High-severity wildland fires put forest resources at risk (reference Fire and Fuels).

Forest Products

Management objectives need to ensure the sustainability and availability of forest products, such as timber, fuelwood, and other special forest products, for economic uses while restoring forests to more natural conditions (Forest Service 2019g).

Special forest products found on the Lincoln NF include posts; poles; fuelwood gathering, which is an important traditional activity, as many local residents still rely on wood to heat their homes during the cold winter months (Forest Service 2019a); Christmas trees; transplants; and teepee poles, herbs, medicinal plants, piñon nuts, and native plant materials, which are important cultural and social products gathered from the Lincoln NF (Forest Service 2019h). Forest products sold over the past 5 years are outlined in table 3-59.

Table 3-59. Forest Product Cut and Sold Reports from the Last 5 Complete Fiscal Years (Fiscal Years [FYs] 2015–2019) (volumes for products are represented in hundred cubic feet [CCF])

		FY19	FY18	FY17	FY16	FY15	5-year average
Harvest Softwood—Sawtimber	CCF	2,018	2,601	2,591	5,270	4,328	3,362
Harvest Softwood—Pulp	CCF	535	642	836	800	1,244	811
Harvest Hardwood—Sawtimber	CCF	-	-	-	-	-	-
Harvest Hardwood—Pulp	CCF	-	-	-	-	-	-
Poles	CCF	43	25	24	32	40	33
Posts	CCF	.06	1	-	-	-	.212
Fuelwood	CCF	2,813	3,177	3,370	3,319	3,342	3,204
All Other Products	CCF	844	31	70	92	302	268

Source: Forest Service 2019h. Table does not include Christmas trees, transplants, limb/bough, cones, cacti, or nut and seed volumes.

Timber Markets

Sawmills

According to the Forest Service, there are currently five active small production sawmills in Otero County, multiple fuelwood processors throughout the four counties, one full production pallet mill in Canutillo, Texas, and numerous commercial fuelwood operations within the four counties (Forest Service 2019b; table 3-60; figure 3-15).

Currently, local sawmills and processors produce products such as:

- Architectural beams
- Framing lumber
- Pallet stock and cants
- Railroad cross ties
- Oil well and equipment mats and oil well cribbing
- Utility poles
- House logs
- Bagged, dried shavings
- Fuelwood

Table 3-60. Sawmills in and adjacent to the Plan Area (volumes in million board feet [MMBF] or million cubic feet [MMCF])

Sawmill	Location	Products	Mill's Annual Volume
Custom Crates and Pallets Ltd.	Canutillo, Texas	Primary product: crates, pallets secondary product: chips, sawdust, etc.	3.5 MMBF
Ellinger Logging	Alamogordo, New Mexico	Rough sawn cut to order. Log supplier to small mills and firewood producers in the area.	3 MMBF
Wilkinson Logging	Tularosa, New Mexico	Rough sawn cut to order, oil field rigging and matting, firewood	1 MMBF
New Mexico Tie and Pole	Tularosa, New Mexico	Utility poles, railroad ties	3 MMBF (estimated).
Jensen Contracting	Tularosa, New Mexico	Sort yard	8 MMBF

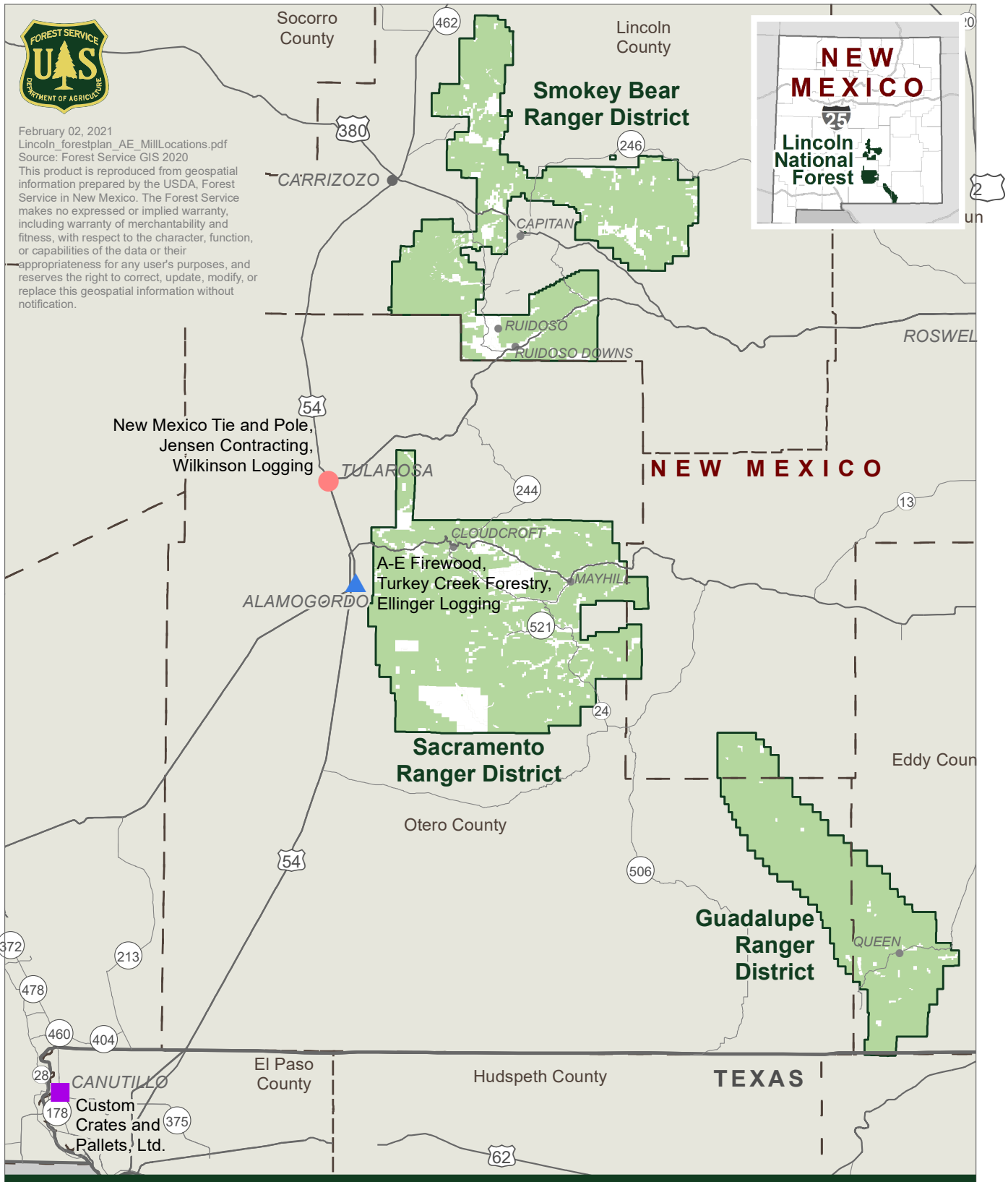
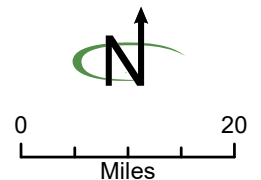


Figure 3-15 Existing Mills

Mills by city

- ▲ A-E Firewood, Turkey Creek Forestry, Ellinger Logging
- Custom Crates and Pallets Ltd.
- New Mexico Tie and Pole, Jensen Contracting, Wilkinson Logging

- National Forest
- Private or other
- Lincoln National Forest, Forest Plan revision area
- County



When planning forest restoration activities and choosing contract mechanisms, it is important to consider the available milling infrastructure and capacity. Milling infrastructure and capacity can change over time, and new fledgling businesses may arise as restoration work continues. Currently, most milling businesses are unable to pay a premium price for material due to a lack of markets and other economic factors. Large capital investments in manufacturing equipment are unlikely for communities adjacent to the Lincoln NF, but that would depend on future projects.

The supply and demand for timber is driven largely by exporting, housing starts, and the home improvement market. Local drivers for the timber market are small-scale operations that do not influence the overall timber market (Forest Service 2019f). Without national or global demand, milling of forest products on the Lincoln NF will likely decrease or remain status quo.

Fuelwood

On the Lincoln NF, milling and production of lumber products are not the primary market. Instead, fuelwood represents the main market. There are multiple fuelwood processing facilities adjacent to the plan area. Additionally, the ability to gather fuelwood for heating and cooking is important for many families and communities, largely due to the economic savings from fuelwood over propane, natural gas, and electricity (Forest Service 2019d).

Bidding

Across the Lincoln NF, there is very little competitive bidding for timber, fuelwood sales, and stewardship contracts. Similarly, the capacity for logging and restoration services has declined to levels insufficient to accomplish large-scale restoration objectives (Forest Service 2019h). Values placed on forest products have not changed since the traditional markets and high-grade logging of the last century. Minimum bids have not kept up with reduced-value timber and the lack of economic growth, slowing restoration efforts and affecting bidding markets. Hauling distances, for trucking wood products from the Lincoln NF to mill locations, compound financial stressors, resulting in limitation on acres restored. Without additional partner support (financial incentives through stewardship agreements and contracts), some acres will not be financially viable. The Accelerating Forest Restoration Act of 2019 (ELT19331) reduced the minimum bid to promote competitive bidding and provided financial relief to the industry. This act authorizes the Forest Service to classify forest restoration products as low- or no-value products, which supports restoration efforts and the timber market by encouraging project bids.

Costs

There are many factors that influence costs for restoration, sustainable forest products, and markets. Apart from infrastructure, a reduced workforce, product values, and external markets are also influences. Other factors also influence the cost per acre; population growth along forest boundaries, coupled with changed expectations from those new residents; deteriorating road conditions; the lack of industry processing facilities; and transportation costs all create high costs per acre for wood product removal.

Future markets

There is a need for innovation in using low-value and sub-merchantable materials, such as small-diameter trees that currently dominate the landscape of the Lincoln NF.

Number of Acres and Percent Currently Suitable for Timber Production

The sustained yield limit reflects the quantity of wood products that could be sustainably removed from the Lincoln NF in perpetuity (Forest Service 2019e). Suitable timberland on the Lincoln NF makes up 21 percent of the plan area and includes spruce-fir, mixed conifer, and ponderosa pine forest types (Forest Service 2019a).

Sustainable Forestry and Forest Products Management

Forest management goals

- Consider timber production activities as tools that contribute to ecological restoration and the maintenance of ecosystem integrity and diversity, while supporting an economically viable wood-products processing industry (Forest Service 2019g).
- In the ponderosa pine and dry mixed conifer forest types, shift emphasis from predominantly even-aged to predominantly uneven-aged forest management practices (Forest Service 2019g).
- Integrate wildlife, watershed, and fuels management program objectives into sustainable forestry and forest product objectives.
- Regional guidance for northern goshawk habitat and Mexican spotted owl recovery emphasized wildlife habitat management and restoration over producing and selling timber products (Forest Service 2019f); however, periodic timber production of suitable lands is a tool to maintain desired conditions.
- Harvesting forest products from ecological restoration and fire mitigation can also have measurable economic value.

Stewardship

- Stewardship contracts have the potential to improve forest restoration efforts, but they can be a slow process. Stewardship contracts should only be used at the size and scale appropriate for the restoration project.
- Stewardship agreements can help bring additional funding and resources to restoration work and may be the preferred contract mechanism in areas that are not financially viable for the traditional logging industry.
- For some projects in the southwest region, the Forest Service pays for on-the-ground treatment through stewardship authorities or by using service contracts (Forest Service 2019f).

Timber sales

- Timber sales have the potential to improve forest resistance and resilience to stressors. It is a relatively slow process, taking 2 to 5 years from the beginning of planning to implementation (Forest Service 2019b).
- Timber harvest and forest thinning treatments are important tools for shaping forest structure and composition to meet ecological integrity desired conditions and other objectives (Forest Service 2019f).
- Timber harvesting can improve wildlife habitat; increase the forest's ability to withstand fire, insects, and disease; and improve timber stand productivity (Forest Service 2019g).
- Regulate timber harvesting and levels suitable for timber production.
- Timber harvesting in excess of 40 acres will require 60-day public notice and review by the Regional Forester.

Forest product management

Markets

- Priority should be given to managing for desired conditions rather than maximizing dollar return or unit output (Forest Service 2019d).
- When planning forest restoration activities and choosing contract mechanisms, it is important to consider milling infrastructure and capacity. Current milling infrastructure and capacity can change over time, and new fledgling businesses may arise as restoration work continues. Most milling businesses are unable to pay a premium price for material due to a lack of markets and other economic factors. Large capital investment in manufacturing equipment is unlikely on the Lincoln NF in the short term.

Workforce

- The supply and demand for timber is driven by regional, national, and global issues (Forest Service 2019a). One local and regional issue that affects restoration work is the availability of a trained workforce.
- There is a lack of a trained workforce in forestry, logging, truck driving, and milling. A lack of infrastructure coupled with an insufficient workforce can make restoration work slow to start. By providing continual and sustainable restoration work, there is potential for driving workforce growth.

Environmental Consequences for Sustainable Forestry and Forest Products

Methodology and Analysis Process

Requirements in the 2012 Planning Rule at 36 CFR 219.11, The National Forest Management Act of 1976, and the Forest Service Handbook 1909.12 provide high-level guidance to conduct a timber suitability analysis as part of the forest planning process. Chapter 60 of the Forest Service handbook lists criteria to be used to identify lands in the plan area not suited for timber production (Forest Service 2015c).

Timber Suitability

Timber suitability was determined using a myriad of resource data incorporated into GIS to apply criteria and identify lands suitable for timber production (figure 3-16). Timber production is defined as the growing, tending, harvesting, and regenerating of trees to produce logs or other products for industrial or consumer use. Lands determined to be suitable for timber production are areas identified as capable of producing a regular, periodic output of timber, maintained in perpetuity, without impairment of the productivity of the land or inconsistency with other land management direction. Lands suitable for timber production include 233,316 acres on the Lincoln NF (table 3-61). Criteria for suitability are defined in the 2012 planning rule procedures at 36 CFR 219.11 and Forest Service Handbook 1909.12, chapter 60. Data were developed using the latest data sources and requirements to match the criteria defined by resource specialists. A more detailed description of the timber suitability analysis can be found in Appendix D: Timber Suitability Analysis.

Table 3-61. Timber suitability classification on the Lincoln NF¹

Land Classification Category	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
A. Total National Forest System lands in the plan area	1,095,600				
B. Lands not suited for timber production due to legal or technical reasons	862,300				
C. Lands that <i>may</i> be suited for timber production (A-B)	233,300				
D. Total lands suited for timber production because timber production is compatible with the desired conditions and objectives established by the plan	166,300	179,200	145,400	179,200	179,600
E. Lands not suited for timber production because timber production is not compatible with the desired conditions and objectives established by the plan	67,000	74,800	108,600	74,800	74,400
F. Total lands not suited for timber production (B+E)	929,300	937,100	970,900	937,100	936,700

Source: Appendix D

¹ – acres are rounded from the results of the timber suitability analysis in appendix D.

Sustained Yield Limit

The sustained yield limit reflects the quantity of wood products that could be sustainably removed from the Lincoln NF in perpetuity. Sustained yield limit was calculated for the Lincoln NF using the number of acres calculated as “lands tentatively suitable for timber production” (2012 planning rule [36 CFR 219.11(d)(6)] and Forest Service Handbook 1909.12, chapter 60, section 64.31), as determined through mapping GIS data layers (appendix D). The tentatively suitable acreage (356,943 acres), consistent across alternatives, was further partitioned by ERU using GIS analyses and was multiplied by regional coefficients consistent with 2012 planning rule directives (same as quoted above). The sustained yield limit informs comparisons between the projected timber sale quantity and projected wood sale quantity (described below) across alternatives, but is not considered a separate indicator due to being consistent across all alternatives.

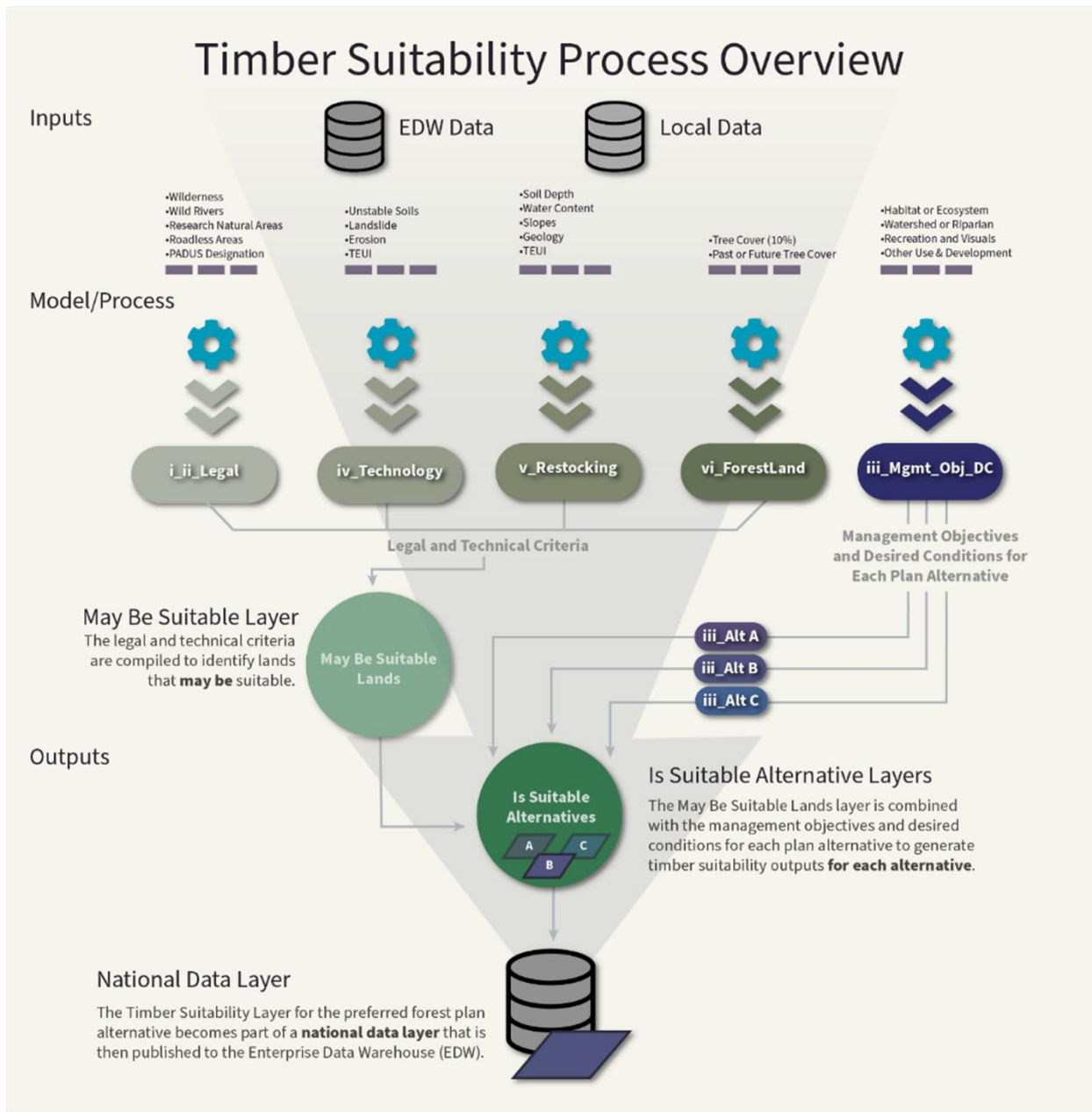
The sustained yield limit for the Lincoln NF was calculated as 21.0 MMBF per decade (appendix D). This quantity of timber and associated wood products delineates the sustainable level for the forest over the next 20 years. Quantities less than this threshold are anticipated to be sustainable in perpetuity unless forest growth stagnates or wildfire removes areas from production; quantities above this threshold would only be feasible for short periods of time.

Projected Wood and Timber Sale Quantities

Projected timber sale quantity and projected wood sale quantity are the quantities of timber and other wood products that can be expected to be sold during the first two decades of the revised plan based on projected vegetation treatments outlined in plan objectives. The projected wood sale quantity includes all woody material likely to be sold from these harvests whether or not the woody material meets utilization standards. The projected timber sale quantity is a subset of the projected wood sale quantity and is an

estimate of the quantity of timber expected to be sold during the plan period. The volume in the projected timber sale quantity is the volume that meets utilization standards, and must be equal to or lower than the sustained yield limit for the Lincoln NF. The estimation of these two quantities must be consistent with the plan components of the final plan or the unique mix of plan components in each alternative, and consistent with the fiscal and organizational capability of the unit. Sale quantities were modeled using state-and-transition models as described in appendix E (figure 3-16, Timber suitability workflow for determining timber).

Figure 3-16. Timber suitability workflow for determining timber



Assumptions

- Wilderness and special management areas may not be compatible with mechanical thinning.
- There may be untreated acres over the lifetime of the plan.
- Not implementing restoration activities such as mechanical thinning will affect desired conditions.

Indicators

- Acres suitable for timber production
- Projected wood sale quantity (projected timber sale quantity and projected wood sale quantity)

Environmental Consequences for Sustainable Forestry and Forest Products Common to All Alternatives

All alternatives contain plan direction to provide a sustainable supply of forest products with consideration to multiple-use objectives, consistent with desired conditions of other resources. Desired conditions promote the sustainable availability and removal of forest products, associated with silvicultural treatments that contribute to ecosystem integrity.

Forest products contribute to local economies and livelihoods, creating opportunities to sustain existing industries or develop new industries based on the availability of supplies and needs of the people. Forest products also support traditional communities and culturally important activities, and they contribute to the long-term socioeconomic diversity and stability of local communities by providing a sustainable and continuous supply of products to meet demand. While the availability and accessibility of traditionally used forest products may vary by alternative, the demand for these products is not anticipated to change, resulting in varying levels of support for traditional communities among alternatives.

All alternatives have the potential for some level of timber harvest to support local and regional markets and contribute financially to area residents. All alternatives include mechanical treatment for fuels reduction, forest restoration, or both, any of which may produce commercial timber, small-diameter timber, biomass, or fuelwood as a by-product. All alternatives provide opportunities for the public to collect other forest products under permit and for unpermitted personal use.

Environmental Consequences for Sustainable Forestry and Forest Products Under Alternative A

In total, there are 166,312 acres that are suitable for timber production under alternative A (table 3-61; figure 2-6). Alternative A would retain forest product availability and use at roughly the same level it has been since the implementation of the 1986 Forest Plan, as shown in table 3-59. The emergence of new timber markets or any significant growth of existing markets would be least likely under this alternative, resulting in little change to the demand for timber products and negligible additional economic benefit (see the socioeconomics section).

Environmental Consequences for Sustainable Forestry and Forest Products Under Alternative B

Alternative B would increase the acreage suitable for timber production, compared with alternative A, by 8 percent (table 3-61; figure 2-8). Unlike alternative A, alternative B includes objectives for mechanical thinning in forest ERUs that provides additional timber production. In overstocked ponderosa pine and mixed conifer forests, treatments would supply numerous cords of fuelwood, available to anyone with a collection permit, provided there is sufficient access to materials.

The predicted amount of timber available for sale (projected timber sale quantity) is 18 million cubic feet over 20 years (table 3-62). At this level of extraction and use, the Lincoln NF can sustainably produce these amounts for years to come, which will provide a stable source of forest products that may benefit local communities. Having a sustainable and increased product base may be grounds to create more outlets for forest product utilization, increasing jobs and boosting the economy of nearby and regional communities.

Table 3-62. A Two-Decade Comparison of Projected Timber Sale Quantity and Projected Wood Sale Quantity on the Lincoln NF in millions of cubic feet (MMCF) by Alternative

Timber Products	Alternative B		Alternative C		Alternative D		Alternative E	
	Decade 1	Decade 2	Decade 1	Decade 2	Decade 1	Decade 2	Decade 1	Decade 2
Timber Products								
A1. Sawtimber (9 or more inches in diameter at breast height)	5	5	5	6	8	7	7	7
A2. Other products (5–9 inches in diameter at breast height)	1	1	1	1	1	1	2	1
B1. Sawtimber (9 or more inches in diameter at breast height)	2	2	2	2	3	3	3	3
B2. Other products (5–9 inches in diameter at breast height)	1	0	1	0	0	0	1	0
C. Projected Timber Sale Quantity	9	9	9	9	13	11	12	12
Other Estimated Wood Products								
D1. Softwood fuelwood (5 or more inches in diameter at breast height)	2.4	2.2	1.62	1.8	1.6	1.8	3.45	3.8
D2. Hardwood fuelwood (5 or more inches at diameter in breast height)	0.3	0.1	0.2	0.3	0.4	0.3	0.44	0.49
D3. Aspen (5 or more inches at diameter in breast height)	0.3	0.1	0.4	0.3	1.0	0.9	0.37	0.31
E. Projected Wood Sale Quantity	12	12	11	12	16	14	17	16

Source: Appendix D

Environmental Consequences for Sustainable Forestry and Forest Products Under Alternative C

Alternative C promotes natural processes and de-emphasizes timber production, but the overall decrease in acres suitable for timber production is only 13 percent less than alternative A with impacts similar to those described under alternative B (table 3-61; figure 2-13). The projected timber sale quantity would be identical to that under alternative B with similar impacts on timber production and economic contributions.

Environmental Consequences for Sustainable Forestry and Forest Products Under Alternative D

Alternative D would have the same suitable timber acreage as alternative B (table 3-61; figure 2-8); however, its emphasis on managing to move ERUs toward desired conditions would increase the projected timber sale quantity and projected wood sale quantity, compared with alternative B (33 percent and 25 percent, respectively; table 3-60). Alternative D has the highest projected timber sale quantity and would provide the opportunity to harvest more wood products, both industrial timber and fuelwood. The additional timber product sale would result in a slight increase in economic contributions compared with alternative A (see the socioeconomics section).

Environmental Consequences for Sustainable Forestry and Forest Products Under Alternative E

Alternative E would have almost the same suitable timber acreage as alternative B (table 3-61; figure 2-15). It would stress timber management on timber sales and forest products, with a resulting projected timber sale and projected wood sale quantities similar to that under alternative D (table 3-62). Impacts on timber production and economic contributions would be similar to those described under alternative D.

Cumulative Environmental Consequences for Sustainable Forestry and Forest Products

National Forest System lands on the Lincoln NF and adjacent land are considered the cumulative effects analysis area. The Lincoln NF is adjacent to BLM, tribal, State, and privately owned lands. Ongoing and planned actions on and near the Lincoln NF would influence the cumulative environmental consequence analysis area. The time frame for future action is 10–15 years.

To sustain a forest products industry, a continuous supply of timber and fuelwood is needed from the region, on both Federal and non-Federal lands. As populations increase, more stress could be placed on the Lincoln NF to meet the demands of people and industry. The availability of forest products on adjacent lands would lessen the impacts and the demands placed on the Lincoln NF.

Past actions still contribute to effects today, such as the abundance of small-diameter, low-value timber. Prior to the amendments of the 1986 Forest Plan, vegetation management was driven by production levels using an even-aged management approach. As a result, there is decreased diversity, degradation of natural spatial patterns, and an abundance of young, small trees.

Current and future forest restoration projects depend on the market demand for timber products. If demand for forest products increases, a greater potential for successful restoration work can be expected, resulting in beneficial impacts through a restored landscape. If demand decreases, the existing milling infrastructure may close and less restoration work can be successfully completed, moving the landscape further away from desired conditions. Market variabilities, which lead to an increase or decrease in demand, are difficult to predict. This makes evaluation of cumulative environmental consequences of past, present, and future actions challenging.

The supply of forest products from private, tribal, State, and other Federal lands affects the demand from the Lincoln NF. Tribal lands provide a variety of forest products but are not accessible by the general public, leaving the need for non-timber products to be permitted on the Lincoln NF.

Multi-jurisdictional collaborations of restoration projects increase opportunities for all parties. Restoration projects planned on neighboring lands would complement efforts to restore the Lincoln NF landscape to desired conditions and have beneficial cumulative impacts. Restoring ecosystems and developing

sustainable industries are a beneficial cumulative impact. An increased number of restoration acres may increase markets, the number of jobs, and the benefits to the local economy. Lincoln NF restoration projects are expected to be complemented and enhanced from nearby projects on adjacent lands.

Uneven-aged management, fuels reduction projects, and restoration of ecosystems would be beneficial when applied across the landscape. When implementing projects, best management practices would be followed. As a result, cumulative environmental consequences are expected to be beneficial.

Restoration work across jurisdictions adjacent to the Lincoln NF is limited by operational and transportation costs. These limitations may influence overall accomplishments of restoration work. Close markets lead to potentially successful treatments and provide greater ecosystem benefit. Future beneficial economic benefits across the region are likely as restoration projects continue. Compared with alternative A, the proposed revisions, along with other jurisdictions' actions, could improve and sustain the availability of forest products and the economic needs of the surrounding communities. These projects are critical to ensuring a continuous, sustainable supply of forest products.

Sustainable Rangelands and Livestock Grazing

Affected Environment

Rangelands on the Lincoln NF are made up of grasslands, shrublands, forests, woodlands, wetlands, and deserts, all of which may be grazed by domestic livestock. Livestock have grazed the rangelands on the Lincoln NF for far longer than the Lincoln NF has existed administratively. Since its Anglo-European settlement around 1850, domestic livestock have nearly continuously grazed what is now the Lincoln NF and surrounding rangelands. Initially, the rangelands were grazed broadly by cattle, sheep, swine, horses, and goats; however, since that time and after the enactment of the grazing permit system, the extent and types of grazing on these lands have decreased dramatically. Currently, the Lincoln NF is primarily grazed by cattle, with some sheep and horse grazing.

Under the grazing permit system, the Forest Service administers domestic livestock grazing to be compatible with other multiple-use objectives. The permit system provides the desired economic and cultural benefits to surrounding communities. Rangelands on the Lincoln NF offer several benefits to the local communities. Not only have they provided and sustained ranching operations for several generations, they also provide the basis for sustaining the local culture and lifestyle. Rangeland grazing of domestic cattle is a strong economic driver for rural communities in Chaves, Eddy, Lincoln, and Otero Counties.

Rangelands also provide large open spaces for hiking, hunting, and camping. Developments and structures built to provide water for livestock operations also benefit many other species. In the absence of livestock operations, these water sources would be greatly reduced.

On the Lincoln NF, rangeland is divided into grazing units known as allotments, which are further subdivided into pastures. The borders of such allotments typically follow geographic and topographic features, such as canyons and riverine habitat, though they may also be completely fenced.

The sizes of allotments on the Lincoln NF vary greatly, ranging from the 400 to 110,000 acres. The average allotment size is nearly 9,000 acres. Permittees for rangeland grazing are generally individuals, families, or corporations, though the rangelands may also be shared through partnerships. Most allotments on the Lincoln NF have a single permittee, with few allotments maintaining shared permits.

The entirety of the Lincoln NF is in open or closed allotments. Open allotments may be active, vacant, or a combination of both. There are a total of 118 allotments on the Lincoln NF, 104 of which are open (935,200 acres), and 14 closed (117,900 acres) (table 3-63). Figure 2-2 shows the location of allotments and their status under the current plan.

Table 3-63. Allotment Status on the Lincoln NF

Status	Number of Allotments	Acres	AUMs Available	AUMs Authorized FY2020
Open	104	935,200	149,400	103,726
Closed	14	117,900	-	-
Total	118	1,053,100	149,400	103,726

Source: Forest Service GIS 2020

Available AUMs are closely connected to the acreage of each allotment, with larger allotments generally having more AUMs available to be authorized for permittees. Available AUMs range from only 20 up to nearly 10,000, and the average number of AUMs on all allotments on the Lincoln NF is 1,494.

Factors affecting or that may lead to impacts on livestock operations and range management on the Lincoln NF are the proliferation of nonnative, invasive plants; woody vegetation encroachment, such as from piñon-juniper; and drought. In addition, livestock may compete for forage with native ungulates, such as deer and elk. All of these factors may reduce forage availability over the short and long term.

Environmental Consequences for Sustainable Rangelands and Livestock Grazing

Methodology and Analysis Process

This analysis assesses the potential impacts on rangelands and grazing in all current allotments in the plan area on the Lincoln NF. Grazing operations are generally confined to established allotments, thus impacts from the proposed alternatives would be on the allotments available for grazing on the Lincoln NF. This plan is to be implemented for 10 to 15 years, which is the period in which impacts are analyzed.

As stated in the affected environment, grazing on the Lincoln NF is managed within allotment units, which are subdivided into pastures. The potential effects on livestock grazing from decisions and management on the Lincoln NF include changes to available and authorized AUMs and the availability and quality of forage in allotments. The potential impacts discussed below were identified by reviewing the best available science and information and by using both qualitative and quantitative data impact indicators. The section is organized by the issue topics identified during scoping and subsequent alternatives development and specifically analyzes impacts on rangeland and grazing, whereas the impact of rangeland management on other resources is covered in their respective sections.

Assumptions

- Livestock grazing under all alternatives is at an appropriate level on the Lincoln NF when rangelands are managed responsibly.
- Lessened forage availability will result in fewer authorized AUMs.
- Increased forage availability will result in more authorized AUMs.

Indicators

- Forage availability
- Allotment availability
- AUMs authorized

Environmental Consequences for Sustainable Rangelands and Livestock Grazing Common to All Alternatives

Effects from Access and Recreation

The addition, maintenance, improvement, or decommissioning of roads may affect how permittees access allotments and livestock. The addition or maintenance of roads may enhance the ability of permittees to reach their livestock; however, constructing roads in an allotment may remove suitable forage for livestock. The opposing impact on grazing and rangelands from access changes would be the decommissioning of administratively closed roads. Decommissioning administratively closed roads may limit grazing operators' ability to efficiently reach certain allotments via motorized vehicle and would subsequently affect their ability to move livestock. Over the long term, decommissioning administratively closed roads may lead to an increase in forage availability. This is because vegetation reclaims the area that was once a road.

Motorized and nonmotorized recreation are widespread throughout the Lincoln NF and may result in unwanted dispersal or disturbance of livestock. Motorized recreation is particularly prevalent on the Sacramento Ranger District (Colcord 2020) and may affect allotments in that ranger district at a higher intensity than in other districts. Aside from the potential to disturb livestock, motorized recreation may erode and compact soil, increase the spread of invasive plants, or damage native plants (Wolf et al. 2017). All of these scenarios would affect forage quality and availability. Additionally, motorized recreation without the use of proper spark arrestors may lead to spark-ignited wildfires, resulting in loss of available forage.

Nonmotorized recreation, such as foot travel, stock travel, or primitive camping, may also affect livestock and forage in a similar manner. Potential impacts of poorly managed or heavy recreation on rangelands include erosion and trail damage, increased trail footprints, trampled vegetation, increased spread of invasive plants and littering, and disturbed livestock.

While it is often viewed as low impact, nonmotorized recreation is known to alter the behavior of livestock (Wolf et al. 2017); however, such impacts as damage or removal of vegetation are likely to be concentrated around trails and campsites or where stock used for travel are grazed. The impacts from recreation on vegetation on the Lincoln NF are discussed in further detail in the Upland Vegetation Communities section.

Outside of impacts on vegetation, nonmotorized and motorized recreation may damage rangeland infrastructure by inappropriate use or illegal activities, such as vandalism, target shooting of water tanks and troughs, or gates left open by recreationists, allowing livestock to escape.

Effects from Natural Resource Management

Under all alternatives, rangelands and livestock are likely to be affected by various types of natural resource management, especially those that disturb the soil surface or remove vegetation. The type and intensity of impacts would depend on management objectives and methods. Nevertheless, any surface-disturbing activities may alter forage availability and lead to changes in grazing infrastructure.

All alternatives would include objectives for vegetation treatments. Over the short term, vegetation management projects, including mechanical thinning and prescribed wildfire, would affect rangelands by removing forage and compacting or eroding soils. Large swaths of land where vegetation has been removed through prescribed wildfire or wildfire may also fragment pastures in allotments. Treated allotments would likely be rested during restoration, thus removing the availability of authorized AUMs in such areas; however, prescribed wildfire that removes large amounts of vegetation is rare on the Lincoln NF. Prescribed burns are generally planned around grazing rotations, and cattle are not present during treatment intervals. Over the long term, vegetation treatments would likely enhance forage. As forage becomes more available, there is a potential for an increase in livestock that could be grazed in a given allotment.

Under all alternatives, natural resource management is intended to move the habitat of at-risk and protected species toward desirable conditions. Riparian areas may be restored under all alternatives, predominantly in areas where upland vegetation has encroached into riparian zones. Protecting the habitat for the threatened and endangered species may affect grazing operations and infrastructure. Management of at-risk species and their habitat is discussed in further detail in appendix A.

Vegetation treatments and restoration of wetlands and riparian zones may lead to a temporary loss of acreage for grazing, especially those treatments that would require restoration of channel shape and function. Removing water barriers would permanently alter water availability for livestock in allotments. The use of heavy equipment for channel reshaping could lead to heavy surface disturbance and thus loss of available forage.

Effects from Livestock Grazing and Rangeland Management

Under all alternatives, stocking, grazing intensity, duration, and timing, and utilization and forage threshold decisions would be considered as part of the project-level analysis. This analysis would cover changes to authorized grazing through term grazing permits, allotment management plans, and annual operating instructions.

No planning level alternative would close an active allotment, and no closed allotments would be returned to active status. Acres open for active grazing would be managed at varying levels under different alternatives, and AUMs would be authorized accordingly. As available forage acres decrease, total AUMs available on the Lincoln NF would also decrease.

Livestock numbers and class would be altered to respond to environmental, social, and economic needs. AUMs may be authorized and assigned to permittees on an annual, seasonal, or monthly basis, and permittees would attend annual meetings with Forest Service range program staff to develop operating guidelines and instructions.

Under all alternatives, acres available for grazing on the Lincoln NF may undergo other rangeland management strategies, such as removal of poisonous or noxious vegetation. Allotments where unpalatable or toxic vegetation has encroached would likely receive vegetation treatments and subsequent restoration. On allotments where restoration takes place, those allotments or pastures may be rested, and livestock would be shifted to a different pasture.

Additional protections for sensitive natural resources may alter forage availability and authorized AUMs, limiting the economic output for grazing operators. The economics of grazing are heavily interconnected with other resources and can be affected through management changes. Such changes would reduce or increase the resources to grazing operations. Periodic adjustments to the intensity, duration, and timing of grazing may not be convenient for operators and could lead to short-term economic costs.

All alternatives maintain the same level of livestock grazing as the 1986 Forest Plan (alternative A), as amended (Forest Service 1986). Alternative A would continue to manage individual allotments under the numerous management areas included in the 1986 Forest Plan (see table 2-2). There would be no desired conditions or landscape-level management approach for rangelands. Under alternatives B, C, D, and E, the proposed plan would include desired conditions for rangelands and objectives, standards, and guidelines to move rangelands toward desired conditions. These plan components provide range managers with a consistent, landscape-level management approach for allotment-level decisions. This would move rangelands toward desired conditions greater than under Alternative A.

Effects from Wilderness and Special Management Areas

Under all alternatives, the management of designated wilderness may affect the permittees' ability to graze livestock; however, there would be no additional impacts on grazing operations, as no new wilderness would be designated. Grazing would be available on existing active allotments, regardless of wilderness designation, under any alternative.

In instances where designations overlap with existing allotments, permittees would be responsible for following stipulations on designated areas. This includes stipulations that may limit the method of access and use of mechanized equipment; this is consistent with policy and plan components for a given special designation.

Segments of wild rivers deemed eligible may include quarter-mile buffers on either side of the eligible watercourse. Fifty-five WSR segments would be managed as eligible for designation in the National Wild and Scenic Rivers System under alternative A; 54 river segments would be managed as eligible under alternatives B, C, D, and E. Where WSRs and grazing overlap, they would be managed under the guidelines in Forest Service Handbook 1909.12, Chapter 82.5.

Environmental Consequences for Sustainable Rangelands and Livestock Grazing Under Alternative A

Effects from Access and Recreation

Alternative A does not provide recreation standards, guidelines, or management direction for the entire Lincoln NF. No specific plan components exist to mitigate the impacts of recreation on grazing operations from trails and dispersed camping. The types of impacts discussed in environmental consequences common to all alternatives would continue under alternative A.

Under the existing plan, there is direction to decommission 100 miles of administrative roads, though that level of decommissioning has not been reached. Decommissioning administratively closed roads may limit how permittees access their allotments and livestock, but would not limit the availability of allotments forestwide. Over the long term, decommissioning may slightly increase forage availability, as surrounding vegetation fills in decommissioned roads.

Effects from Natural Resource Management and Economic Extraction

Standards and guidelines under alternative A are focused on increasing habitat, available forage, and timber production. There are no existing objectives for mechanical thinning or prescribed burning. Alternative A does provide direction for rehabilitating and maintaining riparian conditions; however, it lacks clarification on objectives for restoration or riparian management zones, where riparian treatments would be prioritized. Impacts on grazing operations due to riparian treatments and restoration under alternative A are described in Environmental Consequences for Sustainable Rangelands and Livestock Grazing Common to All Alternatives.

Effects from Wilderness and Special Management Areas

Alternative A does not recommend any new wilderness areas. Direction related to managing existing congressionally designated wilderness areas is consistent with livestock grazing.

Environmental Consequences for Sustainable Rangelands and Livestock Grazing Under Alternatives B, C, D, and E

Effects from Access and Recreation

The proposed plan includes the following guidelines for management of the roads:

- Reconstruction and rehabilitation of existing roads and trails would be emphasized over new road construction.
- The construction of new roads would be designed to limit impacts on ecological resources.

When compared with alternative A, measures taken to improve or create new roads under all action alternatives would promote movement toward desired conditions to a greater degree. The proposed plan includes an objective to decommission 75 miles over a 15-year period. This is similar to the 100 miles included in the current plan. Impacts on livestock grazing from decommissioning would be similar to those described under alternative A.

No new developed or dispersed recreation opportunities or management areas are proposed, though future recreation facilities could be analyzed and developed on a project level. The action alternatives emphasize sustainable recreation and include guidance on implementing management to reduce the impacts of motorized and nonmotorized recreation and rehabilitating dispersed campsites that adversely affect riparian areas. Compared with alternative A, this management would reduce the spread of nonnative, invasive plants on motorized routes and trailheads and would reduce vegetation degradation at dispersed camping sites. These management guidelines would reduce the impacts on rangeland and grazing operations across all action alternatives, where such management is implemented.

Effects from Natural Resource Management

Vegetation management objectives under all action alternatives would include maintaining essential ecosystem components, processes, and functions through vegetation treatments. Treatments would include mechanical thinning, prescribed burning, and specific direction on nonnative invasive plants management.

Over the short term, there would a minimal impacts on grazing from mechanical thinning and moderate impacts from prescribed burning. Where mechanical thinning takes place, livestock would likely be removed, though generally they would be returned after only a short period. Prescribed burning may lead to removal of livestock for longer periods, when compared with mechanical thinning. Permittees would work with grazing staff to plan their rotation accordingly. Impacts would depend on the number and size of burns required and the condition of the vegetation undergoing treatment; however, vegetation treatments are likely to lead to long-term benefits for grazing. Posttreatment, ecosystems and their associated forage would become more resilient and adaptive to local stressors, such as wildfire or encroachment of noxious and unpalatable forage.

By managing vegetation by thinning and prescribed burning, ecosystem health would be restored and movement toward desired conditions would be greater than under alternative A. These desired conditions would increase forage for livestock. As forage becomes more available, there is potential for an increase in the number of livestock that could be grazed in a given allotment.

The proposed forest plan emphasizes restoration treatment objectives that benefit both riparian and wetland ecosystems across the Lincoln NF; however, the level at which improvement of watersheds would take place differs by alternative. All action alternatives would provide management direction for livestock grazing in riparian areas, such as structural developments (i.e., water gaps, pipelines, or troughs). Management would not prohibit grazing in riparian areas but may restrict access to forage through the addition of fencing.

Management of riparian habitat, particularly the creation of riparian management zones, would affect livestock grazing to a greater extent than under alternative A. Stocking numbers may be reduced to levels that are better suited to move water quality, soil, and vegetation to desirable conditions. Under the proposed plan, the Lincoln NF would be required to complete a specific number of aquatic and riparian improvement projects to increase habitat connectivity for riparian species. This would include removing barriers and flooding previously dewatered areas. Impacts from these improvements would be as described in Environmental Consequences for Sustainable Rangelands and Livestock Grazing Common to All Alternatives.

All action alternatives would include plan direction designed to emphasize the protection of at-risk federally listed species and species of conservation concern. The list of at-risk species can be found under affected environment in the Wildlife, Fish, and Plants section. Protecting these species would help maintain or restore ecological conditions, but it could limit the intensity of grazing on allotments where at-risk species are found.

Effects from Wilderness and Special Management Areas

Impacts from designated wilderness are discussed above under Environmental Consequences for Sustainable Rangelands and Livestock Grazing Common to All Alternatives.

All action alternatives would propose the Upper McKittrick RNA; however, due to its limited size (787 acres), this designation is unlikely to affect available AUMs on any substantial scale and does not impose any significant limitations on rangeland management flexibility.

Environmental Consequences for Sustainable Rangelands and Livestock Grazing Under Alternative B

Effects from Access and Recreation

Alternative B balances access to the Lincoln NF and recreation opportunities with natural resource protection more than alternative A. Guidelines to relocate motorized and nonmotorized trails for protection of at-risk species and to rehabilitate dispersed camping sites adversely affecting riparian areas may indirectly benefit livestock grazing and rangeland operations in those areas, through increases in the quality and availability of forage.

Effects from Natural Resource Management

Alternative B includes mechanical vegetation treatment and prescribed burning objectives. It would prioritize treating piñon-juniper woodland and forest-frequent fire ERUs, so as to move them toward desired conditions. As such, allotments that contain the aforementioned vegetation type are most likely to be affected, as described in Environmental Consequences for Sustainable Rangelands and Livestock Grazing Common to All Alternatives. Prescribed wildfire is likely to lead to removal of livestock for a longer period, when compared with mechanical treatments; however, prescribed wildfire would improve forage conditions over the long term at a faster rate, compared with mechanical thinning.

Alternative B would several objectives to improve riparian habitat including restoring riparian habitat on 12 miles of streams, improving watershed condition in two watersheds, and completing five projects to improve habitat connectivity for aquatic and riparian species. These projects would remove barriers, relocate or decommission roads, restore dewatered stream segments, and connect fragmented habitat. When compared with alternative A, these habitat improvement objectives would indirectly improve conditions for grazing by increasing the availability and quality of forage.

Alternative B would strike a balance between protecting riparian zones with other multiple-uses on the entire Lincoln NF. Restoration in riparian habitat would be applied from a landscape-scale approach. Alternative B includes several guidelines for protecting riparian areas when placing grazing infrastructure, such as watering troughs or fencing.

Additionally, riparian management zones would be established under alternative B. Grazing would not be prohibited in these zones, but alternative B includes guidelines to manage grazing distribution and forest use. The Forest Service would adhere to these guidelines when making allotment-level decisions and locating range infrastructure and other concentrated livestock management practices outside of the riparian management zones. There is likely to be a greater impact on grazing and rangelands from riparian management under this alternative, when compared with alternative A; however, it is unlikely that these management guidelines would impose any significant limitations on rangeland management flexibility. Operators would have to work with the Forest Service to coordinate grazing operations with riparian management during allotment level decisions, but they would likely not see a diminished return on investment.

Effects from Economic Extraction

Timber harvest would supplement maintenance and restoration treatments under all action alternatives. Alternative B emphasizes restoration treatments to meet vegetation desired conditions. Under this alternative, grazing operators may benefit from maintenance and restoration treatments from timber harvest. Guidelines would emphasize the removal of woody vegetation, which would increase the available area for forage growth. Increases in forage availability would likely increase the number of authorized AUMs, and grazing operators are like to benefit from this management economically, when compared with alternative A.

Effects from Wilderness and Special Management Areas

Impacts from designated wilderness are discussed in Environmental Consequences for Sustainable Rangelands and Livestock Grazing Common to All Alternatives, above.

Under alternative B, the Forest Service would recommend 40,500 acres of wilderness areas. Impacts on grazing and rangelands under this alternative would be similar to those for designated wilderness.

Environmental Consequences for Sustainable Rangelands and Livestock Grazing Under Alternative C

Effects from Access and Recreation

Impacts would be the same as under alternative B.

Effects from Natural Resource Management

Alternative C includes objectives that would treat the least number of acres of all alternatives. This alternative would emphasize natural processes, rather than extensive vegetation treatments, to move ERUs toward desired conditions. The use of mechanical treatments would be limited. This management

would increase the length of short-term impacts on grazing availability and available forage for rangeland operations when compared with alternative A.

Alternative C would include the same riparian improvement projects as alternative B with impacts as described under that alternative B.

Under alternative C, natural processes would be emphasized to move ERUs toward desired conditions where ERUs are departed or trending away from reference conditions. These plan components would provide management direction to move rangelands toward desirable conditions. This may lead to no net loss of available forage, when compared with alternative A.

Effects from Economic Extraction

Impacts would be the same as under alternative B.

Effects from Wilderness and Special Management Areas

Under alternative C, the Forest Service would recommend approximately 402,000 acres of wilderness areas. Impacts on grazing and rangelands under this alternative would be the same as those described for designated wilderness under Environmental Consequences for Sustainable Rangelands and Livestock Grazing Common to All Alternatives, but they may increase in intensity when compared with other alternatives, as access to allotments may become more difficult with increases in acres of recommended wilderness.

Environmental Consequences for Sustainable Rangelands and Livestock Grazing Under Alternative D

Effects from Access and Recreation

Impacts would be the same as described under alternative B.

Effects from Natural Resource Management

Alternative D would include the same acres of mechanical treatment and prescribed burning as alternative B. Impacts would be the same as under alternative B.

Alternative D would promote restoration of riparian areas more so than alternative B by increasing the objective for improving watersheds to six. Impacts on grazing and rangelands under this alternative would increase, when compared with alternative A, particularly affecting the availability of forage over the short term; however, over the long term, the quality and quantity of forage may increase as restoration projects are completed.

Effects from Economic Extraction

Impacts would be the same as under alternative C.

Effects from Wilderness and Special Management Areas

Impacts would be the same as under alternative B.

Environmental Consequences for Sustainable Rangelands and Livestock Grazing Under Alternative E

Effects from Access and Recreation

As under alternative B, management under alternative E would decommission administratively closed roads; however, it would emphasize access to developed recreation sites. Increased access to recreation sites is likely to intensify recreation-related impacts on livestock and grazing when compared with alternative A, as described in Environmental Consequences for Sustainable Rangelands and Livestock Grazing Common to All Alternatives.

Effects from Natural Resource Management and Economic Extraction

Alternative E would include the same acres of mechanical treatment and prescribed burning as alternative B. Impacts would be the same as under alternative B.

Alternative E would decrease the miles of riparian restoration to eight miles, a 50 percent reduction compared to alternative B. This could decrease the quality and quantity of forage in the long term as less areas are improved.

Effects from Economic Extraction

Alternative E emphasizes timber harvest over restoration objectives through either more acres harvested or increased treatment intensity. This may decrease the trajectory of rangelands toward desired conditions, compared with alternative B.

Effects from Wilderness and Special Management Areas

Under alternative E, the Forest Service would recommend 21,900 acres of wilderness; therefore, when compared with alternative A, impacts would be similar to those identified for designated wilderness, likely with a negligible increase in intensity due to access concerns.

Cumulative Environmental Consequences for Sustainable Rangelands and Livestock Grazing

The analysis area for rangelands and livestock grazing is the private, State, and other Federal lands on and surrounding the Lincoln NF. The time frame for assessing cumulative effects on rangelands and grazing is the maximum life of the plan, which is 10 to 15 years. Nearly the entire Lincoln NF is surrounded by grazing allotments (96 percent of total acreage); however, the boundaries for cumulative analysis extend well beyond the Lincoln NF boundaries. Past, present, and future actions taken by surrounding private, State, and Federal lands have the potential to cumulatively affect rangelands and grazing on the Lincoln NF. On lands surrounding the Lincoln NF, past actions in the plan area have contributed to the existing conditions, while future actions will be addressed in the specific project-level environmental analysis.

BLM field offices have completed land resource management plans to manage lands next to or near the Lincoln NF. In addition, there are a wide range of planning and land use strategies that address land use next to the Lincoln NF. Local soil and water conservation districts have also written land use plans to promote responsible and effective use and management of soil and water resources in their districts. The State of New Mexico has issued a statewide natural resources assessment and strategy and response plan. It guides planning and implementation of natural resource management and restoration activities for the State. Implementing all of these plans, in combination with the Lincoln NF forest plan, contributes to the cumulative effects on species that occur on and next to the Lincoln NF.

In the counties that surround the Lincoln NF there is limited private land available for existing permit holders to graze livestock. Most permittees are unlikely to hold enough private land to graze livestock year-round. Typically, livestock are supplemented with hay during months when they do not have access to grazing allotments on Forest Service or BLM-administered lands. Ranching operations permitted on the Lincoln NF are an important factor in sustaining the local ranching economy and lifestyle.

Water availability, in particular for livestock grazing, is a constant issue for many counties surrounding the Lincoln NF. Some counties may limit agricultural growth, based on the availability of water statewide. As counties make decisions on how to allocate water for consumption and agriculture (including grazing operations), impacts on grazing may be felt on and off the Lincoln NF as water availability for both livestock and forage decreases. The costs associated with grazing livestock in the months they spend off the Lincoln NF could increase as the local production of hay and alfalfa decreases.

Elk and other ungulates are commonly known to compete with livestock for resources on the Lincoln NF, particularly on the Sacramento Ranger District. Elk in New Mexico are managed by the New Mexico Department of Fish and Game and are an important game species for local tribes. Elk may browse vegetation both on and off the Lincoln NF and are a source of competition where livestock and elk herds overlap. As the population of local elk herds increases, they will create greater competition for forage with permitted livestock.

Recreation

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. Recreational opportunities range from primitive to highly developed and are available throughout the year. The Lincoln NF consists of “sky islands,” isolated mountain ranges surrounded by desert. Because these forested mountain areas can be 20 degrees Fahrenheit cooler than surrounding desert regions during summer months, a popular use of the Lincoln NF for local communities at lower elevations is for climatic relief (Jones 2020a). Three scenic byways—the Billy the Kid National Scenic Byway, the Sunspot Highway National Forest Scenic Byway, and the Guadalupe Backcountry Byway—provide opportunities for viewing the diverse scenery of the region, which changes from high desert to high valley meadows and alpine terrain with increasing elevation.

The Lincoln NF consists of three distinct ranger districts: Smokey Bear, Sacramento, and Guadalupe. All three ranger districts are unique in the way they are utilized, and there is no one driver for recreation use across the entire Lincoln NF.

Encompassing approximately one-half of the Lincoln NF, the Sacramento Ranger District is the largest contiguous area of forest. It contains two national recreation trails and most of the developed recreation sites, most of which are operated by private concessionaries. The Sacramento Ranger District also provides for motorized use on 169 miles of designated motorized trails. As a result, the Sacramento Ranger District is a popular destination for off-road vehicle recreation. While motorized vehicle use on motorized trails is not designated in the other two districts, such use still occurs on the regular road system in those districts. Ski Cloudcroft, a ski area open during times of sufficient snowpack, is also in the Sacramento Ranger District.

The Smokey Bear Ranger District is located near the town of Ruidoso. This district contains portions of the White, Capitan, Jicarilla, and Carrizo Mountains, and the hills above Highway 70 east of the city of Ruidoso Downs. Both of the Lincoln NF’s wilderness areas, comprising about 82,924 acres, are located in the Smokey Bear Ranger District, and a large amount of equestrian use and outfitter-guided hunting occurs in this district. Mountain biking is also popular in the Smokey Bear Ranger District, which

contains a trail system built in partnership with the local community that goes from the village of Ruidoso to the Lincoln NF; this trail system is heavily used (Jones 2020a). Ski Apache, the southernmost major ski area in the U.S., is located in both the Smokey Bear Ranger District and the Mescalero Apache Reservation.

The Sitting Bull Falls Recreation Area, which offers climatic relief, is the main driver for recreational visits in the Guadalupe District. This developed recreation site contains Civilian Conservation Corps-era buildings, a publicly accessible natural pool and waterfall, which draw many visitors, picnic shelters, restrooms, and hiking trails within the canyon that all provide climatic relief from the surrounding high desert. The Guadalupe District is also very popular for hunting and off-road vehicle users.

Affected Environment

The Lincoln NF offers a variety of developed and dispersed recreation, including camping and picnicking, hiking, mountain biking, horseback riding, off-road vehicle use, wildlife and scenic viewing, hunting and fishing, and snow sports. In 2014, the latest year for which detailed statistical visitation data is available, there were approximately 921,000 visitors to the Lincoln NF, most of whom reported hiking, driving and skiing as their main activities (Forest Service 2014c, 2014d).

Dispersed Recreation

Dispersed recreation is popular on the Lincoln, including dispersed camping, hiking, mountain biking, horseback riding, scenic viewing, wildlife watching, fishing, and hunting. There are three national recreation trails in the plan area: the Dog Canyon Trail, the Rim Trail, and the newly designated national recreation trail (2018) Guadalupe Ridge Trail.

According to 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 Lincoln NF participate in nonmotorized trail activities while only 3 percent participate in motorized trail activities.

Dispersed camping, which is allowed in most areas of the Lincoln NF, is the most popular form of dispersed recreation there. Generally, dispersed camping is more popular at higher elevations in the Smokey Bear and Sacramento Ranger Districts from May through September. Visitors engaged in dispersed camping often park trucks, off-road vehicles, and campers within 300 feet of forest system roads to set up camp. They gather natural resources, such as nearby stones and dry wood, to create campfire rings at these informal campsites. There are no developed toilets or other facilities in these areas, and impacts from high-intensity use are especially evident in some areas.

Heavy concentrations of dispersed use are found along main access points to the Lincoln NF, near water sources such as along the Rio Peñasco, along scenic and well-maintained roads, and along major access points to the trail system. The Guadalupe Ranger District and the low-elevation 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 at hunting areas.

Mountain biking is a popular activity in the village of Ruidoso. The Smokey Bear Ranger District has been 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 and other organizations that participate in trail activities on the Lincoln NF. The village of Cloudcroft is another popular mountain biking community located in the Sacramento Ranger District. The Smokey Bear Ranger District also contains numerous user-created motorized trails.

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 NF. The most popular areas for equestrian use are the Smokey Bear and Sacramento Ranger Districts. Most equestrian use on the Lincoln NF occurs in the Smokey Bear Ranger District, concentrated primarily within the two designated wilderness areas.

Recreational target shooting is a popular activity across the entire Lincoln NF, although the Smokey Bear Ranger District contains the only permitted shooting range on the Lincoln NF, located outside Ruidoso Downs and directly adjacent to private lands. Historically, Dry Canyon in the Sacramento Ranger District has been used for recreational shooting, which has resulted in resource damage and accumulated refuse. Although mitigations have been implemented, the area continues to receive high use most weekends and intermittent use during the week.

Developed Recreation

Ski Apache, a developed ski area and the southernmost major ski area in the U.S., is located in the Smokey Bear Ranger District and partially located on the Mescalero Apache Reservation. Ski Cloudcroft is located in the Sacramento Ranger District. Numerous other developed recreational opportunities exist on the Lincoln NF, which contains 16 developed campgrounds and 6 group campgrounds. A variety of camping opportunities are available, with campground facilities ranging from highly developed to minimally developed. Some campsites are first-come, first-served while others require reservations. The Sacramento Ranger District contains most of the developed recreation sites. Family campgrounds range from minimally developed sites, such as Skyline Campground adjacent to the White Mountain Wilderness, to sites such as South Fork or Silver Campgrounds, which allow for both tent and recreational vehicle camping. Large paved areas, such as the Silver Overflow Campground, can accommodate larger recreational vehicles.

Motorized Recreation

The Lincoln NF is a popular destination 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 Lincoln NF per the current forest plan. Off-highway vehicle use occurs predominately in the Sacramento Ranger District where two-thirds of the trail system (55 out of 86 trails) are 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 Lincoln NF visitors. Due to this popularity, many user-created motorized trails exist in the district. In addition, illegal motorized use of closed roads has occurred. Demand for motorized off-road vehicle opportunities is expected to increase. Funding, fees, volunteers, and partners assist with sustaining the current infrastructure; however, some services are lacking, such as patrols of illegal off-highway use. These types of situations provoke visitor complaints and dissatisfaction with their recreational experience.

Recreation Special Uses

Recreation special-use authorizations issued by the Forest Service include outfitter and guides, recreation residences, ski areas and related facilities, concession campgrounds, organization camps, recreation events, target ranges, and noncommercial groups. Outfitter and guides and recreation residences comprise most recreation authorizations with 62 authorizations and 28 authorizations, respectively. All 28 existing recreation residences or related facilities are permitted in the Smokey Bear Ranger District. Other significant existing recreation special-use permits include the two ski areas with lifts permitted on the Lincoln NF: Ski Apache Ski Area, one of the largest ski areas in the Southwest, and Ski Cloudcroft.

Recreation Setting and Opportunities

Forest Service personnel use the recreation opportunity spectrum as a tool to manage for a spectrum of recreational opportunities that can be enjoyed in diverse settings. A recreational opportunity is the ability to participate in a specific recreational activity in a particular recreational setting. Recreational opportunities include nonmotorized, motorized, developed, and dispersed recreation on land and water, and in the air. The social, managerial, and physical attributes of a place, when combined, provide a distinct set of recreational opportunities.

Opportunities vary along the spectrum from a very high probability of solitude, self-reliance, challenge, and risk (primitive) to very social opportunities where self-reliance, challenge, and risk are relatively unimportant to the experience (rural or urban). 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. Table 3-64 shows the recreation opportunity spectrum class characterizations.

Table 3-64. Recreation Opportunity Spectrum Class Characterizations

Class	Description
Primitive	This class is characterized by an essentially unmodified natural environment of a fairly large size. Interaction between users is very low, and evidence of other users is minimal. The area is managed to be essentially free of evidence of human-induced restrictions and controls. Motorized use within the area is not permitted. There are no developed facilities.
Semiprimitive nonmotorized	This class is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Interaction among 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 restrictions may be present, but they would be subtle. Motorized recreation is not permitted, but local roads used for other resource management activities may be present on a limited basis. Use of such roads is restricted to reduce impacts on recreational experience opportunities. A minimum of developed facilities (if any) is provided.
Semiprimitive motorized	This class is characterized by a predominantly natural or natural-appearing environment of moderate to large size. The 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 restrictions may be present, but they would be subtle. Motorized use of local primitive or collector roads with predominantly natural surfaces and trails suitable for motorbikes is permitted. Developed facilities are present but are more rustic in nature.
Roaded natural	This class is characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of people. Such evidence usually harmonizes with the natural environment. Interaction among users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and the design of facilities, which are present and well defined.

Class	Description
Rural	This class is characterized by a substantially developed environment and a background with natural-appearing elements. Moderate to high social encounters and interaction between users are typical. Renewable resource modification and utilization practices are used to enhance specific recreational activities. Sights and sounds of humans are predominant on the site, and roads and motorized use are extensive. Facilities are more highly developed for user comfort with ample parking.
Urban	This class is characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resource modification and utilization practices are to enhance specific recreational activities. Vegetation cover is often exotic and manicured. Sights and sounds of people on-site are predominant. Large numbers of users can be expected, both on-site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

Source: Forest Service 1982

Congressionally designated wilderness areas are often associated with a primitive type of recreational opportunity, but the primitive recreation opportunity spectrum class is not synonymous with designated wilderness.

Table 3-65 displays the recreation opportunity spectrum class distribution re-inventoried and completed in 2016. The revised inventory more accurately represents the existing conditions on the Lincoln NF and will be used to help define desired conditions for the plan revision process.

Table 3-65. Recreation Opportunity Spectrum Class Distribution for the Lincoln NF

Recreation Opportunity Spectrum Setting	Total Forestwide Acreage	Percentage Forestwide	Smokey Bear Acreage	Sacramento Acreage	Guadalupe Acreage
Primitive	0	0%	0	0	0
Semiprimitive nonmotorized	173,825	14%	78,278	51,866	43,681
Semiprimitive motorized	769,604	61%	267,107	284,469	218,028
Roaded natural	262,242	21%	54,550	183,859	26,833
Rural	33,951	3%	9,082	24,869	0
Urban	18,293	1%	14,519	3,774	0

Source: Forest Service 2019h

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 Lincoln NF. 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 increase in residential subdivisions and other land development and the increased visitation and associated changes in off-highway vehicle use. Conversely, new protection measures on acres with threatened and endangered species have shifted acres from the semiprimitive motorized to the semiprimitive nonmotorized class. Due to the proximity of urban development and the abundance of National Forest System roads that run next to the White Mountain Wilderness Area, the Lincoln NF does not contain any primitive class acreage.

Environmental Consequences for Recreation

Methodology and Analysis Process

The recreation opportunity spectrum provides a framework for defining the types of recreational opportunities the public might desire and identifies that portion of the spectrum a given national forest might be able to provide or sustain, or both. The recreation opportunity spectrum provides the structure for describing the Lincoln NF contribution to sustainable flows of recreation settings and visitor opportunities. The recreation opportunity spectrum is used to describe whether management actions would sustain classes and related opportunities, change classes and related opportunities, or both. Lincoln NF personnel have a responsibility to provide resilient and relevant recreational opportunities representing a spectrum of recreational opportunities for current and future generations. Recreational users on the Lincoln NF are diverse and have varying opinions and desires for a sustainable recreation program across the Lincoln NF.

In 2010, the Forest Service developed an approach to recreation called Framework for Sustainable Recreation (Forest Service 2010b); Region 3 developed the Southwestern Region Sustainable Recreation Strategy (Forest Service 2014e). The Framework for Sustainable Recreation provides strategic direction for the Forest Service, as follows:

“ . . . 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 recreational 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
- 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 enhanced professionalism of the Forest Service workforce

Under each of the proposed alternatives, the Lincoln NF would address the core themes and attempt to resolve significant recreation issues identified by the public. This section is organized by the issue topics identified during scoping and subsequent alternatives development that are most applicable to recreation. Project-specific analysis would provide more in-depth analysis when implementing the plan.

Assumptions

In the analysis for this resource, the following assumptions have been made:

- All alternatives promote recreational uses to varying degrees.
- The framework for the recreation opportunity spectrum characteristics and sustainable recreation will be applied in project-level planning for all Lincoln NF activities.
- Visitors want varying experiences, from primitive to highly developed, to be available; but, the Forest Service cannot accommodate all preferences in all parts of the Lincoln NF.

- All action alternatives would adhere to the 2008 Travel Analysis Plan and incorporate district proposals for creation of motorized route systems, designation of new and existing routes, and decommissioning of roads and trails.
- Motorized vehicle use will continue to be designated and managed in accordance with the Travel Management Rule, 36 CFR 212, 251, 261, and 295.
- Recreation opportunity spectrum settings are based on the physical, social, and managerial setting characteristics (Forest Service Manual 2310). Desired recreation opportunity spectrum settings result from interdisciplinary discussions, public engagement, and the NEPA process. The amount of vegetation manipulation can have a large impact on recreation opportunity spectrum settings and is an objective way to look at whether management is meeting the desired recreation opportunity spectrum.
- Visitor use information specific to each district is not available. National visitor use monitoring information is collected for the entire Lincoln NF. Site-specific and recreation opportunity spectrum-related use data are not available.
- Recreational visitation rates would continue to be affected by factors outside the planning process, such as population changes in the region. It is uncertain to what extent the level of recreational visitation would be affected directly by proposed management decisions; however, new or altered management direction may influence the type of opportunities available to the public.

Indicator

- Quality and availability of recreational opportunities. This indicator reflects changes to recreational resources from anticipated management activities associated with each alternative. It includes the degree to which conflicts occur between different recreationists.

Environmental Consequences for Recreation Common to All Alternatives

Effects from Access and Recreation

Roads provide recreationists with access to the Lincoln NF and can affect the recreation opportunity spectrum settings and opportunities on the Lincoln NF. All alternatives would maintain open roads, as depicted on the motor vehicle use maps the Forest Service updates annually. All alternatives include objectives for decommissioning administratively closed roads, either based on identification through scoping and public involvement (under alternative A) or through adherence to the current travel analysis plan, subject to further NEPA and public involvement under all action alternatives. Decommissioning administratively closed roads would improve fish and wildlife habitat, increasing the quality and quantity of opportunities for wildlife watchers, fishers, and hunters to participate in those activities. Recreationists striving for solitude would also benefit from areas at greater distances from roads from reduced road density.

No changes would occur to recreation opportunity spectrum classes under any alternatives. Over 65 percent of the Lincoln NF would remain in the semiprimitive motorized and roaded natural classes, and 30 percent would remain in the semiprimitive nonmotorized class. These settings would continue to provide opportunities for visitors to see and enjoy a variety of experiences on the Lincoln NF. Under all alternatives, guidance for project-specific analysis and implementation would conform to guidance in the recreation opportunity spectrum guidebook. Decisions related to recreation settings and related physical and social components would be consistent with desired recreation opportunity spectrum classes.

All alternatives provide a framework for managing recreation through standards and guidelines in the plan. Land management activities directed by the plan have the potential to affect recreational

opportunities and settings under all alternatives. Recreation resources are affected when management activities or proposed projects alter the recreation setting or related opportunities.

Effects from Natural Resource Management

The use of planned and unplanned ignitions, where feasible under alternative A, and the use of wildland fire under all other alternatives, would change scenery in forested vegetation communities, thereby indirectly affecting recreationists' experiences. Recreationists would avoid areas of blackened and burned vegetation, and frequent and extensive vegetation treatments may require area closures or cause recreationists to avoid these sites. This would result in short-term adverse impacts on recreation.

Long-term loss of screening vegetation or forest canopy that provides shading along trails or at dispersed camping sites could also adversely affect recreation; however, areas with open canopies can also facilitate access to dispersed camping sites. Areas opened by fuel treatments may also facilitate user-created trails for bicycling, horseback riding, and hiking. The effects of mechanical vegetation treatments on recreation would be the same as described above for planned and unplanned ignitions, although of lesser intensity and duration.

Effects from Wilderness and Special Management Areas

All alternatives would retain existing designated wilderness, scenic byways, inventoried roadless areas, and national recreation trails. Fifty-five WSR segments would be managed as eligible for designation in the National Wild and Scenic Rivers System under alternative A; 54 river segments would be managed as eligible under alternatives B, C, D, and E. The application of various protective management to the river segments which would be managed as eligible, such as limiting roads within WSR areas, may reduce public access to recreational activities on certain river segments. This could result in minor impacts on recreation for certain user groups. Specific limitations would depend on the specific activity, the river's Outstandingly remarkable values and classification, and the results of a suitability determination, if required. Benefits would continue to accrue to the recreational experience among visitors to Lincoln NF who encounter these areas, which provide various forms of recreation.

Environmental Consequences for Recreation Under Alternative A

Effects from Access and Recreation

Under alternative A, the existing plan would remain in effect. Forest Service personnel would continue to use the recreation opportunity spectrum outlined in the existing condition, and current management practices would continue as they are outlined in the 1986 Forest Plan.

Over 65 percent of the Lincoln NF would remain in the semiprimitive motorized and roaded natural classes, and 30 percent would remain in the semiprimitive nonmotorized class. These settings would continue to provide opportunities for visitors to see and enjoy a variety of experiences on the Lincoln NF.

Effects from Wilderness and Special Management Areas

All current management areas and designated areas would continue to exist as they are described in the 1986 Forest Plan. Recreation management would continue to provide dispersed and developed recreational opportunities and would enhance experiences by providing access, services, and facilities with other resource considerations.

All 35 management areas identified in the 1986 Forest Plan and listed in table 2-2 would continue to provide different user opportunities through distinct management emphases; however, this alternative would not provide recreational opportunities that are consistent with the social, environmental, and economic resource capacity of the Lincoln NF as required by the 2012 Planning Rule. This is because

recreation trend data and visitor use have changed over time, and issues, opportunities, and expectations are now different than they were in the mid-1980s. Recreation managers cannot adequately provide a sustainable recreation program now and into the future by referencing a document created nearly a half century ago.

Environmental Consequences for Recreation Common to Alternatives B, C, D, and E

Effects from Access and Recreation

Under all action alternatives, the revised plan would contain components in the form of desired conditions, objectives, standards, and guidelines to better address or align with the framework for sustainable recreation. These components would also assist the Lincoln NF in moving toward the management of a sustainable recreation program, and they would allow for a better response to current recreational activities and better adaptation to current and future demands for recreation. Implementation of the action alternatives would likely have similar impacts on recreation, with the exception of differences related to recommended wilderness, differences associated with levels of prescribed burning and mechanical treatment, and differing management areas. These differences are discussed below.

All action alternatives would also contain an objective to maintain 100 miles of level 3 passenger car roads and 60 miles of level 2 high-clearance roads per year. This would enhance recreational opportunities by providing for improved access to visitors, compared with alternative A. An objective for decommissioning 75 miles of administratively closed roads within 15 years is similar to the 100 miles included in the current plan. This would have similar adverse impacts as alternative A on the recreational experience of some visitors engaged in backcountry pursuits. The reason is that it could limit access and make it more difficult for visitors to experience and enjoy these remote opportunities.

Effects from Natural Resource Management

Standards and guidelines in all action alternatives would allow for thinning and burning activities to be used to accomplish project- or plan-level desired conditions. In forested vegetation communities, thinning and burning would reduce tree density and would change recreational opportunities available to Lincoln NF visitors. The provision of less-densely vegetated forest lands would provide more opportunities for certain recreational activities. Recreation that benefits from more open forest areas include dispersed camping, picnicking, wildlife viewing, travel by foot, horseback riding, skiing, bicycling, motorized vehicles, and elk hunting (Englin et al. 2001; Venn and Calkin 2011). All these activities are available on the Lincoln NF.

Vegetation desired conditions for more open forests would be less appealing to campers who may avoid dispersed sites with less vegetation screening. Conversely, more open park-like areas would be more visually appealing and improve access to dispersed camping sites for some visitors (e.g., visitors pulling large trailers or driving recreational vehicles). User-created trails for bicycling, horseback riding, and hiking may be more likely in areas opened by fuel treatments or uncharacteristic large disturbances. Frequent and extensive vegetation treatments that elicit formal closures or cause recreationists to avoid these sites would negatively affect users' recreational experiences on the Lincoln NF. Overall, short-term impacts on recreation would result from temporary and localized displacement of recreational opportunities during vegetation treatments, which would limit access to dispersed recreational opportunities.

Vegetation treatment objectives under all action alternatives, which include 200,000 acres of prescribed burning and 6,500 to 19,500 total acres of mechanical thinning, have the potential to alter recreation opportunity spectrum classes from those that are predominantly natural appearing (i.e., primitive, semiprimitive nonmotorized, semiprimitive motorized, and roaded natural) to those with more modified

environments (i.e., rural or urban). Mechanical thinning and prescribed burning actions could be consistent with managing for predominantly natural-appearing environments of primitive, semiprimitive nonmotorized, semiprimitive motorized, and roaded natural recreation opportunity spectrum classes, even though they would be visually evident; however, when compared with alternative A, these treatments could result in more open environments and changes in recreational opportunities by increasing the evidence of other users, which may not be consistent with semiprimitive nonmotorized and semiprimitive motorized recreation opportunity spectrum classes.

In contrast, primitive recreation opportunity spectrum classes would not have similar effects because most of the primitive areas on the Lincoln NF are in wilderness where mechanical thinning could not occur, or they are in less popular parts of the Lincoln NF where the chance of encountering other users is always low. In addition, fires that are uncharacteristically large and burn with more intensity could have effects that occur over larger areas and last longer and are thereby inconsistent with managing for predominantly natural-appearing recreation opportunity spectrum classes. Any minor inconsistencies in managing for recreation opportunity spectrum settings would persist until the evidence of modification practices (e.g., stumps) are not evident and vegetation desired conditions are restored.

Effects from Wilderness and Special Management Areas

Wilderness areas provide opportunities for natural and unconfined recreation. Recommended wilderness would create a more primitive recreational opportunity for visitors, such as providing nonmotorized trails and minimizing future development of developed recreation sites. Primitive recreation, including hiking and horseback riding, would be emphasized, and motorized access for recreation would be limited and not expanded. These areas would lead to additional opportunities to experience unaltered landscapes and would allow visitors in wilderness areas to connect with nature and experience solitude and primitive and unconfined recreation.

Environmental Consequences for Recreation Under Alternative B

Effects from Access and Recreation

Guidelines under alternative B would inform management regarding the construction of new roads and trails or reconstruction and maintenance of existing roads that intersect fish-bearing streams. This would be done to accommodate aquatic organism passage and to avoid or minimize noise and habitat disturbance. This would improve the recreational experience of visitors engaged in activities such as fishing and wildlife viewing, compared with alternative A, which contains no guidelines concerning this resource.

Effects from Wilderness and Special Management Areas

Alternative B would increase protections, compared with alternative A, by classifying the Guadalupe WSA as recommended wilderness. In total, it would recommend 40,500 acres of wilderness and establish two special cave management areas. With regard to effects on recreation opportunity spectrum class distribution, such protections would be compatible with the 43,700 acres currently classified as semiprimitive nonmotorized in the Guadalupe Ranger District. Designated and recommended wilderness areas provide opportunities for natural and unconfined recreation. Recommended wilderness would create a more primitive recreational opportunity for visitors, such as nonmotorized trails and minimizing future development of developed recreation sites.

Primitive recreation, including hiking and horseback riding, would be emphasized, and motorized access for recreation would be limited and not expanded. Compared with alternative A, these areas would lead to additional opportunities to experience unaltered landscapes and allow visitors in designated and

recommended wilderness areas to connect with nature and experience solitude and primitive and unconfined recreation.

Increases in recommended wilderness under alternative B would expand these forms of recreational opportunities, compared with alternative A.

Environmental Consequences for Recreation Under Alternative C

Effects from Access and Recreation

Impacts would be the same as those described under alternative B.

Effects from Wilderness and Special Management Areas

Alternative C would greatly increase protections for recommended wilderness areas, compared with alternative A, by classifying the Guadalupe WSA as recommended wilderness. Alternative C would recommend 402,000 acres of wilderness and would establish two special cave management areas. With regard to the effects on recreation opportunity spectrum class distribution, such protections would be compatible with the 43,700 acres classified as semiprimitive nonmotorized in the Guadalupe Ranger District. Increases in recommended wilderness, which would occur to the greatest extent under alternative C, would expand recreational opportunities the most, compared with alternative A.

Opportunities for other recreational uses, such as mountain biking, would be reduced, commensurate with the number of acres in the recommended wilderness management areas under alternative C. As a result, user conflicts could occur from decreased access to recreational opportunities among mountain bikers, who may be displaced from newly recommended wilderness management areas where they are accustomed to recreating. This would be particularly evident in the Smokey Bear District, where mountain biking is an especially popular activity.

With increased acreage recommended for wilderness under alternative C, special events that are motorized would be more limited or contained to designated locations.

Environmental Consequences for Recreation Under Alternative D

Effects from Access and Recreation

Impacts would be the same as those described under alternative B.

Effects from Wilderness and Special Management Areas

Impacts would be the same as those described under alternative B.

Environmental Consequences for Recreation Under Alternative E

Effects from Access and Recreation

Alternative E would include guidelines that requires access roads to recreation sites to be maintained at level 3 or higher, prioritizes recreation access for land acquisitions, and includes surveys to identify more caves for recreational purposes. This would provide more recreation opportunities on the Lincoln NF compared to alternative A.

Effects from Wilderness and Special Management Areas

Alternative E would recommend only 21,900 acres of wilderness and would not establish any special cave management areas. With regard to the recreation opportunity spectrum class distribution, alternative E

would be most compatible with the semiprimitive motorized and roaded natural ROS classifications. They represent 82 percent of forestwide acreage, and opportunities for mechanized forms of recreation, such as mountain biking, would be enhanced under this alternative.

Similar to alternative B, guidelines under alternative E would prohibit such management activities as vegetation treatments within eligible river corridors, unless such treatments are needed to protect eligibility. Effects on recreation would be similar to alternative B.

Cumulative Environmental Consequences for Recreation

Several past, present, and reasonably foreseeable plans and actions have contributed or would contribute to the cumulative setting with regard to recreation. These include ongoing restoration and habitat improvement projects, management of scenic byways, and climate change.

Several projects have been proposed for funding under the Great American Outdoors Act. It includes activities on the Lincoln NF that aim to address deferred maintenance and other infrastructure enhancements through 2025. These include the Lincoln Cabin Rental Remodel, which would repair three historic cabins and place them in the cabin rental program; the Lincoln NF Water System Upgrades, which would repair and replace water systems across the forest; and the Lincoln road/gravel pit, which would reopen an existing gravel pit to produce aggregate that can be used across the Lincoln NF.

The Forest Service is also in the planning phases of the South Sacramento Restoration Improvement project, and the Smokey Bear North Habitat Improvement project is in the implementation phase. Both of these projects will result in landscape improvements that contribute, on a cumulative level, to enhanced natural landscapes. Implementation of these plans will contribute to beneficial impacts on recreation on the Lincoln NF by providing improved access to visitors and cumulative improvements in fish and wildlife habitat, increasing the quality and quantity of opportunities for wildlife watchers, fishers, and hunters who participate in those activities. Administrative treatments planned at Ski Cloudcroft and other ski areas managed by the Forest Service would also contribute cumulatively to impacts on recreation.

There are three scenic byways that intersect the plan area. The Billy-the-Kid and Sunspot scenic byways are both designated national scenic byways and administered by the State of New Mexico Department of Transportation. Recent wildfires have affected scenic resources along the Lincoln NF's portion of the Billy-the-Kid scenic byway; the area is slowly recovering from these wildfires. Along the 16-mile Sunspot scenic byway, which extends from Cloudcroft to Sunspot, conifer encroachment is a dominant characteristic of the visual landscape. Restoration activities are planned along portions of the roadway, which are expected to restore stands of aspen. The 30-mile Guadalupe Backcountry Byway is managed by the BLM and travels through the transition from cholla cactus in the Chihuahuan Desert west of Carlsbad up into the pine forest of the Guadalupe Escarpment. The Lincoln NF portion of the byway is predominantly located in a scenic area characterized by the presence of piñon juniper, rock outcroppings, canyons, and bluffs.

Additionally, the Guadalupe Ridge Trail is a 100-mile designated National Recreation Trail that begins in Guadalupe Mountains National Park and winds through BLM-administered lands and the Lincoln NF, where it provides access to Sitting Bull Falls Recreation Area, before ending at Carlsbad Caverns National Park's eastern boundary. This trail provides hikers and backpackers with a true wilderness experience in the Chihuahuan Desert and Guadalupe Mountains. Future fuel treatments in this area would require diversion of recreational vehicle and hiking traffic and would affect hiking access. These impacts would contribute cumulatively to impacts on recreation resulting from the proposed plan.

Climate change is anticipated to negatively affect recreational opportunities in the future. The Lincoln NF contains several areas identified as climate refugia, including Sitting Bull Falls Recreation Area and other canyon areas and forested mountain areas that can be 20 degrees Fahrenheit cooler than surrounding desert regions and that can provide relief from heat in summer months. There is general agreement among climate modelers that the southwestern United States is experiencing a warming and drying trend that will continue well into the latter part of the twenty-first century. While some models predict increased precipitation for the region, researchers expect the overall balance between precipitation and evaporation would still likely result in an overall decrease in available moisture. Temperatures are predicted to rise by 5 to 8 degrees Fahrenheit by the end of this century, with the greatest warming occurring during winter months. Some climate model results also suggest a fivefold increase in unusually hot days by the end of the century (Forest Service 2019h).

While the Lincoln NF is anticipated to begin implementing forest management strategies that address the processes of climate change through adaptive management that supports resilient ecosystems, the ongoing effects of climate change, such as insect infestations that visibly alter the extent and composition of forest cover, are expected to continue and contribute cumulatively to landscape-level changes. Maintaining ecosystem resistance and resiliency may help mitigate some potential negative impacts of climate change on the recreational opportunities on the Lincoln NF. These effects may include increased visitation across multiple recreation sites due to longer shoulder seasons; reduced snowfall in November and December means more opportunities for non-snow-based recreation during the extended season. This could mean a greater need for recreation management and facility maintenance.

Severe fire or other effects due to a hotter, drier summer climate may close recreation facilities for an extended period of time, thus limiting the recreational opportunities available in affected areas. Some other effects may be an increase in negative impacts on sensitive and limited resources, such as water, or plant and animal communities. This could make it more difficult to manage the impacts on these resources along with managing increased public use. All these climate-induced changes, when taken together, can adversely affect recreation on the Lincoln NF over time.

Transportation and Forest Access

Affected Environment

The transportation network on the Lincoln NF consists of approximately 3,100 miles of paved Federal, State, county, and National Forest System roads and unpaved county and National Forest System roads. It also includes approximately 500 miles of trails for motorized and nonmotorized vehicles (Forest Service GIS 2020). In the Sacramento Ranger District, U.S. Highway 82 and New Mexico State Highway 130 are the primary east-west routes through the Lincoln NF for passenger vehicles. State Highways 24 and 244 and Sacramento Canyon Road are the main north-south routes for passenger vehicles. In the Smokey Bear Ranger District, the primary east-west paved routes are U.S. Highways 70 and 380.

There is north-south access via State Highways 37, 48, and 246. Queens Highway (State Highway 137) is the main paved roadway in the Guadalupe Ranger District. Highway 62 and Sitting Bull Falls Road are also paved, and there are many unpaved county roads. Local, State, and other Federal agencies maintain roads that are not National Forest System roads. Collectively, these roadways provide access to popular visitor destinations on the Lincoln NF.

Roads and trails open to motorized vehicles are designated pursuant to the Travel Management Rule (36 CFR 212, 251, 261, and 295) and consistent with the existing forest plan. The Forest Service publishes a motor vehicle use map that displays the roads, trails, and areas where motorized use is allowed. The Forest Service updates this map annually.

There are approximately 2,300 miles of National Forest System roads and motorized trails under Forest Service jurisdiction on the Lincoln NF (see table 3-66). The Forest Service manages and maintains National Forest System roads to various road standards or maintenance levels, depending on management objectives. They range from regularly maintained paved roads to rough, high-clearance, dirt roads with little to no regular maintenance. Approximately 1,000 miles of the National Forest System roads are level 1, which means they are closed to motorized vehicle use. There are approximately 330 miles of level 4 and level 3 roads, which provide access for common passenger vehicles; 33 miles of level 3 and 4 roads are paved. The remaining roads are level 2 (rough dirt roads) and motorized vehicle trails. There are nearly 170 miles of motorized trails, mostly in the Sacramento Ranger District (Forest Service GIS 2020).

Table 3-66. Roads and Motorized Trails: Summary of Miles by Type

Route Level	Description	Total Miles
Level 4 Road	Paved or dirt road maintained for moderate speeds by all vehicle types	19
Level 3 Road	Dirt road maintained for passenger car access	312
Level 2 Road	Dirt road for high-clearance vehicles	927
Level 1 Road	Closed	1,063
National Forest System Roads Total		2,321
Motorized Trail Total		171

Source: Forest Service GIS 2020

Forest Service staff use National Forest System roads for a variety of administrative purposes, such as wildland 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. Permittees also use many National Forest System roads as part of special-use authorizations for such activities as hunting guide access, outfitter-provided off-highway vehicle opportunities, and special-use recreation events.

The public uses National Forest System roads to access recreation sites, such as those for camping, fishing, hunting, hiking, backpacking, mountain biking, rock climbing, sightseeing, off-highway vehicle driving, and visiting historic and natural interest areas. National Forest System roads are also used by the public for personal and commercial fuel wood and pine nut gathering, mining, and traditional Native American uses.

There are also unauthorized routes that are not part of the Lincoln NF transportation system. Some were constructed for permitted resource extraction, such as mining or timber roads. These were considered to be authorized temporary roads that would no longer be needed after the permitted use ceased but that still exist on the landscape. Other routes were created by unauthorized user activity. User-created roads and trails account for most unauthorized routes. Many unauthorized routes that remain on the landscape provide access for certain types of motorized vehicles, such as all-terrain vehicles and motorcycles. The Lincoln NF has not done an inventory of unauthorized routes.

There is also an extensive network of trails on the Lincoln NF. They provide motorized and nonmotorized access for such uses as hiking, backpacking, and horseback riding. Most trails in the Guadalupe and Smokey Bear Ranger Districts are restricted to nonmotorized and nonmechanized vehicle uses. Most trails in the Sacramento District are open to motorized vehicles. Trails are generally less than 5 miles long and provide day-use opportunities. There are a few trails, such as the Crest Trail in the Smokey Bear

Ranger District and the Rim Trail in the Sacramento Ranger District, that are longer than 20 miles and are more popular for backpacking. Trails range in difficulty from easy to difficult.

There is an air tanker base used by the Forest Service and other agencies at the Alamogordo airport, which is next to the Lincoln NF. Two historic airstrips on the Lincoln NF, the Sunspot “Heliport” Airstrip and the Bluewater Airstrip, are not officially part of its transportation system.

The Forest Service anticipates that the demand for road and trail use will increase with growing populations and a desire for access to recreation and National Forest commodities. Maintaining the extensive network of National Forest System roads and trails is an ongoing challenge. Increasingly stronger rainstorms during the monsoon season are expected to increase maintenance requirements, including emergency road and trail repairs following storms.

Environmental Consequences for Transportation and Forest Access

Methodology and Analysis Process

This analysis uses the current motor vehicle use map as the basis for which proposed management would change the extent of the designated travel system or nature of public access on system roads and trails. Subsequent travel management planning, which is not a part of this plan revision process and would occur at the project level, would further guide transportation and access decisions on the Lincoln NF. Forest Service staff provided additional information on trends, use conflicts, capacity issues, and more. This information was used to provide a general sense of access across National Forest System roads. The section is organized by the issue topics identified during scoping and subsequent alternatives development that are most applicable to transportation and Forest Access.

Assumptions

- Human populations will continue to increase in areas on and next to the Lincoln NF’s boundaries, increasing travel and access demands. Increasing use will accelerate surface deterioration and may affect access on some roads.
- Climate change may increase the frequency of large, high-intensity wildfires and storms. Access on system roads and trails could be temporarily or permanently impeded during fires or post-fire restoration or because of storm-damaged roads.
- The number of unauthorized user-created routes will increase incrementally.

Indicators

- Miles of system roads available for designated use
- Access for various types of transportation modes

Environmental Consequences for Transportation and Forest Access Common to All Alternatives

Effects from Access and Recreation

Under all alternatives, there would be 1,258 miles of Level 2, 3, and 4 roads available for designated use. There would be no change in the designated route level of any route under any alternative. Unauthorized public access would be possible via unauthorized user-created routes.

Effects from Wilderness and Special Management Areas

Under all alternatives, there would be no roads designated for motorized use in the White Mountain and Capitan Mountain designated wilderness areas.

Environmental Consequences for Transportation and Forest Access Under Alternative A

Effects from Access and Recreation

Under alternative A, the existing road system for conventional two-wheel- and four-wheel-drive roads, motorized trails, and nonmotorized trails would be used (see table 3-66). Motorized use under alternative A would continue to be authorized in all areas where it is currently authorized until any site-specific travel management decisions are made. Travel management decisions would be based on the standard travel management planning process, management area prescriptions in existing plans, and any resource-specific direction in existing plans. Other management decisions about maintenance levels of roads and designated motorized and nonmotorized trails would also be based on resource-specific direction in existing plans. Decommissioning 100 miles of system roads that require low or no maintenance would reduce access opportunities for certain travel modes.

Environmental Consequences for Transportation and Forest Access Under Alternative B

Effects from Access and Recreation

Objectives to maintain 112 miles of level 3 passenger car roads and 60 miles of level 2 high-clearance roads per year would retain access to multiple-use opportunities via those roadways. Decommissioning 75 miles of administratively closed roads over 15 years would result in fewer decommissioned roads, compared with alternative A. Additional resource protections during road construction under alternative B, particularly in riparian areas and stream crossings, could increase road construction and maintenance timelines, compared with alternative A. This would result in temporary and localized decreases in access, compared with alternative A. Fuels treatment activities could result in temporary road closures and delays; heavy equipment could also deteriorate road surfaces, which would reduce access for certain vehicles. Emphasizing the reconstruction and rehabilitation of existing roads over new road construction would limit the potential for new roads, but would improve access on the existing road network.

Effects from Natural Resource Management

Achieving vegetation treatment objectives through mechanical treatments could result in some roadways being used to transport equipment during treatments. Heavy vehicle traffic would result in temporary congestion and closures; it could also degrade road surface conditions. This would change the availability of the road system, thereby resulting in diminished access on some routes.

Prescribed wildfire treatments would temporarily preclude access on some roads and trails to protect public health and safety. In heavily treated areas, frequent access for equipment on maintenance level 3 roads could result in some road surface deterioration. There is a possibility of deteriorated road surface conditions from heavy vehicle use associated with mechanical treatments. Poor surface conditions would decrease access for lower clearance vehicles until maintenance could restore the road to the desired maintenance level.

Effects from Wilderness and Special Management Areas

Recommending 40,500 additional acres as designated wilderness would reduce the portion of the Lincoln NF that is available for motorized use, compared with alternative A.

Environmental Consequences for Transportation and Forest Access Under Alternative C

Effects from Access and Recreation

Impacts would be the same as under alternative B.

Effects from Natural Resource Management

The nature and types of impacts from mechanical treatments would be similar to those under alternative B; however, objectives would include treatments on fewer acres, which would have correspondingly fewer impacts on access. Impacts from prescribed wildfire would be the same as under alternative B.

Effects from Wilderness and Special Management Areas

Recommending 402,000 additional acres as designated wilderness would reduce the portion of the Lincoln NF that is available for motorized use, compared with alternative A.

Environmental Consequences for Transportation and Forest Access Under Alternative D

Effects from Access and Recreation

Impacts would be the same as under alternative B.

Effects from Natural Resource Management

The nature and types of impacts from mechanical fuels treatments would be the same as under alternative B. Impacts from prescribed wildfire would be the same as under alternative B.

Effects from Wilderness and Special Management Areas

Impacts would be the same as under alternative B.

Environmental Consequences for Transportation and Forest Access Under Alternative E

Effects from Access and Recreation

Impacts on transportation and access for decommissioning roads would be the same as under alternative B. However, there would be greater access to recreation over the long term. Compared with alternative A, an emphasis on maintaining access roads to developed recreation sites at maintenance level III or higher under alternative E would improve motorized access to developed recreation areas.

Effects from Natural Resource Management

The nature and types of impacts from mechanical fuels treatments would be the same as under alternative B. Impacts from prescribed wildfire would be the same as under alternative B.

Effects from Wilderness and Special Management Areas

Recommending 21,900 additional acres as designated wilderness would reduce the portion of the Lincoln NF that is available for motorized use, compared with alternative A.

Cumulative Environmental Consequences for Transportation and Forest Access

The analysis area for cumulative effects is National Forest System lands on the Lincoln NF plan area. Under all alternatives, there would be a growing demand for access to the Lincoln NF travel system, which would increase the need for maintenance and evaluation of access on system roads.

Continuing evolution in transportation technology is likely to change access patterns, types of use, and popular locations across the Lincoln NF. These changes have the greatest potential to cumulatively affect access for motorized travel modes. All plan revision alternatives include management direction that is responsive to changing access and use patterns. Alternative E would be the most responsive to accommodating motorized travel, while alternative B would balance motorized and nonmotorized demands. Alternatives C and D would favor nonmotorized access.

Changes to the travel system are subject to funding and management priorities, which are cumulatively affected by factors that are both within and beyond the Forest Service's control. Under all alternatives, priority areas for decommissioning would be those with the greatest combined natural resource, economic, and use benefits.

Facilities and Infrastructure

Affected Environment

Infrastructure consists of physical facilities and systems constructed to support the use of National Forest System lands. Transportation infrastructure is described above. The Forest Service manages and maintains 129 administrative buildings across the Lincoln NF: office buildings, work centers, visitor centers, fire lookouts, warehouses, communications buildings, other utility buildings, water and wastewater infrastructure, and living quarters, such as barracks and residences.

Approximately 42 percent of the administrative facilities are older than 45 years. These buildings are in various stages of repair, and some are no longer needed or being used. The potential for structures 50 years or older 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 before the building can be rehabilitated. The combined effects of increased maintenance requirements as facilities become older, plus deferred maintenance and increasing costs, means that many structures are deteriorating.

The Forest Service manages and maintains 31 administrative sites, including 9 fire lookouts. There are 95 recreation buildings or related structures on the Lincoln NF. The Forest Service manages and maintains 29 developed recreation sites, such as campgrounds, camping areas, interpretive sites, and picnic and day-use areas. Recreation facilities are toilet buildings, shower buildings, storage, entry stations, shade structures, and other infrastructure to support public recreation in a developed setting.

Approximately 73 percent of recreation facilities are less than 20 years old. Portions of one campground and one day-use area were rebuilt in the past 8 years following wildfire and flood damage. The Forest Service also maintains signs, road and trail infrastructure, and other structures to support undeveloped recreation (see the Recreation section).

The Forest Service owns and maintains wastewater systems serving approximately 13 recreation and administrative sites. It also owns and maintains water systems serving approximately eight sites.

Environmental Consequences for Facilities Infrastructure

Methodology and Analysis Process

This analysis considers changes in the number or condition of facilities on the Lincoln NF. Infrastructure is provided to support other uses, including recreation and administrative activities. Analysis related to recreation and grazing infrastructure and land uses is contained in those respective sections. Forest Service staff provided information on the types of facilities on the Lincoln NF, trends, issues, and more. This information was used to provide a general sense of potential changes to facilities infrastructure from the proposed plan. Impacts on facilities infrastructure are mainly dependent on funding and resource management restrictions; therefore, this section is organized by the natural resource management issue topic identified during scoping and subsequent alternatives development.

Assumptions

- New or reconstructed facilities will need to comply with the latest building codes, engineering standards, and applicable environmental regulations.
- Deferred maintenance on facilities infrastructure will continue to outpace budgets.
- Facilities older than 50 years will be subject to compliance with section 106 of the NHPA.

Indicator

- Facilities maintenance, address high-risk conditions in facilities (accessibility, safety hazards, environmental compliance, water systems, etc.)
- Reducing risk to facilities from wildland fire through mechanical and prescribed wildfire vegetation treatments

Environmental Consequences for Facilities Infrastructure Common to All Alternatives

Under all alternatives, the Forest Service would continue to maintain existing facilities and construct new facilities as funding allows. The purpose of facilities and infrastructure is to safely support the intended function of infrastructure. Ensuring that 95 percent of recreation facilities have a fair or good condition rating within 10 years would provide for the longevity and safe use of the infrastructure; however, the aging status of administrative facilities would require an increasing funding commitment to comply with newer building requirements. Repairing older facilities would continue to be costly because older parts may no longer be commercially available and retrofits would be necessary. Under all alternatives, new facilities would be constructed on a case-by-case basis, subject to need and available funding.

Environmental Consequences for Facilities Infrastructure Under Alternative A

Under alternative A, the Lincoln NF would continue to maintain facilities, provide expanded infrastructure, and evaluate opportunities for decommissioning, in accordance with the 1986 Forest Plan. Facility design would adhere to the current Forest Service standards for construction, maintenance, rehabilitation, and decommissioning, as well as applicable local, State, and Federal laws and regulations. The Forest Service would continue to emphasize the reuse of existing facilities rather than constructing new facilities.

Environmental Consequences for Facilities Infrastructure Common to Alternatives B, C, D, and E

Implementing guidelines for facilities location and design in areas of high and very high scenic integrity (219,400 acres) would modify new facility design or siting in those areas, compared with alternative A.

Under all action alternatives, natural resource and scenery protections would limit opportunities for new infrastructure, especially in riparian areas, stream crossings, and areas with high scenic integrity. Retrofitting existing facilities infrastructure in these areas may become infeasible. Balanced funding priorities would allow for some improvements, subject to annual budgets, while other facilities would continue to accumulate deferred maintenance costs.

Under all action alternatives, there would be no short-term impacts from fuels treatment. Over the long term, treatments would improve vegetation conditions, compared with alternative A, and would reduce the threat of wildfire, which could damage or remove facilities. These effects would be greatest where treatments are implemented near facilities. Under all alternatives, decommissioning infrastructure would remove it.

Cumulative Environmental Consequences for Facilities Infrastructure

The cumulative effects analysis time frame is the next 10 to 15 years. The spatial extent of the cumulative effects analysis for facilities and infrastructure is the Lincoln NF boundary. Increasing regional demand for recreation on National Forest System lands would result in a corresponding need to maintain and upgrade recreation and other facilities. Funding and natural resource considerations would influence opportunities to meet those infrastructure needs. Alternatives B and E would provide the greatest opportunities to meet those needs, while natural resource protection priorities under alternatives C and D would require more siting and design requirements for facilities that may result in fewer opportunities to address infrastructure needs, compared with alternative A.

Without vegetation treatments, rising temperatures and drought would continue increasing the threat of wildfire damaging or destroying facilities. Treatments under alternatives B and D would reduce this threat, compared with alternative A. Alternatives C and E would also reduce the threat, compared with alternative A, but to a lesser extent than under alternatives B and D.

Lands

Affected Environment

The Lincoln NF boundary encompasses 1,260,900 acres in south-central New Mexico, which includes 1,094,700 acres of National Forest System lands, intermixed with State of New Mexico land, BLM-administered land, and private land. The Lincoln NF boundary is not contiguous, with more than 30 miles separating the districts. It is further divided into three ranger districts: the Smokey Bear, Sacramento, and Guadalupe Ranger Districts. The Smokey Bear Ranger District is in Lincoln County, the Sacramento District is in Otero and Chaves Counties, and Guadalupe District is in Chaves, Eddy, and Otero Counties.

The Smokey Bear Ranger District is surrounded on the north, west, and east primarily by private land, with some State and BLM-administered lands. To the south, the district borders the Mescalero Apache Indian Reservation and Ruidoso. The Sacramento Ranger District is bounded on the north by the Mescalero Apache Indian Reservation, on the south by the Fort Bliss Military Reservation, and on the west by Alamogordo. In addition, the district is bounded on the west, south, and east by private land, State land, and BLM-administered land. The Guadalupe Ranger District is bounded predominately by BLM-administered land on all sides, with some State and private land interspersed. On the south, the district is additionally bounded by National Park Service land.

Private inholdings, State land, Department of Defense's Fort Bliss, and other Federal entities' land of various sizes are scattered throughout the three ranger districts. For the most part, private inholdings were

created when homesteads were patented to private individuals. These scattered private inholdings and other landownerships create additional miles of irregular property boundaries.

Surface administration acreage within the Lincoln NF boundary and ranger districts is displayed in table 3-67 and figure 1-1.

Lands-related activities include land exchanges, purchases, and ownership adjustment. Special-use activities include authorizations to use National Forest System lands for non-Federal uses, including utility corridors, private and public roadways, communications sites, or signs. These are described further in the Lands Special Uses section.

Table 3-67. Surface Administration within Lincoln NF Boundary, by Ranger District

Landownership	Acres
Guadalupe Ranger District (total)	289,000
Private	5,300
National Forest System	283,700
Sacramento Ranger District (total)	548,600
Department of Defense – Fort Bliss	1,300
Other Federal	100
Private	61,500
State	35,900
National Forest System	449,900
Smokey Bear Ranger District (total)	423,300
Other Federal	500
Private	60,200
State	1,500
National Forest System	361,100
Grand Total	1,260,900
National Forest System Grand Total	1,094,700

Source: Forest Service GIS 2020

Lands acquired from willing sellers have qualities that improve the agency's ability to carry out its mission on National Forest System lands and improve land management. The location or condition of the parcel being acquired may contribute to:

- consolidation of the ownership pattern of the Lincoln NF;
- providing necessary road or trail access to National Forest System lands;
- having unique or high-quality natural or cultural resources;
- improving the management or designated special areas;
- containing important plant or animal habitat;
- containing or influencing wetlands or flood plains; or
- providing opportunities to rehabilitate or stabilize adjacent National Forest System lands.

The Forest Service may acquire lands through exchange, purchase, or donation. Land exchange and land purchase have been, and would continue to be, the means by which Lincoln NF acquires key wildland resources and open space areas. Most Federal lands exchanged are within or near existing communities. Procedures for processing cases and public participation are determined by set laws, regulations, and policies outside the draft land management plan and would apply regardless of the alternative selected.

Most current land surveying activities in the Forest Service are related to meeting flagship national priorities while some activities are still directed to marking and maintenance of property lines and administrative boundary lines. Surveys are necessary to provide visible and legally defensible property lines and help to protect national forests interests and high-quality natural or cultural resources.

Federal ownership is substantial in all four counties in the areas of influence of the ranger districts and exceeds the area of private or State lands. A notable trend of loss of access to the Lincoln NF has developed as a result of unwillingness of many private landowners to allow public access across their property. Residential development has increased adjacent to many Lincoln NF boundaries, and adjacent at-risk communities in the wildland-urban interface have responded to the threat of uncharacteristic wildfire by developing community wildfire protection plans.

The existing fragmented landownership pattern within and adjoining the Lincoln NF, combined with rapid population growth and the nature of the noncontiguous sky islands, has resulted in the loss of traditional public access routes, conflicts in land uses within and adjacent to the Lincoln NF boundary, higher administrative costs, and unique challenges for forest management. Acquiring rights-of-way across private land for public access to National Forest System lands can be challenging for the Forest Service, especially once homeowner associations and subdivision rules and regulations are established.

Some lands of other ownership adjoining the Lincoln NF have national forest characteristics. Acquisition of these lands would protect public access, open space, and scenic resources; reduce ecosystem fragmentation; improve landscape-level management of forest resources; and eliminate the need to encumber the surrounding National Forest System lands with special-use authorizations for roads and access to private infrastructure.

Environmental Consequences for Lands

Methodology and Analysis Process

Current landownership patterns and potential for land adjustments were evaluated and compared across all alternatives. This section focuses on land adjustment management that changes across alternatives and its effect on the lands program.

Assumptions

This analysis also includes a number of assumptions about the lands program over the life of the plan, as follows:

- The Forest Service has the personnel and funding capacity to screen, process, and manage land ownership adjustments.
- Community and public needs for services will continue.
- The emphasis of the lands program will remain on consolidating the Lincoln NF's land base for easier management.
- Acres subject to congressional protection would not be open for land adjustments

Indicator

- Acres identified for conveyance into or out of Federal ownership

Environmental Consequences for Lands Common to All Alternatives

The proposed alternatives do not provide specific guidance or changes on acres identified for conveyance into or out of Federal ownership; therefore, criteria for land adjustment cases would be the same among all alternatives.

The focus of acquiring non-Federal land is on areas with key resource values, such as archaeological sites, threatened and endangered species habitat, high recreation opportunities or access, and riparian habitat. Other considerations for land exchanges include allocating resources that are more useful or productive to other areas of the Lincoln NF and identifying small, isolated inholdings that would simplify management activities and possibly streamline public access. Alternatives C and D would prioritize lands that provide connectivity for terrestrial and riparian plants and wildlife while alternative E would prioritize recreation access during land acquisition evaluations. This could change the lands acquired by the Forest Service. These important resources could be removed or destroyed if private parcels are developed instead of acquired through land adjustment processes.

Due to budgetary constraints, the limitations of the plan direction, and adjacent private development, the Lincoln NF would increase in acreage at a slower rate throughout the life of the plan. As budget and staffing continues to be limited to complete land acquisition cases, non-Federal lands with important resources could be developed instead of acquired. Non-Federal inholdings in large areas of the Lincoln NF could be developed, which could result in the following impacts on adjacent Lincoln NF lands: increased recreational use, new utility corridors, possible changes to forest users' experience, such as affecting opportunities for solitude, loss of access to Forest Service lands if easements are not identified, and impacts on such forest resources as wildlife habitat and scenery.

Additional effects include the encroachment onto National Forest System lands as new development occurs along the Lincoln NF boundary and results in resource impacts and survey needs. Population growth and new development may result in continued pressure to maintain National Forest System lands for their open space.

Other common effects on all alternatives are the limitations of land exchanges. Exchanges can take years to process and are most often at the full expense of the other party. This is due to the Federal government's lack of funds and the other party often receiving a benefit from the exchange.

Cumulative Environmental Consequences for Lands

The lands programs for the national forests have the same requirements and the same relevant laws, regulations, and policies that apply to management of Federal lands. The acquisition of inholdings and the exchange of isolated Federal parcels would consolidate landownership in National Forest System-managed lands and would improve land management objectives and activities. The BLM has very similar guiding laws, regulations, and policies.

With an emphasis on land exchanges, public involvement is an important factor in determining whether an exchange is appropriate and for the benefit of the public and the Lincoln NF. The public must be informed of the exchange early enough to be able to meaningfully contribute to an outcome, for the benefit of the community. The result is an increased trust in the Forest Service's lands program and a greater potential for successful implementation of the exchange or other form of land adjustment case to acquire valued property. Collaborating with local governments and communities early on, in accordance with the associated management approach, may result in land exchanges being developed that meet community and forest needs; the parties then have the opportunity to discuss and agree to potential tradeoffs of open space values for other resource benefits.

The New Mexico State Land Department has trust property within the Lincoln NF boundaries and has a different mission for its management. It manages State trust lands and resources to enhance value and optimize economic return for the trust beneficiaries: schools, universities, hospitals, and other important public institutions. The goal of the trust is to support the education of New Mexico's children in a manner consistent with sound stewardship, conservation, and business management principles supporting socioeconomic goals for today's citizens and for generations to come.

There are private lands within and surrounding the Lincoln NF, with isolated private inholdings that are widely dispersed. Future growth and development of private inholdings and adjacent private lands are expected to increase requests for special-use authorizations and for Educational Land Grant Act and Townsite Act applications for infrastructure.

Encroachments onto National Forest System lands may increase, and Lincoln NF personnel will need to use additional resources to prevent these activities from causing unexpected resource damage. Nevertheless, as Federal land management agencies acquire isolated private inholdings within their legislated boundaries, the efficiency of managing these areas should increase. There should be fewer requests for rights-of-way and other encumbrances across the greater landscape.

Despite budgetary constraints, the Lincoln NF is likely to continue to increase in acreage, albeit at a slower rate. As the complexity of land adjustment cases increases and budget and staffing decrease, lands under other ownership with important resources could be developed instead of acquired. Development of these non-Federal inholdings could increase costs and difficulty managing the Lincoln NF and other management activities in surrounding forests; examples are conflicts with other national forest users, limitations on or changes in recreation use, and access.

Additional effects are development of new utility corridors, increased disturbances of wildlife species or fragmentation of habitats, and possible changes to Lincoln NF users' contact frequency with others. Moreover, there may be new or increased impacts on forest resources. Examples are loss of wildlife habitat, scenery, and potentially archaeological resources and the introduction of nonnative species and loss of native vegetation on National Forest System lands surrounding the development.

Other limitations are not being able to perform fuel treatments and other management activities on these parcels to better achieve vegetation or community fire plan objectives. For example, when the land that borders National Forest System land is subdivided and additional homes are built, the complexity of using fire as a vegetation treatment is compounded.

When lands next to the Lincoln NF are owned or managed by tribes, pueblos, and local or State government, there is a lessened opportunity for Forest Service involvement in exchanges for community needs. This may result in lost opportunities to acquire key resource property or inholdings. This is because these entities will want to maintain management or control over them, due to a lack of acceptable exchange properties. Additionally, the landownership with varying themes, rules, and compatibility of recreational uses along the Rio Bonito recreation corridor is complex and can cause confusion among recreationists and challenges for land managers.

If, instead of acquisition, there would be a collaborative approach to management, the result could be less habitat fragmentation and greater watershed health by developing buffers on private lands. Loss of wildland character is a good starting point and communication tool to work with adjacent non-Federal landowners, who can work to protect those values, perhaps reducing encroachment cases.

Community involvement allows communities to identify important open space and encourages them to take some responsibility for preserving wildland and resource values. Collaborating with local communities and recognizing their desire for open space may assist with future decisions.

Lands Special Uses

Affected Environment

Special Uses

Special uses are referred to as all occupancy, use, and improvements on National Forest System lands that are not directly related to grazing, timber harvest, or mining activities. An authorization is a legal document, such as a special-use permit, term permit, lease, or easement, which allows occupancy, use, rights, or privileges of National Forest System land for non-Federal type uses. The authorization is granted for a specific use of the land for a specific period of time. The Forest Service special-uses program authorizes uses on National Forest System land that provide a benefit to the general public and protect public and natural resources values. Such activities can include water transmission, agriculture, telecommunication, research, photography and video productions, fluid or solid mineral development, and granting road and utility rights-of-way.

Lands Special Uses

Lands special uses authorize utility right-of-way corridors, such as water transmission lines, communications, and research. For lands special-use authorizations, the most frequently permitted categories are communication sites, transportation, and water facilities with 70 authorizations, 68 authorizations, and 58 authorizations, respectively (Forest Service 2019b).

There are numerous sub-transmission, distribution, and underground transmission and communication 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 Lincoln NF.

There may be future needs for energy corridors or developments, such as electric transmission lines, pipelines, solar farms, and wind turbines; this is because of the expected increased demand for electricity to serve the growing populations of the Southwest. There may be natural gas and oil exploration and development on the Lincoln NF within the next 10 to 15 years, although the anticipated potential for development is low.

Renewable energy resources include wind, solar, hydropower, geothermal, and biomass resources. There are no utility-scale (greater than 20 megawatts) renewable energy facilities on the Lincoln NF. The National Renewable Energy Laboratory identified the Lincoln NF as having high potential for the development of two or more utility-scale solar and wind energy sources. The potential for wind energy is highest in the Guadalupe Ranger District and fair to moderate in the other two districts (NREL and Forest Service 2005). The potential for hydroelectric development in the plan area is extremely low due to the Lincoln NF's lack of water resources. The potential for geothermal development on the Lincoln NF is unknown at this time due to a lack of exploration. There are currently no biomass facilities on the Lincoln NF, although there have been some investigations by private companies as to the viability of biomass resources on the Lincoln NF.

Environmental Consequences for Lands Special Uses

The existing laws, regulations, and policies govern special uses on the Lincoln NF and can be found in Forest Service Manual 2700 and Forest Service Handbook 2709.11, 2709.12, and 2709.14, which are

independent from the land management plan and its alternatives. Most of the direction for special uses comes from the Forest Service manuals and handbooks and, therefore, applies to all alternatives.

Changes to land use per alternative through special designations may alter the amount of acreage within the Lincoln NF boundaries available for development. Table 2-5 provides a breakdown of management changes that would vary among alternatives.

Land use may vary per alternative based on other resources management, such as full closures to development in WSAs and restrictions in Inventoried Roadless Areas (IRAs; see Research Natural Areas, Inventoried Roadless Areas, and Wilderness and WSA sections).

Methodology and Analysis Process

Forest Service personnel compared the number of special-use authorizations currently in effect with potential changes that might result from implementation of any of the alternatives considered. The section is organized by the issue topics identified during scoping and subsequent alternatives development that are most applicable to lands special uses. Project-specific analysis would provide more in-depth analysis when implementing the plan.

Assumptions

Special uses are not expected to be a primary driver in selecting one alternative over another. This is because predicted impacts between alternatives from special uses are not dramatically different.

Differences between alternatives are small because:

- Demand for special uses on the Lincoln NF is expected to increase (Forest Service 2019b), and infrastructure (power, communication, water, and transportation) needs will require additional facilities on National Forest System land.
- All alternatives are expected to achieve desired conditions for special uses.
- All projects would follow the outlined Lands Special Use Standards and Guidelines as defined in the proposed plan.
- All projects implemented on the Lincoln NF will require a site-specific analysis of their potential impacts on and from special uses.
- Special-use permits across all alternatives are anticipated and assumed to remain at constant levels or increase moderately based on demand.

Indicators

Indicators of impacts on lands special uses are the following:

- Acres of land available for special-use authorizations
- Acres of land available for future development such as utility corridors and renewable energy

Environmental Consequences for Lands Special Uses Common to All Alternatives

The process for completing land-use authorizations and permits is not identified to change under any of the alternatives.

Under all alternatives, the Forest Service would require collocation of utility corridors; for example, placing a fiber optic line on an existing power line. Consolidating surface disturbance would allow special-use authorizations to continue, while reducing impacts on other resources. Examples are habitat

fragmentation, vegetation cover, soil compaction and erosion, noise pollution, and uncharacteristic wildfire due to trees falling against power lines.

Under all alternatives, individual renewable energy facilities would be subject to approval through the special-use authorization process and would be required to incorporate applicable siting and design standards and guidelines to reduce resource impacts. The potential for new solar or wind energy facilities would be greatest in the Guadalupe Ranger District where the resource potential is highest. Utility-scale hydropower, geothermal, or biomass facilities are not analyzed further because there is insufficient resource potential or expected demand for those sources.

Management designations for other resources would provide guidance on the limitations of the Forest Service to issue land-use authorizations and permits in the designated areas.

Effects from Wilderness and Special Management Areas

Under all alternatives, the proposed 800-acre Upper McKittrick RNA would be closed to motorized access, wood gathering, timber harvesting, vegetation treatments, utility and water rights-of-way, fluid mineral leasing, communication sites, or renewable developments (see RNAs, Trails, and Byways).

Fifty-five WSR segments would be managed as eligible for designation in the National Wild and Scenic Rivers System under alternative A; 54 river segments would be managed as eligible under alternatives B, C, D, and E. More details are included in the Wild and Scenic Rivers section. Some activities or infrastructure may be limited (e.g., roads, vegetation management, and minerals) or restricted (e.g., hydroelectric power and utility corridors) within WSR areas. The specific limitations or restrictions would depend on the specific activity, the river's outstandingly remarkable value and classification, and the results of a suitability determination, if required.

Under all alternatives, the acreage proposed for closures and restrictions in the proposed RNA, designated wilderness, IRAs, and WSRs would be less than 22 percent of the total Lincoln NF lands; therefore, impacts on lands special uses would be minimal, as the majority of the Lincoln NF would remain open to special-use authorizations.

Environmental Consequences for Lands Special Uses Under Alternative A

Effects from Access and Recreation

Under alternative A, the Forest Service would manage developed and dispersed recreation to maintain the current spectrum of opportunities. An original objective under alternative A was to decommission 100 miles of roads over the life of the plan; however, actual closures have not equaled this amount. Continuing to decommission roads would have no impact on lands special uses.

Effects from Wilderness and Special Management Areas

The 1986 Forest Plan does not include any recommended areas for wilderness designation or special cave management areas. Lack of these designated management areas would increase the potential for development to be allowed within these areas; however, a site-specific analysis for future proposed development would be required, and Forest Service specialists could implement protections or reject any development that would cause impacts on the resources.

Under alternative A, Management Area 3A (South Guadalupe) would preclude new development on approximately 21,700 acres (7 percent) of the Guadalupe Ranger District. This closure would apply to special-use authorizations in this area. Under alternative A, constraints on special-use authorizations are

anticipated to be low. This is because only a small percentage of Lincoln NF has restrictions for utility corridors, renewable energy development, or other special uses.

Environmental Consequences for Lands Special Uses Under Alternative B

Effects from Wilderness and Special Management Areas

Under alternative B, the Forest Service is recommending 21 areas for wilderness designation, totaling 40,500 acres, and two special cave management areas: Guadalupe Mountains (26,400 acres) and Snowy River (21,600 acres). Collectively, when combined with 800 acres for the Upper McKittrick RNA, limitations or closures would be applied to 68,300 acres, which is 6 percent of the total Lincoln NF acreage.

Environmental Consequences for Lands Special Uses Under Alternative C

Effects from Wilderness and Special Management Areas

Under alternative C, approximately 450,000 acres would be closed to special-use authorizations (402,000 acres of proposed wilderness and 48,000 acres of proposed special cave management areas). When combined with the 800-acre Upper McKittrick RNA, the total acreage subject to closures and limitations under alternative C would be 450,800 acres, or 41 percent of the Lincoln NF lands.

Environmental Consequences for Lands Special Uses Under Alternative D

Impacts would be the same as those described for alternative B.

Environmental Consequences for Lands Special Uses Under Alternative E

Effects from Wilderness and Special Management Areas

Under alternative E, there would be no special cave management areas designated, but there would be 21,900 acres of recommended wilderness. In total, 98 percent of the Lincoln NF would be open to land-use authorizations; the largest of the action alternatives and similar to those lands open under alternative A.

Cumulative Environmental Consequences for Lands Special Uses

The geographic area of analysis for cumulative impacts on special uses is the plan area and lands adjacent to the Lincoln NF boundary. Future energy development adjacent to the Lincoln NF may increase the likelihood of energy development on the Lincoln NF and the subsequent issuance of special-use permits. When a special-use proposal is received, Forest Service manual direction requires Forest Service personnel to consider whether the proposed use is consistent with the mission of the Forest Service or can reasonably be accommodated on lands of other ownership. Private lands can provide opportunities for requests, such as wind and solar power and small distribution lines, but not for activities requiring large, continuous land bases, such as for access and utilities for inholdings.

The special-use programs for the Lincoln, Cibola, Carson, and Santa Fe National Forests have the same general requirements because they are guided by the same laws, regulations, and policies that apply to the management of National Forest System lands. The restrictions and limitations placed on the special-use programs are likely to vary between the national forests due to differing concerns or needs of the areas' resource management.

Some restrictions to special-use authorizations would be required to meet the desired conditions, standards, and guidelines for other resource areas addressed in the action alternatives in the draft land

management plan. The cumulative consequences of any of the proposed alternatives would not be significant. This is because they would have little to no effect on the activities and opportunities for these types of uses across the greater landscape. Cumulative impacts on special uses could occur through changes in the designation and development of land resources and the need for access. The presence of threatened, endangered, and at-risk species and historical and archaeological features and concerns may preclude the issuance of some land-use authorizations and place restrictions on others.

Population growth in central New Mexico has increased demand for special uses related to public goods and services, such as utilities, on and around the Lincoln NF. As a consequence of potential designation of wilderness areas, placement of utility infrastructure may be displaced to lands of other ownership. This may increase the cost of doing business to the service provider or utility and affect resources near, but outside, the Lincoln NF.

Minerals and Mining

Affected Environment

The Lincoln NF has a long history of mineral development dating back to before its establishment. Mining is carried out as required by the Mining Law of 1872, the Mineral Leasing Act of 1920, the Materials Act of 1947, the Federal Land Policy and Management Act of 1976, and the Code of Federal Regulations. As part of the identification of the Guadalupe Escarpment WSA and to protect the Guadalupe Cave Resource Protection Area, in 2001 the Forest Service recommended for withdrawal approximately 27,300 acres on the Lincoln NF from mineral entry (*Federal Register* 2001); this recommendation expired on January 22, 2021, but the Lincoln NF is working to extend the recommendation. The two wilderness areas on the Lincoln NF—the Capitan Mountains Wilderness and the White Mountain Wilderness (Forest Service 2020c)—have been withdrawn from mineral entry.

Leasable

Leasable minerals are fluid energy leasable minerals (oil, gas, and geothermal), solid energy leasable minerals (coal), and nonenergy leasable minerals (phosphate, sodium, potassium, sulfur, and Gilsonite).

There are no oil and gas leases on the Lincoln NF and no entity has expressed interest in leases. The Lincoln NF boundary is roughly the geologic edge of the Permian basin; however, the Lincoln NF is outside of the Permian basin. For this reason, the oil and gas development near the Lincoln NF is unlikely to spread across its boundaries. According to a map of geothermal resources of New Mexico (Idaho National Engineering and Environmental Laboratory 2003), the Lincoln NF sits outside of any regions of known or potential geothermal resources.

The Lincoln NF has been mined for coal in the past, especially in the Smokey Bear Ranger District. The last coal mining ended in 1939. Due to the geology of the area, coal beds are interrupted by numerous faults and dikes, making mining difficult. As a result of the difficulty of mining and the current market conditions, no development of coal resources is likely.

There may be nonenergy leasables on the Lincoln NF, but none have been recorded. No permits have been issued or are expected to be issued in the future.

Locatable

Locatable minerals are metals, such as gold, silver, copper, and lead, and a small number of nonmetallic minerals, such as rare earth minerals, uranium, borax, feldspar, fluorspar, and gypsum.

The Lincoln NF has a history of mining for precious metals, predominantly gold, silver, lead, and copper, in the Smokey Bear Ranger District. Mineral districts such as White Oaks, Nogal, and Gallinas, produced significant amounts in the early 1900s. Lower-producing districts, such as Oscuro, Jicarilla, and Schelerville, produced metals intermittently in the late 1800s to early 1900s. Production revived during and after World War Two but has since ended. In the Sacramento Ranger District, copper and lead were mined near the community of High Rolls from 1900 through 1945, ending as demand dropped at the end of World War Two. The Guadalupe Ranger District has no past or current locatable mineral mines.

Precious metal development is now limited to prospecting and in-stream panning. In-stream panning is permitted off established claims (Forest Service 2005); however, there are very few streams on the Lincoln NF.

Uranium has many deposits noted in the New Mexico Bureau of Geology and Mineral Resources database (2020), and one uranium pit was developed on the Lincoln NF in 1954; however, it closed the same year. Given the current prices and projected low demand in the future for uranium, no mining is anticipated. Uranium is mined predominantly using in situ recovery techniques, which are most effective in porous soft rock deposits; deposits on the Lincoln NF are hard rock deposits, which are more costly to mine.

Forest Service staff are aware of the existence of rare earth minerals on the Lincoln NF, but no entity has expressed interest in their development (Jones 2020c).

Salable (Mineral Materials)

Salable minerals are common sand, gravels, stone, and other common variety minerals. All three ranger districts occasionally issue small personal use permits for mining up to 8 tons of material. There is one commercial gravel pit on the Lincoln NF, the Apache pit, in the Sacramento Ranger District. It is permitted for a total of approximately 183 acres. A pit expansion plan was developed and permitted in 2011 for future use, based on the available material (approximately 1.5 million cubic yards) for an estimated 30 years of additional operation (Forest Service 2011c).

The Smokey Bear Ranger District has authorized up to 5 acres from three gravel pits for the Lincoln County Road Department to maintain county roads (Canfield 2019). The Forest Service has also permitted approximately 24 acres of surface disturbance on National Forest System lands for the El Capitan precious metals exploration drilling operation (GL Environmental 2007; Forest Service 2017).

Salable mineral development on the Lincoln NF is generally limited by the cost of transportation relative to the low value of the minerals and the common availability of these minerals on state and private lands outside the Lincoln NF boundary.

Environmental Consequences for Minerals and Mining

On the Lincoln NF, mining is likely to continue to be predominantly commercial and personal use salable mineral mining. Disturbances associated with mining and minerals development are expected to continue to include the timber and surface vegetation removal, soil displacement, erosion and sedimentation, road, building, well, pumping station, wastewater pond, and transmission line construction. Other disturbances could include noise from equipment and blasting, emissions from generators and equipment, the spread of nonnative invasive plants, and dust. The section is organized by the issue topics identified during scoping and subsequent alternatives development that are most applicable to minerals and mining. Project-specific analysis would provide more in-depth analysis when implementing the plan.

Methodology and Analysis Process

Mineral resource management was not identified as a key issue in chapter 1. Changes to the management of minerals and mining are minimal across all proposed alternatives.

Assumptions

- Acreages recommended for mineral withdrawal are assumed to remain available for mineral entry for the life of the document.
- For most types of minerals, an act of Congress would be required to permanently enact the recommendation for withdrawal from mineral entry. The Secretary of the Interior can temporarily withdraw an area from mineral entry for up to 20 years at a time, but the secretary is not bound by recommendations in resource management planning documents.
- Valid existing claims in the withdrawal area are not affected by mineral withdrawals, regardless of mineral withdrawal status. The Forest Service is unable to assume that recommended withdrawals would be enacted and thus must assume that those areas would remain available for mineral entry.
- The Forest Service has greater authority to prescribe the locations where salable mineral resources can be developed.

Indicators

- Locatable minerals: Impacts on locatable minerals under each alternative would depend on acres of lands that could be withdrawn from mineral entry if the Secretary of the Interior or Congress were to follow recommendations for withdrawal. Withdrawn lands would affect future locatable mineral activities only, not existing mineral claims.
- Salable minerals: The acres available for minerals, given limitations from different surface use restrictions under each alternative.
- Leasable minerals: acres of lands available for mineral leasing.

Environmental Consequences for Minerals and Mining Common to All Alternatives

Effects from Economic Extraction

Under all alternatives, mining and mineral development would continue on the Lincoln NF. Mining would continue to be managed as required by the laws and regulations listed above. The Forest Service would continue to reclaim abandoned mine lands on Lincoln NF in order to protect human and environmental health, as the budget allows.

Over the short and long term, the public and local communities and economic conditions could benefit from mineral development. The potential beneficial effects of mineral activities include meeting the needs of the public for the minerals, providing local employment, supporting Federal and State programs through royalties paid, and providing a tax base for the state and county. Lincoln NF users could benefit from easier forest access if roads created for mineral access were added to the transportation system as roads open to the public.

Under all alternatives, mine operators would comply with operation and reclamation requirements, which would reduce many short-term impacts and would reduce or mitigate most long-term impacts.

Under all alternatives, reclamation of abandoned mine lands would continue, as funding allows, reducing the impacts from historic mining activities.

As the minerals are extracted, the deposits are depleted and would not be available for use in the future; therefore, mineral extraction would be an irreversible commitment of the resource.

No significant difference in the number of acres leased for mining, the number of mining operations, or the value of operations to the local community is expected under any alternative.

No leasable mineral development is anticipated over the next 10 to 15 years, so no impacts on leasable minerals are anticipated to occur under all alternatives.

Effects from Wilderness and Special Management Areas

The two designated wilderness areas—the Capitan Mountains Wilderness and the White Mountain Wilderness—would continue to be withdrawn from mineral entry under all alternatives. The existing recommendation that the 21,300 acre Guadalupe Escarpment WSA be withdrawn from mineral entry would not be changed under any alternative. The Forest Service will continue to limit salable mineral mining in the area; but locatable and leasable mineral leasing would not be affected unless the recommendation for mineral withdrawal is enacted by the Secretary of Interior or an Act of Congress.

Environmental Consequences for Minerals and Mining Under Alternative A

Effects from Economic Extraction

Alternative A would continue current management of mineral resources. Impacts would continue to occur as described under *Environmental Consequences for Minerals and Mining Common to All Alternatives*.

Environmental Consequences for Minerals and Mining Common to Alternatives B, C, D, and E

If recommendations for withdrawal from mineral entry are enacted by an Act of Congress or the Secretary of the Interior, the areas of withdrawal would no longer be available for minerals leasing or development. None of the areas recommended for withdrawal under the action alternatives have been identified as having high mineral potential, so impacts from these actions on minerals would likely be minor.

Effects from Economic Extraction

Compared with alternative A (the no-action alternative), all of the action alternatives except alternative D recommend areas for withdrawal from mineral entry. Alternatives B, C, and D propose that two special areas be recommended for withdrawal from mineral development. Alternative E would continue the same management as alternative A, and impacts from mining and mineral development would continue as described under alternative A.

Effects from Wilderness and Special Management Areas

Compared with alternative A, alternatives B, C, and D propose that two special areas (the Guadalupe and Snowy River Special Cave Management Areas) be recommended for withdrawal from mineral development. Recommendations for withdrawal do not prohibit or prevent leasable or locatable mineral development in these areas, an act of Congress or the Secretary of the Interior is required to enact the withdrawal. The Forest Service Authorized Officer may deny applications for salable mineral leasing and development in these areas.

All action alternatives include various acreage of recommended wilderness. None of the recommended wilderness areas in any alternative have been identified as having high potential; therefore, any likely impact from wilderness recommendation would be minimal, if any.

Cumulative Environmental Consequences for Minerals and Mining

The cumulative effects spatial extent includes the Lincoln NF as well as towns and areas in and surrounding the Lincoln NF boundary. The demand for minerals and energy resources on the Lincoln NF is influenced by external factors, such as the economy and public demand for these resources and by nearby construction and development. These factors and past trends are considered in evaluating cumulative effects for energy and minerals.

Deposits of most locatable minerals on and around the Lincoln NF are small and of low quality, making them uneconomical to mine. In addition, the remoteness of these deposits and lack of transportation infrastructure connecting potential extraction sites to existing processing facilities increase the difficulty of making development economically viable. These materials are unlikely to be mined in large quantities over the life of the plan, thereby reducing the associated potential impacts.

The Lincoln NF has salable mineral resources that are under development for local and personal uses. These uses and the associated impacts are likely to continue for the life of the plan. Cumulatively, the effects of salable mineral materials activities are highly localized around the extraction sites. They are minor in proportion to the effects of similar salable mineral mining that is ongoing outside the Lincoln NF in the cumulative effects area. Dust and noise from salable mineral development in the cumulative impacts area could affect the Lincoln NF.

The Lincoln NF does not have any known deposits of economically viable leasable minerals. No development is expected to occur over the life of the plan. Leasable energy minerals in the Permian basin, outside the Lincoln NF but in the cumulative impacts area, is not expected to affect the possibility or lack of viability of energy leasable mineral development on the Lincoln NF. Other resources, such as air quality, could be affected by Permian basin oil and gas development.

Cave and Karst Resources

Affected Environment

The limestone karst regions west and southwest of the city of Carlsbad include the Guadalupe Ranger District, portions of the Smokey Bear District, including the Snowy River Cave, and the Sacramento District. These areas are known worldwide for their cave resources. Once a living reef on the edge of an inland sea, the Guadalupe and Sacramento Mountains are home to over 500 known limestone caves, with surveyed passages ranging from a few feet to 130 miles long and up to 1,600 feet deep.

More than 120 significant limestone caves are on the Lincoln NF and are managed by the Forest Service. Many of these caves are in the rough canyons flanking the north and south sides of the Guadalupe Ridge Anticline on the south end of the Guadalupe District. These caves range in size 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 600 feet deep below the entrance via technical vertical shafts and steep inner slopes. Karst features, such as sinkholes, are also found on the Lincoln NF, but they can change suddenly and unexpectedly and are not well mapped.

The Snowy River Cave, partially on the Smokey Bear District, is the third longest cave in New Mexico. At 11 miles long, it is the world's longest calcite formation. There are additional documented smaller caves, with simple chambers and more complex interconnecting passages, in the Smokey Bear and Sacramento Ranger Districts.

The limestone caves of the Guadalupe and Sacramento Mountains are of particular interest to speleologists, hydrologists, and geologists, due to their unique origin and development by a sulfuric acid process. This process, known as sulfuric acid speleogenesis, involves dissolution of limestone by sulfuric acid derived from natural processes. This method of formation results in cave characteristics that are unusual and of scientific interest (Jagnow et al. 2000). Most cave formations due to dissolution of limestone are due to carbonic acid.

The Forest Service 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” (caving clubs), organized under the National Speleological Society. Several caves were used by Euro-Americans since the late 1800s, and a few were used for commercial tours during a dude ranch operation in the early 1900s. Due to these activities, several major caves had sustained vandalism before the creation of the Federal Cave Resources Protection Act of 1988. The Forest Service has been installing cave gates on some caves to prevent unauthorized access. It has installed 23 cave gates as of 2020.

Active management continues with the evaluation of the Lincoln NF significant caves. A cave on Federal lands that has been designated significant meets the criteria in 36 CFR 290.3(c)(d). Over 120 significant caves have been discovered within the Lincoln NF boundaries. The Forest Service is restricted from disclosing cave locations to the public under 36 CFR 290.4. All significant caves on the Lincoln NF now require a special-use access permit in order to protect significant cave resources, including unique ecosystems, cultural resources, and archaeological sites. The number of permits issued for some caves may be limited in order to minimize impacts on cave resources. Some caves may be entirely closed to access if they present a low recreation value and have significant cave resources. Many spelunking groups in the region hold Lincoln NF cave permits and welcome new members interested in exploring caves.

The Forest Service issues approximately 150 cave exploration special-use permits to spelunkers each year. Most have a limit of six users per permit. In 2019 the Forest Service issued 105 recreational permits and 40 volunteer work permits. Permits for scientific research, survey and exploration, and monitoring are authorized by a letter of approval and are not tracked on an annual basis.

An interest in preventing the spread of white-nose disease among bat populations that roost in the caves has required the Forest Service to restrict access and require permits for access (Forest Service 2020d). There is a decontamination protocol in place for cavers on National Forest System lands, which should aid in slowing the spread of white-nose disease.

Environmental Consequences for Cave Resources

Caves on the Lincoln NF are managed as required by the Federal Cave Resources Protection Act of 1988 and as stipulated in the Forest Management Plan. Goals and objectives of cave management on the Lincoln NF are to prevent any damage or other impacts on cave and karst resources, survey existing caves, explore for new caves, and restore caves where possible.

Methodology and Analysis Process

Alternatives that result in reduced visitation to caves would reduce impacts on cave and karst resources; alternatives that restrict development near significant caves would result in reduced access to cave and karst resources. The section is organized by the Wilderness and Special Management Area issue topic identified during scoping and subsequent alternatives development.

Assumptions

The Forest Service will continue its policy on the Lincoln NF of installing cave gates and requiring permits for access as needed to protect cave resources. This will result in a trend toward reduced impacts on cave and karst resources over time. Limiting or prohibiting from cave areas all infrastructure, facilities, sources of pollution, and vegetation treatments would protect cave resources from contamination or damage. Alternatives that enact or extend cave management policies would protect cave resources.

Indicator

- Potential for disturbance, contamination, or damage to cave resources

Environmental Consequences for Cave Resources Common to All Alternatives

All alternatives would continue current cave plan policies on the Lincoln NF. A policy of installing gates and requiring a permit for entry to all significant caves would reduce the risk of theft or damage of cave resources by cave users. This also would reduce the chance of the spread of white-nose syndrome among bats. Under all alternatives, the Forest Service would aim to strategically survey a minimum of 250 acres of surface area for cave and karst features annually. Any newly discovered caves would be evaluated for significance under the Federal Cave Resources Protection Act of 1988.

Caving management and permits are necessary to protect cave values and desired conditions. Inexperienced users may intentionally or accidentally damage cave resources. By assessing user experience as part of the application process for a special-use permit for cave access, the Lincoln NF discourages use by inexperienced users. Experienced cave users are likely to know about minimizing impacts on cave resources. These users may also contribute to an improved understanding of the cave systems and resources on the Lincoln NF.

Mineral withdrawals proposed under the Guadalupe and Snowy River Special Cave Management Areas are recommendations for withdrawal only. No protection from the impacts of mineral development is provided by that recommendation without an act of Congress or the Secretary of the Interior officially withdrawing the areas from mineral entry.

Under all alternatives, cave resources will remain sensitive to damage from the following activities in the vicinity of the cave: contamination due to surface pollution, ground vibration due to construction, smoke from wildfire and prescribed wildfire, and damage to entrances due to vegetation. Current cave management planning will mitigate or prevent this damage under all alternatives.

Environmental Consequences for Cave Resources Under Alternative A

Effects from Wilderness and Special Management Areas

No special cave management areas are included under alternative A. The cave management described above would continue to protect cave resources by installing cave gates and requiring permits for all cave entry.

Environmental Consequences for Cave Resources Common to Alternatives B, C, and D

Effects from Wilderness and Special Management Areas

The proposed plan includes objectives, standards, and guidelines for protecting and managing cave resources that were not included in the 1986 Forest Plan. These plan components include objectives to survey sensitive cave resources and cave infrastructure and standards and guidelines to protect cave resources from development and visitation. These plan components provide additional protection for cave

resources, compared with alternative A, and would provide additional management direction for caves moving forward.

Alternatives B, C, and D would enact the Guadalupe and Snowy River Special Cave Management Areas to further protect cave resources. Cave special management area standards for these areas are as follows:

- Recommended withdrawal from minerals, geothermal, or oil and gas development
- A prohibition on issuing new major infrastructure rights-of-way
- A requirement that new facilities construction would not introduce pollution, such as chemicals and sewage, to protect cave biotic values
- A requirement that significant cave entrances must be located and avoided before mechanical vegetation treatment begins

The Guadalupe Special Cave Management Area would protect approximately 26,400 acres, and the Snowy River Special Cave Management Area would protect approximately 21,600 acres. Compared with alternative A, these alternatives would provide additional protection of cave and karst resources by limiting potential impacts from infrastructure, sources of hydrologic pollution, and vegetation treatments.

Impacts prevented by prohibiting major rights-of-way could include damage to cave features, chambers, or passages from infrastructure footings or foundations intruding into caves and damage to features and cave biota from noise, vibrations, and surface compaction from construction equipment. Requiring that facilities not introduce pollution would protect sensitive cave ecosystems. The requirement that significant cave entrances be located and avoided before mechanical vegetation treatment begins would prevent damage to cave entrances.

The Forest Service would evaluate caves for significance and implement protections, including installing gates and requiring permits for access, for significant cave resources, as needed. This would continue to protect cave resources by installing cave gates, by requiring permits for all cave entry, and by imposing other restrictions on cave access, as needed.

Environmental Consequences for Cave Resources Under Alternative E

Alternative E would not designate the Guadalupe and Snowy River Special Cave Management Areas; however, it would include the same plan components for cave resources as described above. This would provide more protection for cave resources, compared with alternative A.

This alternative includes a guideline that newly identified caves should be reviewed to determine their suitability for recreation purposes. This could lead to additional recreation opportunities on the Lincoln NF and could help disperse recreational cave use; however, it could also expose newly discovered caves to the risk of damage from vandalism or overuse.

Cumulative Environmental Consequences for Cave Resources

National forest and surrounding areas are underlaid with the same cave system or limestone/karst features as those on the Lincoln NF. Cave passages and karst voids can create hydrologic connections that extend beyond the boundaries of the Lincoln NF. This could provide a direct hydraulic connection that would allow pollution from sources outside the Lincoln NF to enter it and damage its cave and karst resources. The number and intensity of pollution sources in the area surrounding the Lincoln NF is the indicator of cumulative effects.

Wilderness and Wilderness Study Areas

Affected Environment

In 1964, Congress passed the Wilderness Act, thereby establishing a national system of lands to preserve ecosystems in a natural condition for the benefit of future generations. The Wilderness Act defines wilderness as undeveloped Federal land that has the following characteristics:

- It is affected primarily by the forces of nature, where people are visitors who do not remain.
- It provides outstanding opportunities for solitude or a primitive and unconfined type of recreation.
- It is of sufficient size as to make practicable its preservation and use in an unimpaired condition.
- It may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Designated wilderness areas contribute to ecological sustainability by providing large expanses of natural landscapes that reflect ecological conditions that normally would 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 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 these areas exist and will be preserved for future generations (Wilderness Connect 2020).

Designated wilderness areas provide unique opportunities for nonmotorized, quiet recreation, solitude, and challenge. These areas provide recreation opportunity spectrum settings of primitive and semiprimitive nonmotorized classes. The Wilderness Act prohibits permanent roads, 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 one is allowed in designated wilderness, consistent with the Americans with Disabilities Act.

Public Law 96-550, the 1980 New Mexico Wilderness Act, states that Congress does not intend designation of wilderness areas in the state of New Mexico to 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.

There are two congressionally designated wilderness areas on the Lincoln NF totaling approximately 82,000 acres: the White Mountain and Capitan Mountains (see figure 2-1). In 2014, of the approximately 767,000 visitors to the Lincoln NF, over 21,000 visited the White Mountain or Capitan Mountains Wilderness Areas (NVUM 2014).

White Mountain Wilderness

The White Mountain Wilderness was designated by Congress as part of the Wilderness Act of 1964. Originally, it was composed of approximately 30,400 acres; in 1980 the New Mexico Wilderness Act added an additional 16,500 acres, bringing its total acreage to 46,900. The White Mountain Wilderness is located in the Smokey Bear Ranger District about 10 miles northwest of the village of Ruidoso, New Mexico. 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 6,400 feet near Three Rivers Campground to 11,300 feet near Lookout Mountain, resulting in diverse plant and animal communities.

Capitan Mountains Wilderness

The Capitan Mountains Wilderness was designated in 1980 and contains approximately 35,100 acres in the Smokey Bear Ranger District. It is the birthplace of the world-famous Smokey Bear, who was found as a cub in a tree near Capitan Pass by local firefighters in 1950.

The wilderness area is adjacent to 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 east to west. Numerous canyons cut into the north side of the rocky range, while rocky outcroppings distinguish the region to the south. Elevations vary from about 5,500 feet near the eastern boundary to 10,083 feet on Capitan Peak.

Guadalupe Escarpment WSA

The 21,300-acre Guadalupe Escarpment WSA was reviewed by Congress as part of the New Mexico Wilderness Act of 1980. The New Mexico Wilderness Act of 1980 stated “the Secretary of Agriculture shall review the Guadalupe Escarpment WSA 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 WSA 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.”

In 2001, approximately 27,300 acres of National Forest System lands were withdrawn from mining and mineral leasing for a period of 20 years, in order to protect the Guadalupe Cave Resource Protection Area. The withdrawn area includes the Guadalupe Escarpment WSA’s 21,300 acres along with the adjacent 6,000 acres north of the WSA.

Areas Evaluated as Having Wilderness Characteristics

Wilderness areas are designated to protect and manage their wilderness character and preserve their natural conditions. As part of the plan revision process, the Forest Service assessed all areas on the Lincoln NF not currently designated as wilderness; the Forest Service assessed the degree to which these areas possess wilderness characteristics. The Final Evaluation Process Documentation and Criteria for the Lincoln NF Wilderness Recommendation Process (Forest Service 2020e) documents the assessment process and results. There are 51 areas totaling approximately 402,000 acres that were determined to possess wilderness characteristics with a high ranking or score, and each of those is included as a recommended wilderness management area in at least one alternative described in chapter 2. Appendix B includes the detailed description and ranking for each of the wilderness polygons with a high ranking or score.

Any area that is ultimately recommended for wilderness designation through the planning process is a preliminary administrative recommendation that may receive further review and modification by the Chief of the Forest Service, the Secretary of Agriculture, and the President of the United States prior to designation. The final authority to designate wilderness has exclusively been reserved by Congress. Recommended wilderness management areas are managed to preserve the wilderness character that form

the basis for their recommendation. Recommendation for wilderness designation does not alter or restrict any valid existing rights.

Environmental Consequences for Wilderness and Wilderness Study Areas

Elements of wilderness character consist of size, naturalness, and outstanding opportunities for solitude or primitive and unconfined recreation. They may also include supplemental values, such as ecological, geological, or other features of scientific, educational, scenic, or historical value. For all alternatives, size is a characteristic that would not be affected; none of the alternatives would reduce any of the recommended wilderness management areas to less than 5,000 acres for areas that are not next to designated wilderness or a WSA.

Methodology and Analysis Process

This section evaluates and discloses the potential environmental consequences to designated wilderness areas, the WSA, and recommended wilderness management areas. Criteria for evaluating the potential level of change to the designated wilderness, recommended wilderness management areas, and WSA are measured by acres of land on the Lincoln NF and overlapping resources and resource uses. Additionally, this section includes a qualitative discussion of the potential effects on the designated wilderness, WSA, or recommended wilderness management areas from management activities, if appropriate. The section is organized by the issue topics identified during scoping and subsequent alternatives development that are most applicable to Wilderness and WSAs.

Assumptions

- Use and development on the Lincoln NF would increase into the foreseeable future.
- Designated wilderness is managed according to the Wilderness Act, 36 CFR 293, applicable Forest Service manuals and handbooks, individual wilderness area management plans, and the Lincoln NF Land and Resource Management Plan.
- Recommended wilderness management areas contiguous with designated wilderness would require less management effort to protect wilderness character than areas that are not contiguous with designated wilderness. This is because there may be fewer new miles of boundary to mark, monitor, and maintain, especially in areas where a high proportion of the boundary of the recommended wilderness management area is contiguous with the designated wilderness boundary. In addition, locally based wilderness stewardship partners and patterns (for example, staging areas, strategies, and tools) have already been developed.

Plan components differ between designated wilderness and recommended wilderness management areas, such as allowing motorized use for administrative access and mechanized uses, such as chainsaws and wheelbarrows, to protect or enhance wilderness characteristics in recommended wilderness management areas.

- Some areas included in the alternatives as recommended wilderness management areas are partly or entirely within IRAs under the 2001 Roadless Rule. Managing lands as recommended wilderness management areas that are in IRAs will add some complexity to management in some areas. For example, vegetation management would be more constrained in recommended wilderness management areas that are also within IRAs than in areas that are managed as IRAs, but not recommended wilderness management areas.

Indicators

- Acres of designated wilderness, recommended wilderness management areas, and WSA
- Degradation of wilderness character to a level at which it would no longer be present in a specific area
- Roadless areas of sufficient size—Impacts would result from building roads.
- Naturalness—Impacts would result from development of facilities or vegetation manipulations that make the area appear less natural.
- Opportunities for solitude or primitive and unconfined recreation—Impacts would result from increases in visitation, development of facilities, increases in motorized or mechanized routes, or increases in management constraints on primitive recreational use, such as hunting or camping.
- Supplemental values—Impacts would result from any action that degrades the inventoried values.

Environmental Consequences for Wilderness and Wilderness Study Areas Common to All Alternatives

Effects from Wilderness and Special Management Areas

Under all alternatives, there would be no change to the currently designated wilderness or WSA (see figure 2-1). The Forest Service would continue to manage designated wilderness using applicable law, regulation, and policy to preserve wilderness character. Natural ecological processes and disturbance would be the primary forces affecting the composition, structure, and patterns of vegetation. Current management from the 1986 Forest Plan recommended non-designation for the Guadalupe Escarpment WSA and did not include forest plan components for its management, whereas under alternatives B, C, D, and E, the proposed forest plan does include forest plan components for its management (see Recommended Wilderness Management Area and WSA plan components).

Wilderness character would be protected in the long term from management actions that include prescribed wildfire treatments. These treatments improve ecosystem composition, structure, and diversity, which would improve the overall apparent naturalness of the area. In the short term, however, wilderness character would be affected due to an increase in human presence by administrative staff during treatments.

No timber harvest or road construction would be permitted in the White Mountain and Capitan Mountains Wilderness or the Guadalupe Escarpment WSA. Mechanical vegetation management, such as mastication, would be prohibited in recommended wilderness management areas, unless treatment is needed to protect the wilderness character (FW-RECWILD-S-3b).

Environmental Consequences for Wilderness and Wilderness Study Areas Under Alternative A

Effects from Wilderness and Special Management Areas

Alternative A offers the least protection of wilderness character to areas recommended as potential wilderness under the action alternatives. This is because there would be no recommended wilderness. The primary activities that could alter the wilderness character of these areas are motorized use, unauthorized motorized use, and dispersed camping.

The White Mountain and Capitan Mountains Wilderness and the Guadalupe Escarpment WSA would continue to be managed as closed to motorized and mechanized recreation, which would protect their

wilderness character. This would be accomplished by restricting activities that could affect the natural appearance and opportunities for solitude and primitive and unconfined recreation. Primitive routes are not maintained in any way for general access.

Alternative A also lacks specific guidelines and components to provide for restoration in wilderness or to address nonnative invasive plants, such as nonnative invasive plants and pigs, for areas without current management plans specific to the wilderness. Nonnative invasive plants can change the composition and function of the ecosystems they invade. This poses a particular problem in wilderness and other natural areas that are set aside to maintain natural conditions.

There are currently 20,200 acres available for livestock grazing in the Guadalupe Escarpment WSA, which would continue in the same manner and degree as on the date the FLPMA was enacted (October 21, 1976), even though the activity may impair wilderness character.

Environmental Consequences for Wilderness and Wilderness Study Areas Common to Alternatives B, C, D, and E

Effects from Wilderness and Special Management Areas

All action alternatives would emphasize vegetation treatments and prescribed burning in frequent fire forest types and piñon-juniper woodland that are highly departed from desired conditions, including historical fire regimes. Mechanical treatments and wildland fire (wildfire and prescribed wildfire) would be used to accomplish vegetation management goals in recommended wilderness management areas, but would not occur in designated wilderness areas. Wilderness character would be protected in the long term from implementing these types of treatments; but in the short term, apparent naturalness and opportunities for solitude would be affected due to an increase in human presence and vehicle and road use. Overall, these actions would increase the apparent naturalness and opportunities for solitude in recommended wilderness management areas, compared with alternative A.

Fire would be managed in the White Mountain and Capitan Mountains Wilderness and the Guadalupe Escarpment WSA to allow the frequency and intensity of the natural fire regime to play its inherent role in the ecosystem. This means both allowing fire where ecosystems evolved in the presence of fire and preventing unnatural spread of fire in ecosystems that evolved without broadscale fires. Wildfire suppression would prevent catastrophic destruction of vegetation and would preserve wilderness character in these areas over the long term. Wildfire suppression restrictions, such as on the use of heavy equipment or retardant, could limit the effectiveness of suppression actions. Minimum impact suppression tactics would reduce unanticipated effects on wilderness character during wildfire suppression.

Existing compatible authorizations would be allowed to continue in recommended wilderness management areas. This includes livestock grazing, tribal uses, water uses and rights, mining claims, and supporting facility maintenance. Mechanical vegetation management would be prohibited in recommended wilderness management areas unless treatment is needed to protect wilderness character. Mechanized uses, such as chainsaws and wheelbarrows, would be allowed in recommended wilderness management areas if they are needed to preserve, protect, or enhance wilderness characteristics of the area.

The recommended wilderness management areas would benefit some wildlife species because primitive management would reduce disturbance and provide habitat connectivity. Conversely, a limited ability to mechanically treat in these areas may mean that ecological conditions become more departed, which may negatively affect wildlife.

Other designated areas on the Lincoln NF that overlap the recommended wilderness management areas could indirectly protect wilderness character. This is due to the protective measures and complimentary management objectives. Table 3-68, below, provides a summary of other management areas and designated areas in recommended wilderness management areas by alternative.

Table 3-68. Overlapping Management Areas and Designated Areas with Recommend Wilderness Management Areas

Management or Designated Areas	Alternative A (Acres or Miles)	Alternative B (Acres or Miles)	Alternative C (Acres or Miles)	Alternative D (Acres or Miles)	Alternative E (Acres or Miles)
Cave Management Areas	N/A	20,700 acres	29,200 acres	20,700 acres	20,600 acres
National Recreation Trails	N/A	12 miles	33 miles	12 miles	12 miles
Inventoried Roadless Areas	N/A	20,000 acres	147,500 acres	20,000 acres	20,000 acres
Research Natural Areas	N/A	800 acres	800 acres	800 acres	800 acres
Wild and Scenic Rivers	N/A	5,400 acres	18,900 acres	5,400 acres	5,400 acres

Source: Forest Service GIS 2020

Environmental Consequences for Wilderness and Wilderness Study Areas Under Alternative B

Effects from Wilderness and Special Management Areas

Under alternative B, a total of 40,500 acres in 21 areas would be managed as recommended wilderness management areas. Increasing recreation infrastructure would be unlikely under alternative B. In the recommended wilderness management areas, there would be 39,300 acres available for livestock grazing activities and related range improvements, such as fences, stock trails, springs, and stock ponds. These areas would continue to be maintained even though continued maintenance and the presence of structures could affect the areas' apparent naturalness.

Environmental Consequences for Wilderness and Wilderness Study Areas Under Alternative C

Effects from Wilderness and Special Management Areas

Under alternative C, a total of 402,000 acres of recommended wilderness in 51 areas would be managed as recommended wilderness management areas. This alternative would limit resource damage by requiring that motor vehicle use by the public is only authorized as designated by the MVUM. It would decommission administratively closed roads with an emphasis on decommissioning those that contribute to resource damage. Vegetation management would stress wildland fire as the primary restoration tool, and mechanical thinning would be used only in limited situations, thereby reducing any impacts on wilderness character. In the recommended wilderness management areas, there would be 395,000 acres available for livestock grazing activities.

Environmental Consequences for Wilderness and Wilderness Study Areas Under Alternative D

Effects from Wilderness and Special Management Areas

Under alternative D, a total of 40,500 acres of recommended wilderness in 21 areas would be managed as recommended wilderness management areas. Impacts would be the same as those described under alternative B.

Environmental Consequences for Wilderness and Wilderness Study Areas Under Alternative E

Effects from Wilderness and Special Management Areas

Under alternative E, a total of 21,900 acres of recommended wilderness in 11 areas would be managed as recommended wilderness management areas. This alternative would encourage opportunities for motorized access, which would increase the potential for detrimental impacts on wilderness character more than all other action alternatives. In the recommended wilderness management areas, there would be 20,800 acres available for livestock grazing activities and related range improvements. Impacts would be similar to those described under alternative B; but, impacts would be slightly greater on active allotments due to the placement of additional upland water sources, making it possible for additional cattle grazing on underutilized allotments.

Cumulative Environmental Consequences for Wilderness and Wilderness Study Areas

The cumulative effects study area for the White Mountain and Capitan Mountains Wilderness, recommended wilderness management areas, and the Guadalupe Escarpment WSA includes all federally managed lands in and adjacent to the Lincoln NF administrative boundary. The time frame for cumulative effects is the timeline of the plan (10 to 15 years). Other adjacent land managers that maintain designated wilderness and WSAs include other national forests, the Bureau of Land Management, and the National Park Service.

On the Lincoln NF, each alternative would manage varying acreages of recommended wilderness management areas, as summarized in table 3-69 and displayed in figures 2-11, 2-16, and 2-18.

Table 3-69. Recommended Wilderness Management Areas by Alternative

Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)	Alternative E (acres)
0 acres	40,500 acres	402,000 acres	40,500 acres	21,900 acres

Source: Forest Service GIS 2020

Past, present, and reasonably foreseeable future actions that have the potential to cumulatively affect the designated wilderness areas, WSA, and recommended wilderness management areas include activities such as vegetation management, mining, increasing recreation use, and fuels reduction activities that would occur adjacent to existing wilderness areas. These actions may affect opportunities for solitude inside designated wilderness areas, depending on the frequency and proximity of actions to wilderness boundaries. For example, expansion of a developed recreation site adjacent to a designated wilderness may increase use levels, thereby negatively affecting opportunities for solitude.

Areas adjacent to the designated wilderness, WSA, or recommended wilderness management areas that are managed for nonmotorized use are usually more compatible with wilderness management objectives

and maintaining wilderness character and quality. If new development occurs adjacent to any of the existing wilderness areas, WSA, or recommended wilderness management areas, effects could include increased noise levels, modified landscapes, and motorized trespass.

Inventoried Roadless Areas

Affected Environment

IRAs were authorized by the 2001 Roadless Area Conservation Rule, 36 CFR 294. The “inventoried” part of the name comes from the Roadless Area Review and Evaluation the Forest Service conducted in the 1970s. IRAs 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 serve as barriers against the spread of nonnative, invasive plant species and provide reference areas for study and research. IRAs also contribute to social sustainability by providing opportunities for dispersed outdoor recreation, which diminish as open space and natural settings are developed elsewhere.

There are 12 IRAs across the Lincoln NF; see table 3-70, below, and figure 2-1.

Table 3-70. Inventoried Roadless Areas

IRA Name	National Forest System Acres
Capitan Mountains	13,900
Carrizo Mountain	17,200
Culp	3,200
Grapevine	2,100
Jefferies Canyon	8,900
Last Chance Canyon	8,900
Little Dog and Pup Canyons	25,400
North Rocky Canyon	8,100
Ortega Peak	11,500
South Guadalupe Mountains	20,000
Tucson Mountain	16,800
West Face Sacramento Mountains	40,900
Total	176,900

Source: Forest Service GIS 2020

The 2001 Roadless Area Conservation Rule prohibits road construction, reconstruction, and timber harvest (with exceptions) in IRAs. This is because these activities have the greatest likelihood of altering and fragmenting landscapes, which could result in immediate long-term loss of roadless area values. Roads and motorized trails can be present within IRAs. The 2001 Roadless Area Conservation Rule does not prohibit motorized travel on existing roads or motorized trails. Official roadless area boundaries were established in the 2000 Forest Service Roadless Area Conservation Final Environmental Impact Statement (Forest Service 2000).

Characteristics of roadless areas include:

- Soil, water, and air resources
- Sources of public drinking water

- Diversity of plant and animal communities
- Habitat for threatened, endangered, and at-risk species and species dependent on large, undisturbed areas of land
- Primitive and semiprimitive motorized and nonmotorized classes of recreation
- Reference landscape for research study or interpretation
- Natural-appearing landscapes with high scenic quality
- TCPs and sacred sites

The IRAs on the Lincoln NF are located in places that generally do not receive a high amount of use by the visiting public; however, some areas on the western escarpment of the Sacramento District area just east of Alamogordo, where hunting and camping are popular, can get a lot of use. Some of the IRAs contain minor infrastructure and have had some minor vegetation treatments. While IRAs located in wilderness areas retain wilderness character, IRAs outside wilderness areas can retain some wilderness or primitive character while not being as restrictive regarding mountain biking, off-highway vehicle use, or chainsaws. It is likely that visitor use in these IRAs will remain low and hunting in these areas will remain at steady levels in the future.

Nonnative, invasive plant species are threats to roadless characteristics. This is due to negative effects on soil resources, the diversity of plant and animal communities, and the overall naturalness associated with the areas' landscape character. Although nonnative invasive plants are observed and acknowledged throughout the Lincoln NF, they are not well documented. Ongoing efforts to document, quantify, map, and treat nonnative, invasive plants are part of the Lincoln NF nonnative, invasive plant management strategy.

Nonnative invasive plants treatment, vegetation projects (of the specific type allowable under the 2001 Roadless Area Conservation Rule), ongoing trail maintenance and reconstruction, and wildland fire management activities all have the potential to improve the areas' roadless characteristics.

Threats to the IRA characteristics mandated for protection by the 2001 Roadless Area Conservation Rule include the occurrence of new and existing unauthorized, user-developed motorized routes.

Environmental Consequences for Inventoried Roadless Areas

Methodology and Analysis Process

This section evaluates and discloses the potential environmental consequences to IRAs. The effects of the various alternatives on IRAs were evaluated, based on how plan direction under each alternative would affect the roadless character of these areas. Specific management outlined for this designated area provides the greatest impact on this resource, therefore the section is organized to reflect that.

Assumptions

Activities in IRAs under all alternatives will be consistent with the 2001 Roadless Area Conservation Rule in order to maintain their roadless characteristics. Any proposals of prohibited activities in IRAs (e.g., road construction) will demonstrate they meet the rule exceptions, in addition to demonstrating protection or improvement of all roadless characteristics of IRAs.

Indicator

- Acres of IRAs in the plan area and the extent to which plan direction under each alternative would protect the roadless character of these areas, including exceptions to prohibition if applicable.

Environmental Consequences for Inventoried Roadless Areas Common to All Alternatives

Effects from Inventoried Roadless Area Management

No new IRAs are proposed under any alternative. Under all alternatives, IRAs would be managed in accordance with current Forest Service regulation and policy. The Forest Service would manage activities in IRAs to follow the Roadless Area Conservation Rule and policy on road construction and timber cutting, sale, and removal, consistent with Forest Service policy on preserving roadless character. IRAs would provide clean drinking water and function as biological strongholds for populations of threatened and endangered species. They would provide large, relatively undisturbed landscapes that are important to biological diversity and the long-term survival of many at-risk species.

Environmental Consequences for Inventoried Roadless Areas Under Alternative A

Effects from Inventoried Roadless Area Management

Management activities are limited in IRAs to sustain the social and ecological roadless characteristics of each area. The Forest Service manages these areas to preserve roadless character. The Forest Service currently manages 12 IRAs on the Lincoln NF, totaling about 176,900 acres. Under alternative A, there would be no change to current management.

IRAs would continue to be reference areas to measure the effects of development on other parts of the landscape and a variety of ecosystems. Examples are undisturbed landscapes that are important to biological diversity, clean drinking water, opportunities for dispersed outdoor recreation, study and research, and high scenic quality.

Environmental Consequences for Inventoried Roadless Areas Common to Alternatives B, C, D, and E

Effects from Inventoried Roadless Area Management

Under alternatives B, C, D, and E, the number (12) and area of managed IRAs (176,900 acres) would be the same as those described under alternative A. The proposed plan would include a desired condition that the roadless character of IRAs is protected and conserved. It also would include guidelines to ensure the protection of IRA characteristics; examples of this are managing IRAs for semiprimitive nonmotorized and semiprimitive motorized recreation settings and closing and rehabilitating temporary roads as projects are completed. These guidelines would protect roadless characteristics by maintaining natural-appearing landscapes and preventing illegal motorized use.

Similar to alternatives B and C, alternative D would also decommission administratively closed roads, but would prioritize decommissioning roads that affect riparian areas or hinder habitat connectivity. This would further protect habitat for at-risk species where they occur in IRAs.

Alternative E would focus on providing more accessible recreation opportunities by maintaining access roads; therefore, it would not provide the same level of protection for IRA characteristics as the other alternatives.

Under all alternatives, to varying degrees, IRAs would continue to provide opportunities for dispersed primitive outdoor recreation, while opportunities would be diminished elsewhere on the Lincoln NF as open space and natural settings are developed. IRAs would also serve as protective buffers against the spread of nonnative, invasive plant species and provide reference areas for study and research.

Alternatives B, D, and E include the entire South Guadalupe Mountains IRA (20,000 acres) to also be managed as a recommended wilderness management area. Alternative C would include 147,500 acres of the following IRAs to also be managed as recommended wilderness management areas: Capitan Mountains, Carrizo Mountain, Culp, Grapevine, Jefferies Canyon, Last Chance Canyon, Little Dog and Pup Canyons, Ortega Peak, South Guadalupe Mountains, and West Face Sacramento Mountains. Managing these IRAs as recommended wilderness management areas would provide beneficial protections to IRA characteristics. This also would maintain consistency with IRA guidelines in the proposed plan, such as maintaining habitat connectivity by limiting barriers, such as roads, that reduce connectivity. It would minimize disturbance of federally listed species through primitive management or not allowing road construction.

Cumulative Environmental Consequences for Inventoried Roadless Areas

The cumulative effects analysis area for IRAs includes all federally managed lands in and adjacent to the Lincoln NF administrative boundary. The time frame for cumulative effects is the timeline of the plan (10 to 15 years). Other adjacent land managers that maintain roadless areas, including wilderness and WSAs, include other national forests, the Bureau of Land Management, and the National Park Service. The roadless character of IRAs within the cumulative effects analysis area would be maintained or enhanced through Forest Service or other agency regulation and policy. Other agencies and adjacent forests may also recommend portions of IRAs as wilderness or a WSA, resulting in cumulative effects that protect the roadless character and associated benefits, such as undisturbed soil, water, and air; public drinking water sources; plant and animal diversity; wildlife habitat; primitive and semiprimitive recreation; high scenic quality; and protection of traditional cultural properties.

National Scenic, Historic, and Recreation Trails

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

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

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

Affected Environment

The Forest Service administers the following nationally designated trails on the Lincoln NF:

- Dog Canyon Trail
- Rim Trail
- Guadalupe Ridge Trail

All three trails are designated in the National Trail System as recreation trails (American Trails 2020).

Dog Canyon Trail

Native Americans have used the 5.5-mile Dog Canyon Trail for thousands of years as an access route from the desert environment of the Tularosa basin to the Sacramento Mountains. Designated as a national recreation trail in 1981, the Dog Canyon Trail is a steep trail for experienced hikers that passes through multiple vegetation zones as it rises approximately 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 and ends at Forest Road 90B. The visitor center is located at the state park.

The Dog Canyon Trail is most popular in the spring and fall months when temperatures are cooler (Forest Service 2020f). 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. The most visited portion is the lower trail from the state park to the ruins of a stone cabin, which is 2.9 miles up the canyon. Distances along the trail are marked with a sign every quarter mile to the stone cabin, and every half mile beyond there.

Youth crews from various conservation corps, volunteer groups such as the New Mexico Rails-to-Trails Association, and Forest Service personnel periodically maintain the trail. The Sacramento Ranger District applies for grant funding to support maintenance and improvement work when possible. The Forest Service considers this trail to be in good condition with no recent impacts from wildfires, insect and disease, or flooding.

Rim Trail

Congress originally designated the Rim Trail in 1978; it was the first Forest Service trail in New Mexico to be designated as a national recreation trail under the National Trails System Act of 1968. Originally 14 miles, Congress has periodically added new sections, most recently in 2000. Now 31.2 miles, the trail is a combination of old Indian paths, railroad grades, and homestead trails linked together by new sections of trails built from the 1960s to 1980s. The trail passes through mixed conifer (Douglas-fir, white fir, and southwestern white pine), quaking aspen, and meadows. It runs north to south along the top of the Sacramento Mountains, offering trail users glimpses of the Tularosa basin. Except for the first 1.1 miles, which are open to nonmotorized uses only, the trail is designated for hikers, horses, mountain bikers, and motorcycles.

The Rim Trail has been highlighted in numerous trail websites, and it 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 on the Lincoln NF. Overall, year-round trail use is increasing.

Forest Service personnel, boy scouts, military volunteer groups, youth conservation corps, and others maintain the trail on an annual basis. Annual recreation event permit holders also perform maintenance.

This trail is in fair condition, which is a recent downgrade in condition status due to large outbreaks of insects and diseases, which have affected the visual characteristic in many locations along the trail.

Guadalupe Ridge Trail

Designated in 2018, the 100-mile Guadalupe Ridge Trail is an interagency national recreation trail that winds through the Guadalupe Mountain and Carlsbad Caverns National Parks, the Lincoln NF, and areas managed by the Bureau of Land Management. The Lincoln NF contains 21 miles of the trail within its boundaries. In the Guadalupe Ranger District, the trail provides nonmotorized and motorized access for hikers, equestrians and stock, motorized vehicles, and bicyclists. The trail traverses the rocky peaks of the highest point in Texas, Guadalupe Peak (8,751 feet), to the challenging mountainous landscape of the New Mexico Chihuahuan Desert.

The Lincoln NF has mountain mahogany, ponderosa pine evergreen oak, and mixed coniferous forests along with spectacular rocky canyons. Visitors that wish to explore some of the many caves in the Guadalupe Ranger District, such as the 3-mile-long Cottonwood Cave, can secure a free permit from the district office. An optional loop will take trekkers through Last Chance Canyon and Sitting Bull Falls, a desert oasis with a series of small waterfalls and pools. Recently constructed, this trail is still in good condition.

Environmental Consequences for National Scenic, Historic, and Recreation Trails

Methodology and Analysis Process

The Forest Service staff evaluated impacts of the various alternatives by comparing the plan direction of each alternative toward meeting the nature and purpose of these routes and protecting their historic, recreation, and scenic qualities. The most important management tool and metric associated with designated trails is the National Trails System Act of 1968. There are numerous requirements in the National Trails System Act that must be met to comply with the intent of the law. Scenic and historic trails are required to have a comprehensive trail management plan (Public Law 90-543, as amended through Public Law. 111-11, 2009). These plans are developed by the trail's administering agency and provide a framework for managing and allocating uses along the trails. Additional management tools and metrics used to manage designated trails include the SMS and recreation opportunity spectrum. Specific management outlined for this designated area provides the greatest impact on this resource; therefore, the section is organized to reflect that along with issue topics identified during scoping.

Assumptions

- Management under all alternatives will be consistent with a designated trail's comprehensive management plan.
- Recreation opportunity spectrum classes may vary considerably depending on the alignment of the trail and its proximity to roads; however, designated trails are primarily nonmotorized and most often are classified as semiprimitive nonmotorized or primitive.
- National visitor use monitoring information is collected for the entire Lincoln NF; however, data are not available for visitor use information specific to each trail or site-specific and recreation opportunity spectrum-related uses.

Indicator

- Meeting the nature and purpose of the trail through consistent management and plan direction

- Scenic integrity objectives for designated trails
- Miles of designated trails

Environmental Consequences for National Scenic, Historic, and Recreation Trails Common to All Alternatives

Effects from Natural Resource Management

Vegetation management through mechanical treatments and prescribed wildfire would occur across all alternatives, although under alternative A there would be no objectives for a specific amount per year; prescribed burns would be implemented on a project-by-project basis based on available funds and opportunities under current management. This would result in no change to existing designated trail access or scenic integrity.

All action alternatives include objectives for mechanical treatments (thinning and commercial harvests) while offering opportunities for fuelwood collection when projects allow. In the short term, restoration activities completed with mechanical treatments may alter scenic resources visible from the designated trails by changing forest stands from closed forests to more open forests. In the long term, vegetation treatments may improve scenery by creating vistas, promoting healthy vegetation, and improving ecosystem resilience to uncharacteristic disturbances. Prescribed wildfire activities typically have short-term smoke effects with enhanced vegetation conditions in the long term. While some short-term impacts may occur, scenic integrity objectives would still be met, particularly in the long term. More detailed effects can be found in the Scenery section.

Multiple-use management activities may affect scenic resources viewed from nationally designated trails under all alternatives. Effects of other multiple-use management on scenic resources can be found in the Scenery section. Management activities may affect designated trails by altering the appearance of the landscape and cause both short-term effects (lasting 1–2 years) and long-term effects (lasting more than 2 years). Under all alternatives, there is the potential to affect the scenic integrity as viewed from designated trails as a result of proposed vegetation management activities, particularly activities with mechanical treatments.

Effects from National, Scenic, Historic and Recreation Trail Management

No new nationally designated trails are proposed in any alternative. The Forest Service would continue to manage current nationally designated trails to protect the values for which they were designated, provide opportunities to view natural features and scenery, and provide recreational opportunities in a variety of recreation opportunity spectrum settings.

Environmental Consequences for National Scenic, Historic, and Recreation Trails Under Alternative A

Effects from Natural Resource Management

Vegetation management through mechanical treatment and prescribed wildfire objectives would occur across all alternatives, although under alternative A there would be no objectives for a specific amount per year; prescribed burns would be implemented on a project-by-project basis based on available funds and opportunities under current management. Vegetation management, both mechanically or with prescribed wildfire, would continue in the views of designated trails. This would result in both short-term effects and long-term benefits, as discussed above under Environmental Consequences for National Scenic, Historic, and Recreation Trails Common to All Alternatives.

Effects from National, Scenic, Historic and Recreation Trail Management

Under alternative A, current management would continue under the 1986 Forest Plan for the 136.7 miles of the three designated trails. Forest Service personnel would continue to use the recreation opportunity spectrum outlined in the existing condition, and current management practices would continue as they are outlined in the 1986 Forest Plan. There would continue to be limited management direction for individual designated trails or direction for wildland fire, the treatment of nonnative invasive plants, or mechanical treatments that contribute to trail values.

There would be no change in current direction for any designated trail under alternative A and some trails not specifically mentioned in the 1986 Forest Plan (such as the Guadalupe Ridge Trail). Under this alternative, the Forest Service would continue to manage national scenic, historic, and recreation trails for moderate to high scenery integrity objectives.

Environmental Consequences for National Scenic, Historic, and Recreation Trails Common to Alternatives B, C, D, and E

Effects from Natural Resource Management

Standards and guidelines in all action alternatives would allow for thinning and burning activities to be used to accomplish project- or plan-level desired conditions. Vegetation treatment objectives in all action alternatives include 200,000 acres of prescribed burning and 6,500 to 19,500 acres of mechanical treatment; these treatments have the potential to alter recreation opportunity spectrum classes from those that are predominantly natural appearing (i.e., primitive, semiprimitive nonmotorized, semiprimitive motorized, and roaded natural) to those with more modified environments (i.e., rural or urban). Mechanical thinning and prescribed burning actions could be consistent with managing for predominantly natural-appearing environments, even though they would be visually evident from the designated trails. The treatment activities could temporarily conflict with the recreation opportunity spectrum class objectives, especially in primitive areas and areas where sensitivity to those activities is greater, compared with semiprimitive motorized, roaded natural, rural, and urban areas (see the Recreation section). Prescribed wildfire could be used to move transition ecosystems toward more natural fire regimes and to promote ecosystem resiliency.

In forested vegetation communities, thinning and burning would reduce tree density when compared with alternative A. In the shorter term, restoration activities completed with mechanical treatments may affect trail access and alter scenic resources visible from the designated trails by changing forest stands from closed forests to more open forests and from residual stumps and soil disturbance. In the long term, vegetation treatments may improve scenery by creating vistas, promoting healthy vegetation, and improving ecosystem resilience to wildfires and other disturbances. Effects from prescribed wildfire activities may have impacts in the short term with benefits occurring within a few years. Some trail users would avoid treated areas with views of freshly cut stumps, vegetation piles, and blackened and burned vegetation. While some short-term impacts may occur, scenic integrity objectives would still be met, particularly in the long term. More detailed effects can be found in the Scenery section.

Alternative C includes objectives to treat the least number of acres through mechanical practices (between 6,500 and 12,500 acres); it could have the least potential to temporarily conflict with trail values. Under alternatives B, D, and E, objectives would mechanically treat between 11,000 and 19,500 acres. While there are differences in short-term impacts on designated trails from mechanical and prescribed wildfire treatments, both methods would improve long-term recreation access and scenic integrity that contribute to trail values; however, acres treated with prescribed wildfire would recover quicker than those treated with mechanical treatments.

All action alternatives have the potential for construction of transmission lines, solar development, and windmills. The expansion of infrastructure due to population growth could mean more power distribution lines. This could lead to more crowded and dispersed camping along forest roadsides; however, alternatives B, C, D, and E include plan components that emphasize natural-appearing scenery and manage for natural-appearing scenery in foreground views, including high SIOs, and moderate SIOs in middleground and background views of national recreation. Very high SIOs occur when the trail passes through designated or recommended wilderness. These alternatives provide plan components that emphasize natural-appearing scenery and provide opportunities to protect and enhance trail qualities with beneficial effects of connecting people with nature and enhancing natural settings. When compared with alternative A, the potential for a greater amount of beneficial effects occurs in the action alternatives due to the comprehensive plan direction.

Effects from National, Scenic, Historic and Recreation Trail Management

Under all action alternatives, the number and miles of managed nationally designated trails would be the same as those described under alternative A. The revised plan would contain components in the form of desired conditions, objectives, standards, and guidelines to address or align with the framework for sustainable recreation. All alternatives would use a SMS to define scenic integrity objectives across the Lincoln NF.

Cumulative Environmental Consequences for National Scenic, Historic, and Recreation Trails

The cumulative effects analysis time frame is the next 10 to 15 years, and the analysis area is the Lincoln NF boundary. While no impacts from activities outside the Lincoln NF are expected for Dog Canyon Trail and Rim Trail, other cumulative effects can occur.

The longer-distance designated Guadalupe Ridge Trail passes in and out of National Forest System lands, and settings and landscapes may change rather abruptly from undeveloped, natural settings to developed, rural or urban settings. Unlike national scenic and historic trails, comprehensive management plans are not required for national recreation trails (Public Law 90-543, as amended through Public Law 111-11, 2009), and the Forest Service has not developed a current trail management plan yet. Future management decisions that promote interagency coordination would contribute to the consistency and movement of designated trail values toward desired conditions.

Wildfires along or near designated trails would directly alter visual qualities, would change the recreational setting, and could limit users' ability to interpret scenic resources along the trail. The extent to which wildfire and restoration would diminish scenic values or decrease users' ability to access and interpret trail resources would be based on the location and severity of any fires.

National Scenic Byways

The National Scenic Byways Program is administered by the U.S. Department of Transportation, Federal Highway Administration. The program was established to help recognize, preserve, and enhance selected roads throughout the nation. The U.S. Secretary of Transportation recognizes roads designated as a national scenic byway through this program based on one or more intrinsic qualities: archaeological, cultural, historic, natural, recreational, or scenic (US DOT 2018). National scenic byways provide tourism benefits for the region and communities that they traverse. The Chief of the Forest Service can designate routes traversing National Forest System lands as national forest scenic byways, which serve as gateways to attractions such as hiking trails, overlooks, historic sites, and wilderness areas.

Affected Environment

There is one national scenic byway, the Billy the Kid National Scenic Byway, and one national forest scenic byway, the Sunspot Highway National Forest Scenic Byway, on the Lincoln NF. Both are administered by the State of New Mexico Department of Transportation (US DOT 2018).

The BLM manages the nearby Guadalupe Backcountry Byway, which partially extends onto the Lincoln NF. Starting north of Carlsbad, the Route 137-based BLM-designated byway runs southwest for about 30 miles through Chihuahuan Desert lands and up into the rugged Guadalupe Mountains of the Lincoln NF. The Lincoln NF portion of the byway is predominantly located in a scenic area characterized by the presence of piñon juniper, rock outcroppings, canyons, and bluffs.

Billy the Kid National Scenic Byway

The Billy the Kid National Scenic Byway, designated in 1998, is an 84-mile-long loop in the heart of Lincoln County. Only 16 miles of this byway fall on Lincoln NF lands along New Mexico State Highway 48 (Forest Service GIS 2020). A corridor management plan for the Billy the Kid National Scenic 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 National Scenic Byway received a grant to revise its management plan. The corridor management plan phase II was completed in 2001; it highlighted 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.

Continued collaboration and management of this small area needs to be done in partnership with the local communities to ensure the essence of this area is maintained. The Little Bear Fire in 2012 and the White Fire in 2011 altered the visual conditions along this route along State Highway 48 and U.S. Highway 82, but conditions are improving.

Sunspot Highway National Forest Scenic Byway

Designated in 1989, the Sunspot Highway (New Mexico State Highway 6563) became one of the first scenic byways. It is a 13.6-mile-long, two-lane highway traversing the front rim of the 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 find the Sunspot Observatory, the Apache Point Observatory, and the Sunspot Visitor Center and Museum. These locations offer tours and exhibits to the public, while a group of scientists explores the skies from its 9,200-foot elevation. Roadside pull-outs provide visitors with unique opportunities to see the Tularosa basin from an elevated perspective in the Sacramento Mountains. There is no management plan for this byway.

The draw of this byway is dominated by visual qualities, both in views of the Tularosa basin and for viewing the aspen tree colors in the autumn. These aspen stands, which have grown in old fire scars, are beginning to transition to a mixed conifer ecosystem. A declining number of aspens is steadily changing the scenic quality of this byway.

Environmental Consequences for National Scenic Byways

Methodology and Analysis Process

The Forest Service evaluated the effects of the various alternatives by comparing the plan direction of each alternative to the designation objectives of these routes. The primary management tool and metric

associated with scenic byways is the SMS to manage, maintain, and improve the viewshed associated with the byway (also see the Scenery section). Specific management outlined for this designated area provides the greatest impact on this resource; therefore, the section is organized to reflect that, along with applicable issue topics identified during scoping.

Assumptions

- Scenic byways are designated to showcase the intrinsic qualities—archaeological, cultural, historic, natural, recreational, or scenic—of the area while adding to its economic well-being.
- Management under all alternatives would be consistent with the designation and scenic byway corridor management plan or interpretive master plan.
- The 1986 Forest Plan does not have specific management direction on how to manage scenic byways; it is assumed that the foreground of scenic byways would be managed for the retention visual quality objective.
- To describe and compare consequences, this analysis uses SMS terminology (scenic integrity objectives) for all alternatives. For alternative A, the visual quality objectives identified in the 1986 Forest Plan and other plan direction would be used to manage scenery.
- The retention visual quality objective is equivalent to the high scenic integrity objective.
- Miles of designated scenic byways would not vary by alternative.

Indicators

- Intrinsic qualities of scenic byways as described in the designation and plan direction
- Scenic integrity objective allocations within each scenic byway corridor
- A qualitative discussion of the potential effects on scenic resources from vegetation management activities

Environmental Consequences for National Scenic Byways Common to All Alternatives

Effects from Natural Resource Management

Under all alternatives, there is the potential for impacts on the scenic integrity, as viewed from scenic byways, as a result of proposed vegetation management objectives, particularly from mechanical treatments. In the short term, restoration activities completed with mechanical treatments may reduce access and alter scenic resources visible from the scenic byways by changing forest stands from closed forests to more open forests and from residual stumps and soil disturbance. In the long term, vegetation treatments may improve scenery by creating vistas, promoting healthy vegetation, and improving ecosystem resilience to uncharacteristic disturbances. Prescribed wildfire activities typically have effects in the short term with benefits occurring within a few years. While some short-term impacts may occur, scenic integrity objectives would still be met, particularly in the long term. More detailed effects can be found in the Scenery section.

Effects from National Scenic Byway Management

No new scenic byways are proposed for any alternative. The byways are managed by the state of New Mexico (Billy the Kid and the Sunspot byways) and BLM (Guadalupe Backcountry Byway). Impacts from management activities would be adjacent to the byways that influence the character for which they were designated. Corridor management plans would guide management of scenic byways under all alternatives. The Forest Service would continue to manage land adjacent to scenic byways to protect the

values for which they were designated and to provide opportunities to drive for pleasure and view natural features and scenery. Scenic byways would continue to provide tourism and economic benefits for the region and communities that they traverse.

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

Environmental Consequences for National Scenic Byways Under Alternative A

Effects from Natural Resource Management

The 1986 Forest Plan does not include any objectives that direct specific amounts of vegetation treatment, either mechanically or with prescribed wildfire. Vegetation management, both mechanically or with prescribed wildfire, would continue within the views of scenic byways with both short-term effects and long-term benefits, as discussed above under Environmental Consequences for National Scenic Byways Common to All Alternatives.

Effects from National Scenic Byway Management

Alternative A does not include specific plan components for scenic byways. The Forest Service would manage the scenic quality in accordance with the high SIO using the analysis assumption that the foreground from high-use roads would be managed for the high SIO. Current visual resource maps or management area direction may not accurately show these areas as high SIO if the scenic byway designation occurred after the release of the 1986 Forest Plan.

Environmental Consequences for National Scenic Byways Common to Alternatives B, C, D, and E

Effects from Access and Recreation

Alternative E emphasizes easier access and increased multiple-use opportunities on the Lincoln NF. This alternative differs from the other alternatives in that it has fewer restrictions on uses and activities that may temporarily or permanently alter the scenic conditions that contribute to the byways' intrinsic qualities. Increased human presence under these alternatives could result in diminished scenic objectives along scenic byways, when compared with alternative A, by allowing increased evidence of human alteration, such as vegetation trampling and removal.

Effects from Natural Resource Management

Alternatives B, C, D, and E all contain objectives for mechanical thinning and prescribed wildfire treatments. Vegetation treatment objectives include 200,000 acres of prescribed burning and 6,500 to 19,500 acres of mechanical thinning; they have the potential to affect scenic objectives. Vegetation management, both mechanically or with prescribed wildfire, would continue within the views of scenic byways with both short-term effects and long-term benefits to meet the high SIO in foreground views. Prescribed wildfire would result in blackened and scorched vegetation, which may be visible in project areas following treatments. While these resource management actions would result in short-term visual impacts on the landscape, they would serve to restore the Lincoln NF to a more natural variable state that improves ecosystem health and function over the long term when compared with alternative A, resulting in beneficial effects on scenic integrity objectives.

All action alternatives include objectives for 200,000 acres of prescribed wildfire treatment; effects are the same across these alternatives. This level of treatment would have more short-term impacts and benefits occurring within a few years. This is because landscapes typically recover quickly, with prescribed wildfire's effects being less noticeable than mechanical treatments' effects.

Alternative C focuses on minimizing human intervention on the Lincoln NF, and its objectives have the least number of acres of mechanical thinning (between 6,500 and 12,500 acres). Due to less vegetation treatments, alternative C would potentially have the least short-term impacts on the scenic integrity and associated byway qualities. The objectives under alternatives B, D, and E have the highest mechanical treatment acres proposed (between 11,000 and 19,500) and would have the most impacts. This is because the effects from mechanical treatments recover more slowly than those from prescribed wildfire treatments.

Effects from National Scenic Byway Management

Under alternatives B, C, D, and E, scenic byways are included as a designated area with specific plan components. The plan components within this designated area would not change between alternatives. Potential impacts on the scenic integrity, as viewed from scenic byways, may differ between action alternatives as a result of proposed vegetation management activities' objectives.

Desired conditions and guidelines in alternatives B, C, D, and E emphasize natural-appearing scenery, managing for the high SIO, and meeting scenery objectives. The action alternatives would provide opportunities to preserve and enhance scenic byway intrinsic qualities by connecting people with nature and enhancing natural settings. When compared with alternative A, the action alternatives' comprehensive approach allows for a greater amount of beneficial effects to occur.

Cumulative Environmental Consequences for National Scenic Byways

The cumulative effects analysis time frame is the next 10 to 15 years. The spatial extent of the cumulative effects analysis for scenic byways is the Lincoln NF boundary. Scenic byways pass in and out of National Forest System lands, and settings may change rather abruptly from undeveloped, natural settings to developed, rural or urban settings. Since most private lands and other ownerships do not have the same regulations for natural resource management, the effects of ongoing developments or activities next to or within National Forest System land boundaries can sometimes be quite noticeable when viewing the continuous landscape. This potentially affects the visitors' satisfaction and the quality of their experience on a scenic byway. Forest visitors often view natural resources as a continuous landscape with little discernment regarding the landownership being viewed. If activities on other ownerships and private lands were designed to lessen impacts on natural resources, including scenery, these activities would cumulatively improve the qualities of the byway on the Lincoln NF.

Wildfires along or near scenic byways would directly alter visual qualities, would change the recreational setting, and could limit users' ability to interpret scenic resources along the byways. The extent to which wildfire would diminish scenic values or decrease users' ability to access and view scenic resources would be based on the location and severity of any fires. Visual conditions were affected along the Billy the Kid National Scenic Byway by both the Little Bear Fire in 2012 along State Highway 48 and the White Fire in 2011 along U.S. Highway 82.

Movement toward desired conditions for scenic byways would provide tourism benefits for the region and communities that the byways traverse and contributes to sustainable social and economic systems. This then impacts byways by increasing use, potentially leading to scenic impacts from overcrowding. Additionally, within the planning period, New Mexico is expected to experience population growth. Growth and demand for a variety of recreation settings and opportunities are expected to increase. A

growing population places increasing demands on recreation that could result in more human concentration and use at existing recreation areas, increased conflicts, increased density in motor vehicle use, and reduced quality of recreation settings. As use of scenic byways increases, compliance with scenic and other desired conditions would be a challenge. Many scenic byways emphasize unmodified natural environments, and increased use can lead to an increased potential for disturbance from visitors stopping and exploring off the byway.

Wild and Scenic Rivers

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

Wild and scenic rivers that are eligible for designation must meet the basic criteria for inclusion in the National Wild and Scenic Rivers System. Eligible rivers must be free flowing and possess at least one value that is outstandingly remarkable on a regional or national level. Outstandingly remarkable value categories include scenic, recreation, geologic, fish and wildlife, historic, cultural, or other similar values that are a unique, rare, or exemplary feature that is significant when compared with similar values from other rivers at a regional or national scale (Forest Service 2015d, Chapter 80). The National Wild and Scenic Rivers System Act defines river classifications on a variety of elements: accessibility, developments along the shoreline, presence or absence of impoundments, and water quality. For management purposes, river segments are classified as wild, scenic, or recreational.

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

Affected Environment

WSRs 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 WSRs, and also through the potential for accessing funding from individuals and groups that have an interest in preserving WSR resources. Currently, there are no designated WSRs on the Lincoln NF. See figure 2-7 for a map of eligible WSRs under current management (alternative A).

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 designations based on a comprehensive statewide inventory of potentially eligible rivers for inclusion in the National 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 National Wild and Scenic Rivers System Act.

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 Wild and Scenic Rivers System (Forest Service 2015d, 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 and 2002 river assessments of eligibility and classification for wild, scenic, and recreational river designation were used to inform the river evaluation for the plan revision; any changed circumstances that may affect the eligibility of river segments will be considered and documented.

The Forest Service, in its initial evaluation of eligible river segments, included all rivers named on U.S. Geological Survey quadrangle maps within the Lincoln NF boundary. As such, the Forest Service meets the requirements and is not required to conduct any further evaluations during this plan revision process. Appendix G includes criteria for outstandingly remarkable values, all analysis documentation, a list of eligible rivers and their classification, and maps.

There are 55 eligible river segments totaling approximately 141 miles on the Lincoln NF. There are 95 miles classified as wild, 3 miles classified as scenic, and 43 miles classified as recreational. Certain protections are applied to eligible rivers until a decision is made as to the future use of the river and adjacent lands through an act of Congress or a change in eligibility or suitability status from a future study (Forest Service 2015d, Chapter 80). Site-specific projects or activities within eligible river corridors may only be authorized when that project or activity protects the free flow, the outstandingly remarkable values for which the river is deemed eligible, and the classification of the river. Neither eligibility nor designation by Congress affects existing water rights or the existing jurisdiction of State and Federal Governments as determined by established laws.

The following river segments were determined to be eligible for inclusion in the National Wild and Scenic Rivers System during the 1993 and updated 2002 preliminary analysis of eligibility and classification (table 3-71).

The final step in the river evaluation process is to determine suitability for inclusion in the National Wild and Scenic Rivers System. A final determination of suitability will not be conducted as part of this planning process.

Table 3-71. River segments on the Lincoln NF determined eligible for inclusion in the National Wild and Scenic Rivers System, by eligibility category and length

Stream Reach Name	Classification	Outstandingly Remarkable Values*	Segment	District	Length (miles)
Big Canyon	Wild	B – scenic D – rock formations, cliffs, steep gradient J – pools	133, 134, 137, 138, 141, 142, 144, 145, 149	Guadalupe	16
Hale Canyon	Wild	B – scenic, stream, rock formation D – spire rock formations	343	Smokey Bear	2

Stream Reach Name	Classification	Outstandingly Remarkable Values*	Segment	District	Length (miles)
Dog Canyon	Recreational	B – cliffs C – state park, geologic interpretation G – Mescalero travel route H – Mescalero stronghold J – unique plants, Sacramento penstemon, Sacramento prickly poppy, and Chaplin’s columbine	18	Sacramento	3
Duran Canyon	Wild	B – scenic, stream, rock formations D – spire rock formations	339	Smokey Bear	2
Fresnal Canyon	Recreational	B – scenic, Tunnel Vista D – box canyon-travertine G – tunnel, Fresno Shelter J – Sacramento prickly poppy	10	Sacramento	2
Last Chance Canyon	Wild	B – scenic, D – rock formations, cliffs, steep gradient	26, 28, 31, 36–39	Guadalupe	17
Monument Canyon	Recreational	D – travertine dams, water F – very southern eagle roost habitat, not associated with water	31	Sacramento	3
North McKittrick	Wild	B – scenic D – rock formations, cliffs, steep gradient, rock formations J – pools	151–155	Guadalupe	9
Pancho Canyon	Scenic	B – scenic, rock formations D – spire rock formations	354	Smokey Bear	3
Rio Peñasco	Recreational	J – purple thistle	82–84 86–90	Sacramento	17
Sacramento River	Recreational	J – combination of travertine deposits, waterfall, and wetlands	29	Sacramento	1
Sitting Bull Falls	Wild	B – scenic C – wading, picnicking, shelters I – waterfalls J – pools	8, 19, 20, 21	Guadalupe	9

Stream Reach Name	Classification	Outstandingly Remarkable Values*	Segment	District	Length (miles)
Ski Apache North Fork Rio Ruidoso	Recreational	B – scenic C – Ski Apache Ski Area	109	Smokey Bear	2
South Fork Bonito Creek	Recreational	B – scenic, stream C – wilderness area, high-use trail	120	Smokey Bear	5
Three Rivers	Recreational	B – scenic, waterfalls in Fall Creek C – wilderness area, trail D – rock formations, cliffs, steep gradient	110	Smokey Bear	10
Turkey Canyon	Wild	B – scenic D – rock formations, cliffs, steep gradient	52	Guadalupe	6
Upper Dark Canyon	Wild	B – scenic D – rock formations, cliffs, steep gradient J – pools	69, 70, 73, 74, 76, 77, 81, 85, 92, 96, 97	Guadalupe	34

Source: Forest Service GIS 2020

*Values:

- | | |
|---|-------------|
| A. Free Flowing (all segments above are free flowing) | E. Wildlife |
| B. Scenic | F. Historic |
| C. Recreational | G. Cultural |
| D. Geologic | H. Riparian |
| I. Ecological/Botanical | |

Environmental Consequences for Wild and Scenic Rivers

Methodology and Analysis Process

The analysis in this section evaluates the river segments determined to be eligible for inclusion into the National Wild and Scenic Rivers System. It also describes the potential environmental consequences on the WSR resource that may result with the adoption of different alternatives in the revised forest plan. Specific management outlined for this designated area provides the greatest impact on this resource; therefore, the section is organized to reflect that.

Assumptions

- Management of WSR resources complies with the 1968 Wild and Scenic Rivers Act (WSR Act).
- All eligible river segments and associated corridors are managed in compliance with Forest Service Handbook 1909.12, section 84.3 – Interim Protection Measures for Eligible or Suitable Rivers. These guidelines are specific to water resources projects, hydroelectric power, minerals, transportation systems, utility proposals, recreation development, motorized travel, wildlife and fish projects, vegetation management, and domestic livestock grazing.
- A suitability study provides the basis for determining which eligible rivers should be recommended to Congress as additions to the Nation System. If a proposed project has the potential to adversely affect the free flow or outstandingly remarkable values of an eligible river, the suitability of that river should first be studied before approving the project.

- No suitability studies are being conducted as part of this plan revision.
- A 2002 amendment to the 1986 Forest Plan identified 55 river segments as eligible and managed as such

Indicator

- Miles of rivers determined to be eligible for inclusion in the National Wild and Scenic Rivers System

Environmental Consequences for Wild and Scenic Rivers Common to All Alternatives

Under all alternatives, the identified eligible WSRs and their corridors (one-quarter mile on either side of the river) would be managed in accordance with Forest Service Handbook 1909.12, section 82.5. The determination of eligibility constrains the type and manner of activities that may occur within the river corridor without first conducting a suitability analysis. Three constraints would apply to activities proposed under any alternative in all eligible river corridors: (1) free-flowing river character must be maintained; (2) identified outstandingly remarkable values must be protected; and (3) the river classification must be maintained (wild, scenic, or recreational).

Effects vary by river classification; eligible wild river corridors are most restrictive, and eligible recreational river corridors are the least restrictive. For example, the cutting of trees is not allowed in corridors classified as wild unless it is necessary for human safety or to protect a cultural value at risk; however, tree cutting is acceptable within recreational corridors to meet resource objectives. Additionally, fire (either natural or planned) is acceptable in all eligible WSR areas to provide for better wildlife habitat or to restore conditions within the natural range of variability. Some activities or infrastructure may be limited (e.g., roads, vegetation management, and minerals) or restricted (e.g., hydroelectric power and utility corridors) within WSR areas to maintain, protect, or enhance river characteristics and outstandingly remarkable values. The specific limitations or restrictions would depend on the specific activity, the river's outstandingly remarkable values and classification, and the results of a suitability determination, if required.

Environmental Consequences for Wild and Scenic Rivers Under Alternative A

Alternative A would carry forward 55 eligible segments (17 rivers) identified in the 2002 amendment to the 1986 Forest Plan (see figure 2-7). Alternative A includes approximately 141 miles of eligible rivers, with an estimated 45,100 acres of river corridors (using a 0.5 mile buffer) (Forest Service GIS 2020).

Alternative A would continue to manage the eligible river segments using the 1968 WSR Act and the FSH 1909.12, Section 82.5. The 1986 Forest Plan does not include plan components for managing these river segments.

Environmental Consequences for Wild and Scenic Rivers Common to Alternatives B, C, D, and E

Alternatives B, C, D, and E carry forward 54 eligible segments (16 rivers) identified in the 2002 amendment to the 1986 Forest Plan (see figure 2-9). All action alternatives include approximately 139 miles of eligible rivers, with an estimated 44,500 acres of river corridor (using a 0.5 mile buffer) (Forest Service GIS 2020). These action alternatives do not carry forward Segment 109 (Ski Apache North Fork Rio Ruidoso). It was removed due to changing conditions since the original WSR Eligibility Report in 2002. It was determined that segment 109 and its associated stream channels do not meet the definition of free flowing. The associated stream channels are not "natural," because the ski runs have been reworked many times since the 1960s (McConnell 2009).

Under alternatives B, C, D, and E, the proposed plan includes components that provide management guidance for the eligible river segments. These plan components include restrictions on vegetation treatments and new road and trail construction. These provide additional protection for these river segments, compared with management under alternative A, which relies on the WSR Act and FSH 1909.12, Section 82.5.

Cumulative Environmental Consequences for Wild and Scenic Rivers

The intent of the WSR Act is to counteract “the established national policy of dam and other construction” and to “preserve other selected rivers or sections thereof in their free-flowing condition and to protect the water quality of such rivers and to fulfill other vital national conservation purposes” (WSR Act 1968, section 1(b)). The Santa Fe National Forest, the Cibola National Forest and the Carson National Forest to the north have both identified eligible WSRs as part of their recent plan revisions. Together, these protections of free-flowing rivers in their natural state serve to complement river development that has occurred in many other parts of this landscape and thereby fulfills the intent of the WSR Act.

Additional eligible rivers may be identified in existing or future planning efforts or through separate river studies on adjacent national forests. They also may be identified on lands managed by other agencies—the BLM, National Park Service, U.S. Fish and Wildlife Service, and State of New Mexico—that manage the National Wild and Scenic Rivers System. No negative cumulative effects are expected to occur on designated or eligible WSRs as a result of any of the alternatives.

Any project-level planning in eligible river corridors would need to be consistent with the preliminary classifications. It also would need to protect the free-flowing character and outstandingly remarkable values that provide the basis for their inclusion in the National Wild and Scenic Rivers System. This would be accomplished by following forest plan direction until such time as a negative suitability determination is made or Congress makes a final determination on their designation.

Research Natural Areas

This section describes the current condition and evaluates and discloses the potential environmental consequences for research natural areas (RNAs) that may result with the adoption of a revised forest plan.

Affected Environment

Research natural areas are designated for research and education and to maintain biological diversity on National Forest System lands. These areas maintain natural conditions by allowing natural physical and biological processes without human intervention. To maintain the unique feature an RNA was created to protect, deliberate manipulation may be used. According to the Forest Service, RNAs may only be used for “Research and Development, study, observation, monitoring, and those educational activities that do not modify the conditions for which the Research Natural Area was established” (Forest Service 2003).

RNAs are selected to preserve a spectrum of relatively pristine areas that represent a wide range of natural variability within important natural ecosystems and environments, and areas that have unique characteristics of scientific importance. The purposes of RNAs are (1) to preserve examples of all significant natural ecosystems for comparison with those influenced by man, (2) to provide educational and research areas for ecological and environmental studies, and (3) to preserve gene pools of typical and endangered plants and animals.

Currently, there are no designated RNAs on the Lincoln NF (Forest Service 2020g). The 1986 Forest Plan had three proposed RNAs on the Lincoln NF: Upper McKittrick, William G. Telfer, and Haynes Canyon. During the plan revision process, an evaluation was conducted to determine the need for additional RNAs

(see table 3-72). The primary criterion for determining need was the lack of ecological representation in the RNA system regionwide. In addition to the RNAs recommended in the 1986 Forest Plan, no other areas were evaluated.

Table 3-72. Results of the Lincoln NF RNA evaluation showing ecological types needed in the regionwide RNA system and whether specific areas should be recommended or withdrawn

Name	Status	Size (approx. acres)	MMMS ^a	MCFF ^b	SFF ^c	MSG ^d	Recommend or Withdraw ^e
Upper McKittrick	Recommended in the 1986 Forest Plan	800	X	X			Recommend, this area contains unique mountain mahogany shrubland for research
Haynes Canyon	Recommended in the 1986 Forest Plan	600		X			Withdraw, due to changing conditions in this area
William G. Telfer	Recommended in the 1986 Forest Plan	600			X	X	Withdraw, due to changing conditions in this area

Source: Forest Service 2019b

^a Mountain mahogany mixed shrubland

^b Mixed conifer-frequent fire

^c Spruce-fir forest

^d Montane/subalpine grassland

^e Rationale for decisions included in appendix C

Upper McKittrick Proposed RNA

The Upper McKittrick RNA would comprise 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 RNA 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. Upper McKittrick, however, is far enough from water that it does not receive livestock use. The high floral abundance and diversity, together with the geographic position and considerable variability in topographic relief and aspect, provide a rich array of factors for study.

The proposed Upper McKittrick RNA falls within the Guadalupe Escarpment WSA. It was proposed to preserve a unique mountain mahogany shrubland for research. At its initial proposal date, the condition of this area was within the historical range of variation for the ecosystems in the RNA (Forest Service 2014f). Current conditions have changed little since the proposal with no history of wildfire or insect and disease disturbance. This proposed RNA was reevaluated during the plan revision, and the Forest Service determined it should be carried forward in the planning process and formally designated as an RNA.

William G. Telfer (Buck Mountain) Proposed RNA

The RNA was proposed to represent the spruce-fir forest type through all stages of succession, including unique stands of over 300-year-old corkbark fir. The original conditions were within the historical range of variation, with predominately mature and old-growth forest. It consisted primarily of mid- to late successional forest when proposed. In 2012, the entire proposed RNA was burned to varying degrees of severity in the Little Bear Fire. Fifty-two percent was burned severely, and 31 percent was burned moderately. The entire boreal forest environment, including most of the old-growth stands of corkbark fir,

has been altered by high-severity fire. This stand-replacing fire has altered the entire proposed RNA to a condition where natural, unmodified, late successional forest is no longer available.

The proposed RNA may not meet the needs for which it was created as a study site for old-growth spruce-fir forest. This proposed RNA will not be further evaluated during the plan revision. Due to the changing conditions in this area, the Forest Service has determined it should not be carried forward in the planning process to be designated as an RNA.

Haynes Canyon Proposed RNA

The RNA was proposed to represent mixed conifer forest as an outstanding example of late seral mixed conifer with aspen; however, vegetation mapping indicates that it is predominantly mixed conifer/frequent fire ERU. The condition of the RNA when proposed was within the historical range of variation for the ERUs represented in the RNA (Forest Service 2014g).

This proposed RNA will not be further evaluated during the plan revision because there is limited old growth on the site and the aspen stands have been succeeded by conifers (see appendix C for more details). The Forest Service has determined it should not be carried forward in the planning process to be designated as an RNA.

Environmental Consequences for Research Natural Areas

Methodology and Analysis Process

The analysis in this section evaluates the potential environmental consequences on the RNA resource that may result with the adoption of different alternatives in the revised forest plan. Also, impacts from proposed RNAs on other resources and overall Lincoln NF lands were qualitatively analyzed. Specific management outlined for this designated area provides the greatest impact on this resource; therefore, the section is organized to reflect that.

Assumptions

- Under all alternatives (because they must conform to Forest Service Manual 4063 direction), recommended RNAs are protected and maintained in a natural condition for the purpose of conducting non-manipulative research and for fostering education. RNAs are managed for nonmotorized access. Recreation use may be restricted or prohibited if use threatens or interferes with the objectives of the RNA. Logging and wood gathering activities are not permitted. Vegetation treatment may only occur where needed to establish or maintain vegetation communities.
- In all alternatives, completion of RNA designations and establishment reports will depend on agency capacity (e.g., staffing and budget). Implementation of establishment reports and management plans will provide additional emphasis toward meeting the desired conditions of the RNAs. Until designation, recommended RNAs will be managed to protect and maintain a natural condition.
- Following approval of the plan, further evaluation and a NEPA environmental assessment will be completed for each recommended RNA. If approved by the regional forester, with concurrence of the station director, the plan will then be amended to recognize these areas as designated RNAs.

Indicator

- Number and acres of proposed RNAs by alternative
- Alteration of natural conditions and biological diversity

Environmental Consequences for Research Natural Areas Common to All Alternatives

Under all alternatives, proposed RNAs would be managed under the more restrictive guidance outlined in objectives and guidelines within the forest plan and would not be affected directly by mechanical treatments occurring in nearby areas; but, they could experience indirect impacts. Vegetation treatments and timber harvesting would not be permitted in these areas. They generally do not need restoration treatments, although that would be allowable if needed to maintain the characteristics for which the areas were designated.

Specific restrictions would be applied to all designated RNAs and would restrict overnight camping and campfires in these areas. Special-use permits, such as for commercial tours, would also be restricted except in support of research in the remaining established research natural areas. This would result in a greater protection of the unique species ecological resources of the area. It would also decrease recreational opportunities in these areas. For any recommended RNA in wilderness (Upper McKittrick), recreation use would continue to occur; but, it would be in a more managed setting consistent with a transition or a semiprimitive wilderness opportunity spectrum, where signs and evidence of management would be present but subordinate to the wilderness characteristics.

RNAs can be used to monitor climate change impacts due to the predominance of natural processes and representation of diverse ecosystems (Massie et al. 2016). Additionally, they can be used to monitor succession and other long-term ecological change (Massie et al. 2019). Research opportunities from RNAs would inform scientific knowledge of and management direction on the Lincoln NF.

Under all alternatives, there would be minimal impacts due to restrictive RNA plan components. Additionally, any designated RNA would contribute to maintaining the Lincoln NF biological diversity and ecological values, and would maintain properly functioning ecosystems that reflect natural processes.

Environmental Consequences for Research Natural Areas Under Alternative A

Alternative A carries forward the proposal for Upper McKittrick RNA that was first brought forward in the 1986 Forest Plan. Alternative A also carries forward the proposals for Haynes Canyon and William G. Telfer RNAs, even though the updated evaluation found them ineligible for designation (see table 3-72). The proposed Upper McKittrick RNA is managed under Management Area 3A, which provides plan direction to preserve the wilderness characteristics of the area (1986 Forest Plan, page 111). The proposed Haynes Canyon RNA is managed under Management Area 2F, which emphasizes developed and dispersed recreation, wildlife habitat management, and timber management (1986 Forest Plan, page 99). The proposed William G. Telfer RNA is managed under Management Areas 1H and 1I, which respectively provide for developed recreation and soil productivity (1986 Forest Plan, pages 74 and 81).

The recommendation of these sites for formal designation as an RNA under alternative A was never formalized. This alternative would continue current management of these areas until they are designated or withdrawn. While alternative A contains the most acres of proposed RNAs (2,000 acres), due to changing conditions in the Haynes Canyon and William G. Telfer sites, alternative A would not contribute more to any additional ecological representation than alternatives B, C, D, and E due to two of the sites no longer containing the ecological components for which they were initially proposed. While alternative A provides opportunities for research alongside alternatives B, C, D, and E, by including proposals for two RNAs that don't qualify for that status, it may also detract from these opportunities.

Environmental Consequences for Research Natural Areas Common to Alternatives B, C, D, and E

All action alternatives would recommend one proposed RNA (Upper McKittrick) totaling approximately 800 acres. In addition, these alternatives would not propose RNA recommendations for Haynes Canyon and William G. Telfer, based on the rationale included in appendix C. Alternatives B, C, D, and E would provide for similar RNA restrictions to alternative A.

Under all action alternatives, there would be minimal impacts on the proposed Upper McKittrick RNA due to restrictive RNA plan components. Additionally, any designated RNA would contribute to maintaining the Lincoln NF biological diversity and ecological values, and would maintain properly functioning ecosystems that reflect natural processes. These components would provide for research opportunities that can expand the scientific understanding and basis for land management decisions.

Alternatives B, C, D, and E would not propose the Haynes Canyon and William G. Telfer areas for RNA designation (see appendix C for details). Since these areas would no longer be eligible for RNA designation and would not be proposed, the RNA restrictions would not apply; therefore, these areas could face impacts from timber harvesting, road and trail construction, and increased recreational use. Compared with alternative A, these two areas would face additional impacts from activities that would no longer be restricted due to not being designated.

Cumulative Environmental Consequences for Research Natural Areas

The cumulative impacts analysis area is the Lincoln NF, New Mexico National Forest System lands, and the regional network of RNAs. The Coconino National Forest, Santa Fe National Forest, and Gila National Forest all have included proposed RNAs in their revised plans. Because the RNAs are located within the interior of the forests, activities occurring outside National Forest System lands should have no or extremely limited impacts.

Establishment of RNAs on the forests should contribute to the vegetation communities within the existing RNA system and provide a potential scientific basis for climate change research. The forests' RNAs would also be complementary to existing RNAs on the Gila, Coconino, Coronado, and Tonto National Forests, as well as those within the areas managed by the Bureau of Land Management.

Socioeconomics

Affected Environment

The following section summarizes the current conditions and trends related to the social and economic environment of the plan area, including social and demographic characteristics, local economic conditions, and social benefits. Elements of all these factors have been used as indicators of livelihood, well-being, and resilience, which are factors important to understanding the socioeconomic impacts of the Lincoln NF and any management actions taken on Lincoln NF land. Information provided in the following section was primarily drawn from the Lincoln National Forest Assessment (Forest Service 2019b) and supplemented with updated data as appropriate.

To accurately portray the relationship between current Forest Service land management and the community, the area of influence must be defined. The area of influence 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” (Forest Service Handbook 1909.12, section 13.21). The area is comprised of the four counties overlapping the Lincoln NF: Chaves, Eddy, Lincoln, and Otero Counties. This geographic 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 four counties (Forest Service 2019b).

Data for the state of New Mexico are provided as a comparison population for the area of influence. In addition, information is included for select communities in the area of influence. This finer level of geographic information is provided to highlight differences and trends that may not be visible at the county level.

Demographics

From 1980 to 2000, the greatest amount of population growth in the area of influence occurred in more sparsely populated areas of Lincoln and Otero Counties, where the largest swaths of National Forest System land are 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 over the same period (UNM BBER 2014). More recent population change in the area of influence also varied by county (see table 3-73, below). All area counties had population increases below that of the state of New Mexico comparison population for the period between 2000 and 2018. For 2010 to 2018, only Eddy and Otero Counties had a population increase higher than the state average.

Table 3-73. Populations Trends

	2000	2010	2018	Percent change 2010–2018	Percent change 2000–2018
State					
New Mexico	1,819,046	2,059,179	2,095,428	1.8%	15.2%
County					
Chaves County	61,382	65,645	64,689	-1.5%	5.4%
Eddy County	51,658	53,829	57,900	7.6%	12.1%
Lincoln County	19,411	20,479	19,556	-4.5%	0.8%
Otero County	62,298	63,797	66,781	4.7%	7.2%

Sources: U.S. Census Bureau 2000, 2010, 2018

Recent expansion of Otero and Lincoln Counties is at least partially explained by the relocation of retirees or partial retirees attracted by the mountains and recreational amenities (Forest Service 2019b).

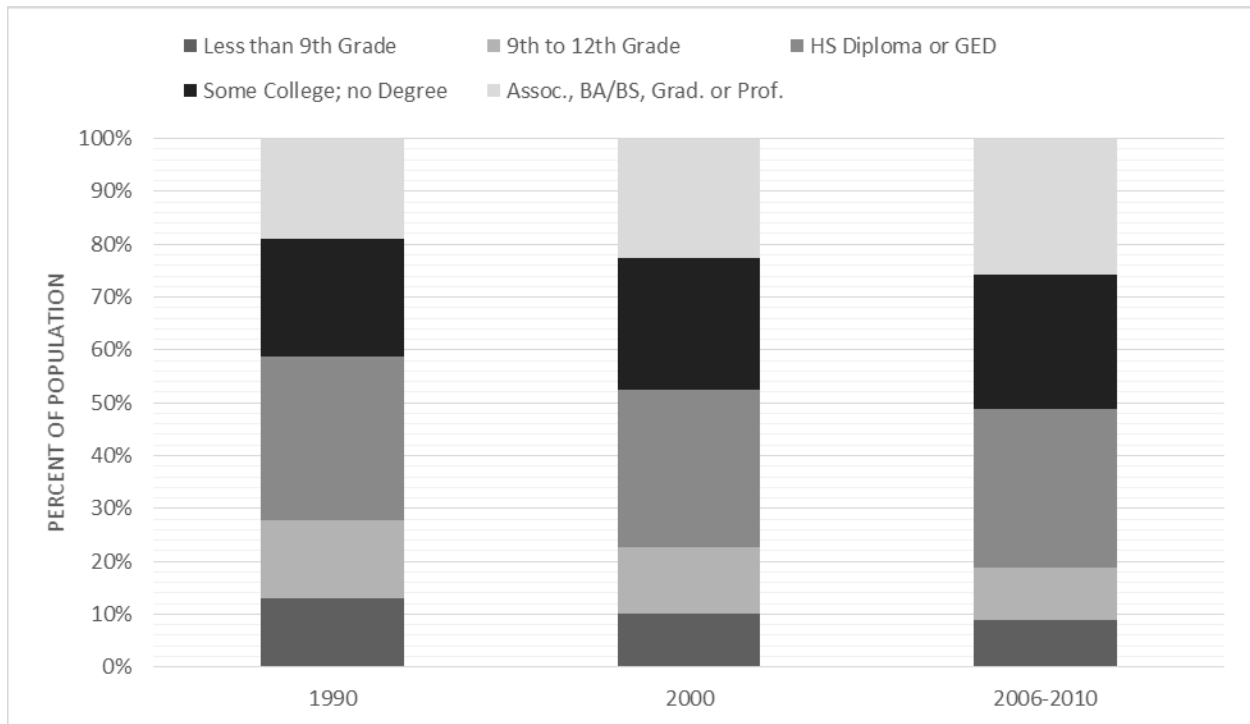
Population projections for the area of influence predict a minimal change (0.2 percent increase overall) between 2020 and 2040. Population increase is anticipated to be highest in Chaves County (6.6 percent) with a decrease anticipated in Lincoln (14.6 percent) and Otero Counties (2.2 percent; UNM BBER 2017).

Factors driving population change in the area of influence vary by county. Net movements in and out of Chaves and Eddy Counties have been minimal. Conversely, Lincoln and Otero Counties both experienced significant amounts of net in-migration between 1990 and 2000 (approximately 6,700 and 5,000 individuals, respectively). Population increases in Lincoln and Otero Counties at that time were likely the result of increased interest in building and purchasing seasonal and recreational homes, which would have resulted in subsequent increases in supporting employment sectors, such as construction; finance, insurance, and real estate; transportation; and utilities; however, during the Great Recession (late 2007–2009), when a housing market correction and subprime mortgage crisis caused a period of severe economic decline nationwide, net in-migration fell dramatically in both Lincoln and Otero Counties. 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 (Forest Service 2019b).

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

The population within the Lincoln NF area of influence is slightly less educated than New Mexico’s overall population, with a trend toward an increasing portion of the population with at least some higher education (figure 3-17, below). Educational attainment (the highest level of formal education a person has received) is linked to a host of social and economic outcomes, including median earnings. The average earnings of a bachelor’s degree holder are almost twice that of an adult with a high school diploma; annual wages of those with some college are approximately 20 percent greater than those with only a high school diploma (UNM BBER 2014). Other factors affected by educational attainment include homeownership and health. These all affect quality of life over time. Higher education levels are also associated with increased participation in birding, nonmotorized winter activities, backcountry activities, and wildlife viewing. In contrast, participation in fishing, hunting, motorized off-road use, and motorized winter activities decreases in associated with higher education attainment levels (UNM BBER 2014).

Figure 3-17. Educational Attainment of Individuals Age 25 or Older within the Lincoln National Forest Area of Influence



Source: UNM BBER 2014.

Age and educational attainment can influence the values and priorities influencing public interest in forest management, and how and where forest use occurs. Older populations are more likely to be retired and may have more time to spend on forest recreation; they may also enjoy different types of recreation (for example, scenic drives or low-level hiking rather than mountain biking or rock climbing). More urban and more educated populations may also have different connections to the Lincoln NF than traditional, rural populations, and different demands for recreation, all of which could change the overall nature of how communities interact with the Lincoln NF and forest management.

For discussion of ethnicity and race in the area of influence, refer to Environmental Justice.

Housing

Occupied housing units represent from 44 to 89 percent of all housing units for the area of influence counties. The vast majority of vacant homes are seasonal and recreational homes. This is particularly true for Lincoln and Otero Counties, with over 41 percent of all housing units in Lincoln County representing seasonal homes, as compared with 5.8 percent at the state level (see table 3-74, below).

Table 3-74. Housing Summary

	Chaves County	Eddy County	Otero County	Lincoln County	New Mexico
Total housing units, 2017	27,085	24,011	31,561	17,976	927,790
Occupied	23,343	21,273	23,657	7,902	770,435
	86.2%	88.6%	75.0%	44.0%	83.0%
Vacant	3,742	2,738	7,904	10,074	157,355
	13.8%	11.4%	25.0%	56.0%	17.0%
For rent	1,059	285	840	641	24,509
	3.9%	1.2%	2.7%	3.6%	2.6%
Rented, not occupied	144	217	299	112	4,396
	0.5%	0.9%	0.9%	0.6%	0.5%
For sale only	373	215	752	713	13,215
	1.4%	0.9%	2.4%	4.0%	1.4%
Sold, not occupied	182	65	176	172	4,359
	0.7%	0.3%	0.6%	1.0%	0.5%
Seasonal, recreational, occasional	223	342	3,688	7,534	54,194
	0.8%	1.4%	11.7%	41.9%	5.8%
For migrant workers	23	193	31	10	586
	0.1%	0.8%	0.1%	0.1%	0.1%
Other vacant	1,738	1,421	2,118	892	56,096
	6.4%	5.9%	6.7%	5.0%	6.0%

Source: Headwaters Economics 2020b

The four-county Lincoln NF area of influence contains roughly one-sixth of New Mexico's wildland-urban interface, which is approximately 101 square miles; nearly all of it is contained within Lincoln and Otero Counties. Approximately 44 percent of the wildland-urban interface currently is developed with homes (Headwaters Economics 2020a). 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; all findings point to the expanding pattern of residential development adjacent to public lands as a significant contributing factor (Headwaters Economic 2020a).

Economics

Since 2000, unemployment in the area of influence has followed the same general trends as the state of New Mexico's trend, with unemployment peaking during the Great Recession and high through 2010 (table 3-75 and table 3-76). Since 2005, the area of influence has had a lower unemployment rate than New Mexico. At the individual county level, the number of employment opportunities are similar among Eddy, Chaves, and Otero Counties. In recent years, Eddy County has had the lowest unemployment rate. At the other end of the spectrum is Chaves County, which typically has had higher unemployment than other area counties.

Sectors of the economy are organized according to three main categories: non-services related, services related, and government. In the area of influence, service-related industries represent an increasing percentage of area jobs. Government also continues to represent an important economic sector. On average, the government provides approximately 19 percent of total employment in the area of influence; however, government jobs comprise nearly 40 percent of all employment in Otero County based on 2011 data (UNM BBER 2014). This is due to a large military presence in Otero County, specifically Holloman Air Force Base, and the White Sands Missile Range (UNM BBER 2014).

Spending by recreational visitors represents another important source of employment and income in the area of influence. Communities that are able to capture spending from recreational visitors have businesses that offer services and goods desired by those engaged in outdoor recreation (White et al. 2016). On average, the majority of recreational trip spending comes from expenditures for lodging; food and drinks in restaurant, bars, and grocery stores; and fuel (White et al. 2016). A variety of factors, including the size of the travel party, time spent in the local area, type of recreational trip, personal preferences and income, and shopping opportunities, influence how much money people spend in local communities and their types of purchases; the specific recreational activity has a secondary, and limited, influence (White et al. 2016).

Visitors traveling to recreate outside the local area of their home (nonlocal visitors) spend up to twice as much as visitors recreating near their homes (local visitors) (White et al. 2016). Furthermore, visitors who take trips where they stay overnight away from home (whether local or nonlocal) spend more money than visitors on day trips (White et al. 2016). National visitor use monitoring data collected in 2014 on the Lincoln NF revealed an estimated 767,000 visits were made to the Lincoln NF, mostly for recreational purposes. See the recreation section for additional details on recreation in the plan area. Of those visits, less than 35 percent of visits were from individuals that live within 50 miles (local visitors), while approximately 40 percent of the individuals reported living more than 200 miles away (nonlocal visitors). The average total trip spending per party was \$438 (Forest Service 2014d). Nonlocal visitors also include international visitors, primarily those from Mexico who are drawn to the Lincoln NF, as it includes the closest ski area and mountain recreation area for border communities.

Industry sectors that provide goods and services to visitors generally include retail trade; passenger transportation; arts, entertainment, and recreation; and accommodation and food. Travel and tourism-related employment represents approximately 20 percent of the total employment in the Lincoln NF area of influence. Based on 2019 U.S. Census Bureau data, Lincoln County had the largest percentage of travel and tourism-related employment with 38.5 percent, while Eddy County had the smallest with 14.5 percent (Headwaters Economics 2020c). The larger percentage of travel and tourism-related employment in Lincoln County is likely related to the many recreation opportunities that can be found in the Smokey Bear Ranger District, which includes the White Mountain and Capitan Mountains Wilderness Areas; the southernmost major ski area in the U.S., Ski Apache, which offers snow-based activities in the winter and zip-lining in the summer; and a number of walking and mountain biking trails. Industries that contain jobs in travel and tourism often pay relatively low wages, though this varies by industry subsector, and many of these jobs are only part-time or seasonal.

Table 3-75. Unemployment Trends

		Chaves County	Eddy County	Lincoln County	Otero County	New Mexico
2000	Labor force	25,619	23,109	9,584	24,214	845,755
	Unemployment rate	5.6%	5.6%	4.2%	5.3%	4.9%
2005	Labor force	26,115	24,586	10,809	26,815	918,156
	Unemployment rate	5.8%	4.6%	4.4%	4.9%	5.1%
2010	Labor force	28,042	25,658	9,386	24,984	936,088
	Unemployment rate	7.5%	6.4%	7.5%	7.3%	8.1%
2015	Labor force	27,780	29,887	8,713	25,062	934,982
	Unemployment rate	6.3%	4.9%	5.7%	6.2%	6.5%
2018	Labor force	27,137	31,376	8,702	24,601	944,997
	Unemployment rate	4.9%	3.3%	4.6%	4.9%	4.9%

Source: U.S. Bureau of Labor Statistics 2020

Table 3-76. Employment Trends by Economic Sector – Area of Influence

Employment Sector	Employment (Full- and Part-Time)			
	2001	2005	2010	2015
Total Employment	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
Agriculture (forestry, fishing, and 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 (including 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 enterprises	~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

Source: UNM BBER 2014

Note: ~ represents estimates

In the context of forest management, economic benefits from forest management activities are variable and depend on economic drivers beyond the national forest (Erbaugh and Oldekop 2018). The forest can contribute to economic sustainability to the surrounding communities, through provisioning jobs and labor income directly or indirectly via forest-related programs, such as mining, agriculture (grazing and timber), and recreation. Payments to counties (secure rural schools and payments in lieu of taxes) also

help support community economic sustainability. Resource-dependent communities and individuals, particularly those that may live near or below the poverty line, also may depend on forest products such as fuelwood, game animals, and edible and medicinal plants to supplement incomes, which may affect community livelihoods. Improved livelihoods suggest a community may be more resilient to changes in forest management; a lack of access to basic needs may indicate a greater reliance on forest products (for example, fuelwood for survival heating in the winter or hunting for food) and, thus, a greater potential to be affected by changes in forest management.

Average earnings per job and per capita income vary throughout the area of influence, but they are generally below state of New Mexico averages based on 2018 data (see table 3-77). Earnings per job and per capita income are highest in Eddy County, potentially influenced by the presence of mining sector jobs in that county (Forest Service 2019b). Trends in median household income and poverty are discussed in the Environmental Justice section.

Table 3-77. Average Earnings and Per Capita Income

	Chaves County	Eddy County	Otero County	Lincoln County	New Mexico
Average earnings per job, 2018 (2018 \$s)	\$48,926	\$65,836	\$48,615	\$32,080	\$49,530
Per capita income, 2018 (2018 \$s)	\$40,322	\$54,122	\$34,636	\$41,793	\$41,609

Source: Headwaters Economics 2020b

Total personal income comprises labor and nonlabor income. Labor income includes wage and salary disbursements; nonlabor income is comprised of dividends, interest, rent, retirement, unemployment benefits, and other transfer payments. See table 3-78.

Table 3-78. Labor and Nonlabor Income

	Chaves County	Eddy County	Otero County	Lincoln County	New Mexico
Total Personal Income (\$1,000), 2018	2,608,405	3,133,691	2,313,040	817,296	87,188,845
Nonlabor Income	1,143,016	1,150,376	1,106,639	492,753	38,659,022
	43.8%	36.7%	47.8%	60.3%	44.3%
Dividends, Interest, and Rent	445,510	601,542	485,937	243,989	17,976,423
	17.1%	19.2%	21.0%	29.9%	20.6%
Transfer Payments	697,506	548,834	620,702	248,764	20,682,599
	26.7%	17.5%	26.8%	30.4%	23.7%
Labor Earnings	1,465,389	1,983,315	1,206,401	324,543	48,529,823
	56.2%	63.3%	52.2%	39.7%	55.7%

Source: Headwaters Economics 2020d

High nonlabor personal income (over 60 percent in Lincoln County) may be in part an indicator of a large retiree population (i.e., transfer payments from Medicare and Social Security payments) or income from investments (dividends, interest, or rent). High nonlabor personal income from government transfer payments can, however, indicate a high level of hardship-related transfer payments, such as Medicaid or welfare.

If public land resources are a reason growing areas are able to attract and retain nonlabor sources of income, then public lands are important to the local economic well-being by contributing to economic growth and per capita income (Headwaters Economics 2020d). The Lincoln NF contributes to nonlabor income by providing settings, facilities, and landscapes for recreation opportunities that attract visitors and amenity migration (the influx of people relocating to areas with high natural amenities and wilderness; Hjerpe et al. 2017). Natural amenities and wilderness areas can attract people to relocate to nearby communities, bringing other investments into rural communities.

Contributions from the Lincoln National Forest

Use of traditional resources on the Lincoln NF has historically supported local communities, including employment for ranchers and miners, or in the timber industry. Other uses have included more cultural, historical, or traditional purposes, such as hunting, fishing, gathering plants for food and medicinal uses, and fuelwood gathering. Over the past few decades, resource-based uses and industries (mining, oil and gas extraction, ranching, and timber harvest [see Headwaters Economics 2020d, 2020e]) have declined while amenity-based activities (recreation and residential development) have emerged as the predominate use on and around the national forest. At present, the vast majority of visitors come to the Lincoln NF to engage in recreation, and the area has attracted second-home investments and a growing number of retirees, families, and individuals who have opted for a rural lifestyle.

Forest Service data on expenditures and resources were input into a regional input-output model (IMPLAN) to estimate the economic impacts of the Lincoln NF programs, resources, and uses (see table 3-77). This economic contribution analysis includes recreational 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 socioeconomics section is based on the four-county area of influence, which includes Chaves, Eddy, Lincoln, and Otero Counties, for this section, the economic contribution analysis also includes El Paso County, Texas. This is because the economic contribution model shows economic linkages between Lincoln NF management and the El Paso County economy (Jaworski 2017). Social contributions are examined in the Quality of Life section.

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 (for example, timber and forage), recreational visitors, and forest expenditures (for example, equipment and salaries) all contribute to economic activity in the region (Jaworski 2017). Table 3-79 shows the contribution of activities on the Lincoln NF to regional employment and labor income, by sector (Jaworski 2017).

Market transactions attributable to activities on the Lincoln NF support an estimated 989 jobs and \$31.5 million in labor income in the regional economy. Forest Service activities on the Lincoln NF are responsible for approximately 0.19 percent of total employment and 0.13 percent of labor income in the five-county area. The Lincoln NF 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 NF activities. Approximately 5 percent of employment and 1 percent of labor income in the agriculture sector are attributable to activities on the Lincoln NF.

The extraction and consumption of forest products (i.e., timber and forage), recreational visitors, and forest expenditures (for example, equipment and salaries) all contribute to economic activity in the region. 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 NF are 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).

Counties containing Federal lands have historically received a percentage of the revenues generated by the sale or use of natural resources on these lands. Traditionally, this has been 25 percent of the value of public land receipts, such as revenue from Federal timber sales. A steep decline in Federal timber sales on national forests during the 1990s significantly decreased revenues to local counties. The Secure Rural

Table 3-79. Employment Trends by Economic Sector – Area of Influence

Employment Sector	Employment Regional Totals^{1,2}	Employment Related to Lincoln NF¹	Labor Income Regional Totals (Thousands of 2015 Dollars)^{2,3}	Labor Income Related to Lincoln NF (Thousands of 2015 Dollars)³
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	517,737	989	\$25,097,585	\$31,549
Lincoln NF as percentage of total	Not applicable	0.19%	Not applicable	0.13%

Source: Jaworski 2017

Notes: 1. Regional economy includes Chaves, Eddy, Lincoln, and Otero Counties in New Mexico and El Paso County in Texas.

2. Employment: jobs numbers are the annual averages of monthly jobs in each industry using 2015 data. 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.

3. Labor income includes employee compensation and proprietors' income—the wages, salaries, and benefits paid to employees and self-employed individuals.

Schools (SRS) and Community Self-Determination Act of 2000, reauthorized in March 2018, was enacted in part to address this decline by stabilizing payments to counties dependent on revenues from Federal timber sales. SRS funds are allocated to specific purposes based on three titles in the act (roads and schools, special projects, and wildfire protection). Counties are eligible to receive either the 25 percent of value of public land receipts or the SRS funds. All counties on the Lincoln NF area of influence have chosen to receive the SRS funds due to the local decline in the timber industry.

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

Table 3-80, below, summarizes SRS payments and PILT made in the area of influence. It should be noted that PILT represent total payments to the county from all Federal lands, and are not limited to the payments associated with National Forest System lands.

Table 3-80. Summary of SRS Payments and PILT in the Area of Influence (2018)

	Chaves County	Eddy County	Lincoln County	Otero County	Total
PILT	\$3,225,294	\$3,598,621	\$1,889,698	\$3,597,259	\$11,930,122
PILT-eligible acres (National Forest System)	40,311	134,032	505,808	395,791	1,075,942
SRS payment total	\$32,247	\$75,618	\$258,638	\$593,486	\$1,023,471

Source: Headwaters Economics 2020f

Quality of Life

Quality of life can be defined as the subjective satisfaction individuals have with their life (for example, people’s experience of life) and the objective circumstances in which they find themselves (for example, physical and mental health, safety, impacts from their environment, and respect for their values).

The Lincoln NF contributes to quality of life through economic and social contributions. Contributions to local and national populations can be viewed from the perspective of ecosystem services. Broadly defined, ecosystem services, based on the Millennium Ecosystem Assessment, are the benefits people obtain from their environments, such as clean air and water, storing carbon, natural hazard regulation, and supporting cultural or spiritual values (Millennium Ecosystem Assessment 2005). Ecosystem services include those values captured in market transactions (i.e., from sale of timber) as well as those nonmarket values contributing to quality of life. Services are categorized into four groups, including provisioning services (i.e., forage, livestock, forest products, and fresh water), cultural services (i.e., land use, aesthetic values, spiritual and religious values, recreation, and ecotourism), regulating services (i.e., carbon sequestration and storage), and supporting services (i.e., nutrient cycling and habitat support).

The Lincoln NF may contribute directly or indirectly to enhancing quality of life through its ecosystem services. For instance, clean air and water directly benefit the health of communities on and around the

Lincoln NF. Management direction protecting historic and cultural sites can indirectly protect cultural and spiritual values that may be associated with those resources.

Trends in contributions from Lincoln NF resources have changed over time, as the local economy has shifted from a resource-based dependency to one focused more on services and recreation opportunities. Unique contributions from the Lincoln NF are detailed in specific resource sections. Highlights include, but are not limited to, contributions from hunting, which represents a traditional use and a source of employment in the form of outfitters and guides (see Recreation section); cultural history, including the birthplace of Smokey Bear and historic sites relevant to Billy the Kid (see Cultural and Historic Resources and Uses section); and a unique cave system and recreational access to caves (see Cave Resources section).

For this discussion, quality of life is divided into three main categories: (1) well-being, including ecosystem resilience, access to resources, and employment; (2) health and safety, including access to clean air and water; and (3) traditional, cultural, and spiritual practices, including the traditional use of natural resources and recreation. These are not mutually exclusive categories, but they provide a way to conceptualize what goes into quality of life. Based on stakeholder input from area of influence public meetings, Lincoln NF's contributions to the quality of life for local communities have been identified below:

Well-Being

- Resilient ecosystems for climate and weather events
- Solitude
- Scenery/aesthetic value
- Providing business and income opportunities (outfitting and guiding)
- Health (mental and physical)
- Spiritual and cultural connection
- Educational opportunities (plant collection, geological studies, school groups, and citizen science programs)
- Historical connection to the national forest (through family and culture)
- Economic growth from tourism associated with the national forest

Health and Safety

- Clean water, especially for local communities
- Clean air
- Habitat resistant to uncharacteristic wildfire
- Access to recreation opportunities

Traditional, Cultural, and Spiritual Practices

- Gathering fuelwood
- Livestock grazing
- Harvesting timber
- Hunting and fishing

- Collecting plants (medicinal and cultural uses)
- Christmas tree cutting
- Hiking
- Backpacking
- Mountain biking
- Camping
- Skiing
- Horseback riding
- Observing wildlife and bird-watching
- Observing wildflowers and fall colors
- Photography
- Rock climbing
- Caving
- Painting
- Picnicking
- Scenic drives
- Historic interests (homesteads and railroads)
- Off-highway vehicle use

Environmental Consequences for Socioeconomics

Methodology and Analysis Process

This section presents the social and economic consequences of implementing the alternatives. A quantitative analysis, in the form of jobs and labor income contributions, is provided for market transactions that result from activities on the Lincoln NF. A qualitative analysis is provided for values associated with ecosystem services supporting the quality of life for visitors and communities near the Lincoln NF. The Lincoln NF social benefits can be used or valued differently by different groups and communities. The Lincoln NF assessment, completed in 2019, provided an in-depth study of social and economic conditions and local community values and beliefs; the affected environment, above, provides a summary of the key social benefits that the Lincoln NF offers.

It should be noted that conditions outside Forest Service management control, including market trends and demographic changes, will continue to affect socioeconomic conditions. Unless otherwise noted, all effects are for the life of the draft forest plan (10–15 years). Socioeconomics would fall within the economic and livestock grazing and rangeland management issues identified during scoping. The effects in this section are organized by the applicable indicators of effect identified below.

Jobs and Income

The Forest Service estimated economic effects on the Lincoln economic area of analysis through the use of a regional input-output model (IMPLAN), and evaluated an assessment of impacts on selected industrial sectors of the economy, including recreation, timber, and livestock grazing. IMPLAN is a

regional economic impact model that provides a mathematical account of the flow of dollars and commodities through a region's economy. This model provides estimates of how a given amount of an economic activity translates into jobs and income in the region. By using Forest Service expenditure data, resource output data, and other economic information, IMPLAN can describe the jobs and income that are supported by Forest Service management activities. The Forest Economic Analysis Spreadsheet Tool (Aphelia), a spreadsheet modeling tool developed by the Forest Service, uses a Microsoft Excel workbook as an interface between user inputs and data generated using the IMPLAN input-output modeling system.

Economic impacts are described in terms of direct, indirect, and induced impacts. Direct impacts, such as income and employment, are directly affected by activity on Forest Service-administered land (for example, money spent on accommodation and food by recreational visitors). Indirect impacts occur when related industries gain from purchases by the directly affected businesses (for example, purchase of supplies by food and accommodation businesses). Induced impacts are the results of spending by employees hired due to the business activity. Together, these are reported as the total impact of the different management alternatives. Together, the direct, indirect, and induced effects comprise the total economic impact on the local economy.

The analysis was conducted for the economic area of analysis which, as described in the affected environment section, included the four New Mexico counties of Chaves, Eddy, Lincoln, and Otero Counties in the area of influence and El Paso County, Texas, due to the social and economic linkages between these counties and the Lincoln NF. The model for this analysis used the 2017 IMPLAN data, which is the latest available dataset that the Aphelia application supported at the time of the analysis. Results are provided in 2019 dollars unless otherwise noted.

Details for the methodology used to provide the quantitative analysis for the primary uses on the Lincoln NF with economic contributions (recreation, livestock grazing, and timber) are provided below. Regional economic contributions are also estimated for contributions that are not likely to vary by alternative, including mineral development, Forest Service expenditures and salaries, and payments to counties and states. These contributions are detailed in Environmental Consequences Common to All Alternatives.

Access and Recreation: This economic analysis for recreation represents a contribution analysis. Traditionally, an economic impact analysis for recreation measures only the effects of "new" income in the economic area of analysis, based on spending of nonlocal residents on local recreation. The premise is that spending by local residents does not represent an additional source of economic activity in the area, and spending by local residents would continue in the absence of forest recreation opportunities, using local substitute recreation opportunities.

Local residents, however, can make considerable recreation-related expenditures (based on spending on such items as gas and food); therefore, to capture the importance to local communities, this analysis provides a contribution analysis, which captures spending by both local and nonlocal residents.

The two determining factors of economic input for recreation are visitor numbers and how much each visitor spends while in the area. The Forest Service used average visitor data from the most recent National Visitor Use Monitoring (NVUM) survey to estimate average annual visitor numbers (Forest Service 2014d). As discussed in the affected environment, above, population projections through 2040 predict minimal population change (0.02 percent increase). As a result, no increase in recreation was included in the model to account for a visitation change as a result of a population increase. The actual visitation level is likely to vary, based on regional and national economics and other factors.

The average visitation level and expenditures by type were obtained from the Forest Service's NVUM program for the past three visitation surveys (White 2017). Generally, the specific recreational activity has

a secondary influence on visitor spending when compared with the type of visitation (i.e., day or overnight). Some activities, however, have more or less spending, on average, because of the types of purchases required to complete the trip. For example, downhill skiers are among the highest recreation spenders. On a per night basis, these visitors spend significantly more than other visitors for recreation fees (i.e., lift tickets), restaurants and bars, and lodging, and are thus categorized separately. Recreation visits with a primary focus on wildlife-related recreation (including wildlife viewing, hunting, and fishing) are also captured separately. See table 3-81, below.

Table 3-81. Estimated Annual Lincoln NF Visitors

Visitation Type	2014	2009
Wildlife-related visits	44,486	41,064
Downhill skiing-related visits	83,370	38,220
Total visits	767,000	696,000

Sources: Forest Service 2014d, 2009

Note: National Forest visit is defined as the entry of one person upon a national forest to participate in recreation for an unspecified period of time. Wildlife-related visits include those where the primary activity was viewing wildlife, fishing, or hunting.

The distribution of visitor type (i.e., local or nonlocal visitor) and use type are based on the most recent round of monitoring and are used to estimate visitor spending. Visits are broken out by recreation trip type. The NVUM trip type segments help explain differences in spending of distinct subgroups of visitors and the “segmentation yields total spending averages for general recreation that are statistically and practically different for each trip segment” (White 2017). User groups are defined based on the NVUM, as follows:

- Local visitors on day trips (L-Day)
- Local visitors staying overnight on Forest Service-administered lands (L-OVN)
- Local visitors staying overnight off Forest Service-administered lands (L-OVN)
- Nonlocal visitors on day trips (NL-Day)
- Nonlocal visitors staying overnight on Forest Service-administered lands (NL-OVN)
- Nonlocal visitors staying overnight off Forest Service-administered lands (NL-OVN)

Local visitors are defined as those living within 50 miles of the recreation site.

Livestock grazing represents a historical use with current contributions to local area economies. The level of use on the Lincoln NF varies in response to changing forage conditions, due to factors such as drought or fire. In some years, full permitted numbers are authorized; in other years, fewer numbers are authorized. Authorized grazing use is normally somewhat lower than permitted grazing use. In 2015, authorized use was about 78 percent of permitted animal unit months due to the reasons listed above. These figures do not include the potential capacity of vacant allotments. The economic impact analysis shows levels of authorized use would continue to be similar to current conditions. Changes across alternatives are estimated as changes from this baseline.

For consistency, the analysis assumes that current market demand for livestock products would continue over the planning period with a continuing demand for grazing of the National Forest System lands. While new plan direction is designed to improve the vegetation condition, periods of drought are also expected to continue into the future. Under all alternatives, there would be 145,044 total permitted AUMs, based on allotments currently open to grazing. Based on an authorization level of approximately 78

percent, this would result in an average of 113,134 AUMs. Management direction that provides for potential closure of or opening of currently vacant allotments could affect this level of use, as discussed by alternative, below. To estimate direct employment associated with livestock grazing on the Lincoln NF, AUMs are multiplied by a ratio of statewide cattle ranching/sheep farming employment over all AUMs required for cattle and calf/sheep inventory in New Mexico. This estimate of direct employment is then incorporated in IMPLAN to calculate indirect and induced effects. The chief advantage of this method that it recognizes that public land grazing may look quite different from other activities in the cattle ranching or sheep farming sectors in IMPLAN (e.g., feedlots).

Timber and Forest Products: Estimated annual forest product volumes harvest data are used to estimate the economic impact of timber-related activities by alternative. Table 3-82 provides a summary of the anticipated harvest by product category. Product cut volumes are estimated based on the 5-year average of Forest Product Cut and sold reports (Forest Service 2020h), and total volume of harvest by alternative based on timber and wood sale quantity modeling in appendix D. See the timber suitability appendix for details of these estimates (appendix D).

Table 3-82. Estimated Annual Forest Product Volume Harvest by Alternative

Product (100 cubic feet)*	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Harvest Softwood—Sawtimber	5,254	5,254	5,035	6,568	7,225
Harvest Softwood—Pulp	1,267	1,267	1,215	1,584	1,743
Harvest Hardwood—Sawtimber	0	0	0	0	0
Harvest Hardwood—Pulp	0	0	0	0	0
Poles	52	52	49	64	71
Posts	0.3	0.3	0.3	0.4	0.4
Fuelwood	5,007	5,007	4,799	6,259	6,885
All Other Products	419	419	401	524	576

Source: Forest Service 2020h and appendix D

Note: No hardwood sawtimber or pulp harvest is anticipated. The table does not include non-convertible forest products such as Christmas trees, transplants, limb/bough, cones, cacti, or nut and seed volumes.

Fuelwood represents the dominant use of wood products on the Lincoln NF. This analysis assumes that 100 percent of product would be processed within the economic area of analysis. Likewise, it is assumed that 100 percent of commercial sales of fuelwood and harvest for personal use would occur in the area. There are numerous commercial fuelwood operations and five sawmills that process timber in the economic analysis area, as detailed in the sustainably forestry and forest products section. The direct effects of timber and wood product sales were estimated using direct response coefficients developed from a national Timber Mill Survey conducted by the University of Montana’s Bureau of Business and Economic Research (Sorenson et al. 2016), which provide more regional-specific information than those in the default IMPLAN model. The indirect and induced effects were generated by the IMPLAN model.

Quality of Life

As discussed in Affected Environment, above, the Lincoln NF provides socioeconomic benefits via ecosystem services in the form of market contributions (measured by jobs and income, as discussed above) and in the form of contributions for values that cannot be easily measured in the market, such as

impacts on quality of life. As detailed in Affected Environment, key nonmarket ecosystem services provided by the Lincoln NF were identified in the socioeconomic assessment (Forest Service 2019b). Three main indicators were identified for quality of life: well-being, health and safety, and traditional, cultural, and spiritual practices. An overview of the types of services analyzed for the three main categories of quality-of-life indicators is provided below.

Well-being is tied to employment and labor income, in the connection with individuals' and communities' ability to have access to sustainable income, a sense of security, and access to resources. Well-being is also related to the ability to access opportunities for recreation and leisure activities, as well as access to clean air and water. The analysis is, therefore, based on the degree to which management would support economic opportunities related to Lincoln NF resources, as well as provide for landscape and habitat to support the values noted above. It is assumed that forest plan components that contribute to increased income or employment, contribute to health and safety, or support traditional, cultural, or spiritual values also have beneficial effects on overall well-being.

Health and safety are related to numerous goods and services supported by the Lincoln NF, such as recreation opportunities, air and water quality, and wildland fire management. Forest management that supports long-term maintenance or improvement of water quality would support water for municipalities, as well as habitat for aquatic species important for local economic activity and traditional uses. Access to recreation supports physical and mental health. Forest Service-supported wildfire suppression for local communities and vegetation treatments to move toward forest desired conditions would reduce risks of uncharacteristic wildfire and support community health and safety. Likewise, management that supports resilient ecosystems would allow for area vegetation and habitat to have increased resilience to climate change. The analysis for health and safety is tied with the ability of forest management to maintain or improve habitat conditions for these features.

Review of the social impacts of traditional, cultural, and spiritual practices is tied with the ability to access resources and utilize Lincoln NF lands in a variety of ways. Traditional uses of forest resources include primarily livestock grazing, timber and wood product harvest, and hunting. The analysis includes an assessment of the level to which the continued use of or access to these resources is permitted. It also includes a discussion of how vegetation management would affect these uses. In addition, this analysis examines impacts on forestry resources used in traditional cultural practices by Native Americans.

Spiritual and cultural values derived from the forest may also take the form of religious importance of certain places on the Lincoln NF, particularly for Native American communities. Opportunities to connect with nature and experience solitude may also represent spiritual values for some users. The social impact of these values was estimated through the degree of protected open spaces and the provision of diverse recreation opportunities via designated or management areas and recreation opportunity spectrum settings.

As demonstrated in table 3-83, below, ecosystem services may contribute to multiple aspects of local quality of life, jobs, and income. For instance, recreation opportunities contribute to well-being by providing economic benefits to surrounding communities, but they also contribute to mental and physical health. The table below is intended only to note indicators that are most applicable to a given ecosystem service.

As insufficient data and resources are available to assign quantitative values to quality-of-life impacts that may result from changes among alternatives, the analysis considers potential impacts in qualitative terms. This is consistent with direction provided in 40 CFR 1502.23 and Forest Service 2012 Planning Rule regulations.

Table 3-83. Key Issues and Indicators

Key Issue/Ecosystem Services	Indicator			
	Jobs and Income	Well-Being	Health and Safety	Traditional, Cultural, and Spiritual Practices
Access and Recreation				
Recreation opportunities	X	X	X	X
Scenic value		X		X
Natural Resources				
Wildfire protection/fuels mitigation	X	X	X	X
Timber and forest product availability	X	X		X
Water quality		X	X	
Wildlife habitat	X	X		X
Ecosystem resilience	X	X	X	X
Livestock Grazing and Rangeland Management				
Forage availability	X	X		X
Livestock grazing	X	X		X
Wilderness and Special Management Areas				
Solitude/quiet recreation experience	X	X		X
Economics				
Forest Service expenditures	X	X		
Payments to counties and states	X	X		

Assumptions

General assumptions are included below. Assumptions specific to an individual resource's analysis are detailed in the methodology section, above.

- Jobs represent the annual average of monthly jobs, so one job may represent one job lasting 12 months or two jobs lasting 6 months each. Because jobs occurring over multiple years may not represent additional new employment opportunities (for example, one employee working for 2 years represents two jobs), results are presented in the form of annual averages. Total jobs represent direct, indirect, and induced jobs supported.
- Labor income (earnings) represent all forms of employment income, including employee compensation (wages and benefits) and proprietor income. Total labor earnings include those from direct, indirect, and induced employment.
- The exact change in indicators by alternative is unknown.
- Estimates for input data are based on the professional expertise of the resource specialists and available literature. Indicators have the potential to be affected by factors out the Forest Service's control, including market conditions.
- Forest budgets (that affect expenditures and salaries) are distributed by an act of Congress and may fluctuate over the life of the management plan; they are not dictated by the management plan or alternatives. Providing for improved economic and social benefits to communities on and around the Lincoln NF or that have ties to the Lincoln NF will continue to be a focus of the Forest Service's management.

Indicators

- Jobs and income—quantitative impacts based on total regional contributions
- Quality of life—a qualitative discussion in terms of impacts on (1) well-being, (2) health and safety, and (3) traditional, cultural, and spiritual practices

Environmental Consequences for Socioeconomics Common to All Alternatives

Jobs and Income

Under all alternatives, employment and labor income supported by activities on the Lincoln NF would account for less than 1 percent of regional totals; however, impacts at the individual community level economy may be more significant.

Below, table 3-84 and table 3-85 provide a summary of total jobs contributed and labor income supported, respectively.

Table 3-84. Total Jobs Contributed*

Resource Area	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Recreation (local and not local)	451	451	451	451	451
Recreation (wildlife and fish-related local and not local)	32	32	32	32	32
Grazing	342	342	342	342	342
Timber	38	38	36	48	55
Minerals	0	0	0	0	0
Payments to states and counties	327	327	327	327	327
Forest Service expenditures	288	288	288	288	288
Total Forest Management	1,478	1,478	1,477	1,488	1,495

Sources: Forest Service 2020i; IMPLAN 2017

* Jobs represent full- and part-time jobs and include wage and salary jobs, sole proprietorships, and individual general partners.

Table 3-85. Labor Income Contributed (\$1,000s of 2019\$)

Resource Area	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Recreation (local and nonlocal)	\$13,495	\$13,495	\$13,495	\$13,495	\$13,495
Recreation (wildlife and fish-related local and nonlocal)	\$1,084	\$1,084	\$1,084	\$1,084	\$1,084
Grazing	\$4,493	\$4,493	\$4,493	\$4,493	\$4,493
Timber	\$3,545	\$3,545	\$3,397	\$4,431	\$5,149
Minerals	\$5	\$5	\$5	\$5	\$5
Payments to states and counties	\$16,640	\$16,640	\$16,640	\$16,640	\$16,640
Forest Service expenditures	\$16,147	\$16,147	\$16,147	\$16,147	\$16,147
Total Forest Management	\$55,409	\$55,409	\$55,262	\$56,269	\$57,014

Sources: Forest Service 2020i; IMPLAN 2017

Recreation: Based on the most recent NVUM data, there are an estimated 767,000 recreation visits to the Lincoln NF annually; approximately 65 percent originate outside the local area (greater than 50 miles). The average total trip spending per party was \$438 (Forest Service 2014d). The expenditures of local and nonlocal visitors to the Lincoln NF support approximately 451 jobs and \$13.5 million in labor income annually. Recreation is critically important to local communities. Although local visitors typically consume less goods and services per visit than nonlocal visitors, they support economic activity.

The quantitative economic analysis for recreation consists of one set of figures for all alternatives. The estimates do not address differences between the alternatives. This is because the differences in management actions affecting recreation cannot be quantified with a reasonable level of certainty. The type of recreational use and experience may change depending on alternative, as discussed qualitatively by alternative.

Livestock Grazing: Under all alternatives, authorized grazing is anticipated to occur at levels similar to the current conditions; therefore, economic contributions would be similar across alternatives, supporting 342 jobs and \$4.5 million in labor income annually. Under all alternatives, the authorized grazing level would continue to be affected by the available forage level and factors such as annual precipitation.

Timber and Forest Products: Currently, there are five active, small-production sawmills in Otero County, multiple fuelwood processors throughout the four counties, and one full-production pallet mill in Canutillo, Texas. Under all Alternatives, the emphasis of sustainable forestry in future years would be on the sale of forest products removed through forestry activities rather than the development of large-scale commercial timber operations, which are no longer supported by the timber market. While removal of forest products and the related jobs and income would be supported under all alternatives, the level of timber product economic contributions would vary slightly based on restrictions placed on harvest. In addition, contributions may be affected by factors outside the Forest Service's control, including the local market for forest products and the cost to extract the product.

Minerals: The Lincoln NF's limited resource extraction means the contributions, at present, are limited. Fluctuations in market prices may lead to increased interest and exploration and development of the Lincoln NF's energy and mineral resources in the future. Because the Forest Service cannot predict global market conditions, the present condition was used for all alternatives.

Economic contributions from energy and mineral development in the plan area are currently from salable mineral materials (i.e., sand, gravels, and stone). As discussed in the Energy and Minerals section, current development of this resource occurs in the form of small, personal-use permits and one commercial gravel pit, the Apache Pit, which produced approximately 58 tons of gravel in 2018. Use at select sites is also authorized for the Lincoln County Road Department and to support El Capitan Precious Metals' exploration drilling operation.

Salable minerals development is generally limited by the cost of transportation relative to the low value of the minerals and the common availability of these minerals on State and private lands. Based on the current level of extraction, it is estimated that mineral development supports negligible jobs or labor income annually, although availability of free-use permits for local governments may have local economic importance for those entities.

In summary, the mineral program contributes limited number of jobs, income, and raw materials to the local and national economy under all alternatives.

Payments to States and Counties: As discussed in the affected environment, Forest Service-managed lands result in payments—in the form of PILT and SRS payments—to states and counties that contain

those lands. PILT does not vary across alternatives, as these formulas are calculated independent of Forest Service receipts. Because area counties have chosen to receive SRS payments in lieu of the 25 percent fund ties to timber receipts, SRS payments are also likely to remain the same between alternatives. Regional contributions from these payments are estimated to support 327 jobs and \$16.6 million in labor income annually.

In summary, the PILT and SRS programs offer local economic stability in the form of jobs and labor income and are consistent across alternatives.

Forest Service Expenditures: The Lincoln NF's annual budget (including expenditures and salaries) was approximately \$17.3 million in fiscal year 2017. Approximately 66 percent of the budget was spent on salaries, and the remainder was spent on equipment and other non-salary expenditures that contribute to land management. Forest budgets may fluctuate over the life of the management plan, but they are not dictated by the management plan or alternatives. Contributions are estimated to support 288 jobs and \$16.1 million in labor income annually.

In summary, Forest Service non-salary expenditures generate economic activity in businesses that supply goods and services to support Forest Service programs; these are anticipated to be consistent across alternatives.

Quality of Life

Under all alternatives, market and nonmarket ecosystem services contribute to the quality of life of Lincoln NF beneficiaries through improving or maintaining well-being, health and safety, and traditional, cultural, and spiritual practices, as discussed below.

Well-Being: Traditional socioeconomic activities on the Lincoln NF, such as grazing and the ability to collect and use forest products, are supported under all alternatives. Being able to freely practice traditions, maintain a sense of cultural identity, and know their cultures are recognized and valued can have positive effects for individuals' and communities' well-being (Tang and Jardine 2016).

Local timber operations improve individual and community well-being by creating the potential for small-business opportunities and also by producing fuelwood and other forest products for resident use. All alternatives support the availability to harvest and access these products.

Under all alternatives, the Lincoln NF would continue to support livestock grazing. From a cultural standpoint, rangelands provide the basis for sustaining the custom and culture of the 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. Some families have made conscious employment choices to remain in the local community and maintain this traditional lifestyle. 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 (Forest Service 2006).

Under all alternatives, the Lincoln NF would continue to offer a spectrum of recreation opportunities and settings to local communities and nonlocal visitors. Focused recreation areas, such as those occurring at developed ski areas or year-round resorts, large campgrounds, or trail systems for featured recreation, would support developed uses. These areas recognize a variety of sustainable recreation settings and opportunities and would be provided under all alternatives (see the recreation section for additional details). Under all alternatives, the Lincoln NF would continue to also provide opportunities for more dispersed recreation. Solitude and quiet recreation experiences could occur in all recreation opportunity spectrum classes, but particularly in areas with special protection for fish and wildlife, WSRs, and wilderness areas.

While it is not anticipated that the overall level of recreation or the jobs and income supported in the regional economy would change significantly by alternative, the type of recreation and the recreation experience may vary. Impacts would depend on the type and location of the recreation taking place, as well as the behavior of the individual recreationist. Impacts could also occur as a result of proposed management on specific groups of users related to recreation, including motorized recreation users, permitted outfitters, and those interested in hunting and fishing. In the long term, actions that affect the habitat quantity or quality for big game species or other species of economic value could affect the quantity of game and fish available for hunting and fishing, as well as the quality of the recreation experience.

In addition, management to preserve mountain and forest vistas or view the wildlife is beneficial for local residents and visitors (see the scenery section for additional details). High-quality scenery and access to preserved spaces can further increase community resilience and the ability to obtain viable livelihoods by increasing property values, which contributes to higher rental incomes and home values (Berrens et al. 2006). Such features can also attract retirees or those with nonlabor income sources to areas, which provides additional economic benefits for area communities (Rosenberger et al. 2008). For others, opportunities to experience solitude, particularly in wilderness areas, is a benefit (McKenna et al. 2016).

Health and Safety: Under all alternatives, forest management of vegetation, forest soils, and forest watersheds and riparian systems would contribute to clean water supplies. Water supplies would benefit area communities through reduced costs for water treatment for municipal water supplies. In addition, adequate clean water would in turn contribute to food production, sanitation, continuation of traditional practices (for example, grazing and fishing), and economic development for forest beneficiaries (also see the watersheds and water section).

Forest Service coordination with communities to suppress wildfire would reduce the potential for direct and indirect health risks associated with fire in local communities in the long term, including from smoke emissions; it also would reduce the potential for economic impacts. Similarly, fuels management actions on National Forest System lands minimize risks of uncharacteristic wildfire, which would support community health and traditional uses on the Lincoln NF. Variations in vegetation treatments may affect the magnitude of fire resilience on the Lincoln NF over the long term, which may affect the quality of life of forest beneficiaries differentially (also see the air quality section). The Lincoln NF plays an important role in climate change mitigation through carbon sequestration and the removal of CO₂ from the atmosphere, supporting long-term public health.

Traditional, Cultural, and Spiritual Practices: Across all alternatives, traditional uses such as livestock grazing, timber harvest, and hunting would continue to be permitted. Hunting on the Lincoln NF is a traditional cultural practice that provides food and is an activity that can be shared across generations. In addition, visitors who come to the Lincoln NF to hunt wildlife contribute to the overall economy of the area by supporting recreation-related jobs and those directly and indirectly associated with visitor spending.

Livestock grazing would continue to be similar to current levels, continuing support for the cultural importance of this resource for local communities, as discussed above.

Timber harvest would also continue under all alternatives at similar to current levels, supporting the availability of products for personal fuel use and traditional wood product use. Harvests would continue to be affected by market conditions, including the cost of extraction, based on a site-specific basis. Recreation management under all alternatives also would provide access to nature and cultural sites with opportunities for a variety of educational activities, as well as access to solitude for spiritually important settings.

Under all alternatives, the ability to access materials to sustain Native American traditional ways of life and to provide products for traditional cultural practices, such as wood, herbs, medicinal plants, piñon nuts, and native plant materials, would be maintained.

Environmental Consequences for Socioeconomics Under Alternative A

Jobs and Income

The level of contributions from Lincoln NF resources would remain similar to that described under the impacts common to all alternatives. Livestock grazing estimated contributions would be as described under impacts common to all alternatives. As discussed above, actual use for livestock grazing varies based on the local forage and market conditions. Alternative A would not be likely to support long-term forestwide improvement in forage availability due to a lack of forestwide objectives.

A lack of restoration objectives under alternative A would also limit the potential for long-term improvement of forest products (for example, fuelwood, posts, and poles). Projected wood and timber sale quantities would provide continued local support for jobs and income and potential for beneficial social effects stemming from timber-based economic activity. It is anticipated that timber and woodland products would support 38 jobs and \$3,545,000 in labor income.

As noted under impacts common to all alternatives, recreation visitation levels are not anticipated to have overall changes by alternative. Under alternative A, recreation management would vary by management area. While a spectrum of recreation opportunities would be supported, this alternative would not provide management associated with current recreation trends and levels of use; therefore, it may not support the full economic opportunities for the Lincoln NF.

Quality of Life

Well-Being: Under alternative A, jobs and income supported by forest resources would remain similar to current conditions, providing for continued support of well-being from access to these sources of employment; but, it would provide limited opportunities for long-term improvement in services supported by these resources. Alternative A has limited forestwide recreation management plan components, and recreation opportunities are not consistent with the social, economic, or environmental resource capacity of the Lincoln NF. This could limit the degree to which recreation continues to contribute to the quality of life in the long term.

Alternative A would include the least support for values associated with wilderness character, as there would be no recommended wilderness. Management actions for Management Area 3A – South Guadalupe are protective, but not at the same level as recommended wilderness plan components. Additionally, alternative A would not prioritize restoration or preservation of natural scenery; therefore, this alternative would provide the least benefits to quality of life in terms of solitude and opportunities for quiet recreation.

Health and Safety: Alternative A would maintain current management of water resources based on current standards; however, of all alternatives, a lack of objectives for water restoration would result in the lowest opportunity for improvement in watershed health, with the highest potential for related health impacts. Potential carbon sequestration would remain as it is in current conditions. Of all alternatives, the risk of uncharacteristic wildfires would be reduced the least under this alternative. The potential for health impacts from fire and the associated smoke would remain.

Traditional, Cultural, and Spiritual Practices: Under alternative A, current levels of traditional uses would continue in the short term; however, a lack of specific objectives for improving vegetation or

treating fuels could affect the long-term availability of resources. Should an uncharacteristic wildfire occur as a result of limited movement toward desired conditions for fuels, the ability to access these resources could also be affected. For livestock grazing, limited objectives for improving and maintaining range infrastructure could further affect the ability of grazing practices to continue in the long term. Similarly, timber and forest project use would be permitted; however, a lack of vegetation management objectives could result in decreased long-term harvest potential with related impacts on the ability to access resources for uses with traditional or cultural importance.

Access to Lincoln NF resources with traditional importance for Native Americans, such as plant materials and medicines used by the Mescalero Apache would also be affected by a lack of forestwide vegetation management. Examples of these materials are agave, piñon nuts, and oak brush and teepee poles for ceremonial structures.

Alternative A has no forestwide standards or guidelines addressing traditional or cultural uses of the Lincoln NF. Sites with traditional cultural importance would remain inaccessible per guidelines in other laws, including National Heritage Resources Act and Archaeological Resources Protection Act.

As noted under the well-being discussion, a lack of preservation of areas with wilderness character under alternative A would reduce services related to these areas, such as solitude, natural visual setting, and wildlife habitat.

Environmental Consequences for Socioeconomics Common to Alternatives B, C, D, and E

Jobs and Income

Under all action alternatives, the Lincoln NF would continue to provide economic opportunities and sustain jobs and income to a similar degree as under alternative A, as discussed under impacts common to all alternatives. Variations by alternative are detailed below for timber and grazing contributions.

Under alternatives B, a sustainable harvest level would be maintained at a level similar to that under alternative A, as timber production and sales would occur where applicable to move toward desired conditions, supporting 38 jobs and \$3,545,000 in total labor income. The emphasis on natural restoration processes under alternative C would result in a slight decrease in forest project harvest and related jobs and income (36 jobs and \$3,397,000 in labor income).

Alternative D, which relies on active management to achieve resource objectives, would result in additional timber product for sale as a result of vegetation management activities, thereby supporting a slight increase in related economic contributions (48 jobs and \$4,431,000 in labor income). Relative to the entire analysis area economy, these changes would be small impacts, but to the local timber industry specifically, this may represent a more meaningful impact.

Similar to Alternative D, Alternative E would support continued development of forestry resources, at an elevated level compared to alternative A (55 jobs and \$5,149,000 in labor income). The increase in employment and labor income generated from timber and other forest product removal under alternatives D and E may cultivate opportunities for the growth or development of local or regional timber and other forest products industries in the plan area; however, most of the forest project harvest is associated with projects to meet vegetation management objectives, and it is unlikely that large-scale commercial operations would occur under any alternatives.

For livestock grazing, the level of permitted grazing would be the same under all alternatives, as discussed under impacts common to all alternatives section.

As noted under impacts common to all alternatives, no direct change in recreation levels has been forecast by alternative; therefore, economic contributions would remain similar to those under alternative A.

Quality of Life

Traditional forest resources use (i.e., timber and grazing) would be supported under all alternatives. As discussed under jobs and income, under alternative B timber production and sales would occur where applicable to move toward desired conditions, supporting employment levels at the same level as under alternative A.

The emphasis on natural restoration processes under alternative C would result in a decrease in forest project harvest and related jobs and income. Alternative D would promote vegetation management, resulting in additional forest product harvesting and increasing jobs and income from the timber industry, as compared with alternative A. Alternative E would emphasize resource uses and support continued timber harvest, resulting in slightly increased timber contributions, compared with alternative A.

For livestock grazing, the level of permitted grazing would be similar among all action alternatives. Support for forage resources would occur under all alternatives due to management to move ERUs toward desired conditions.

Under all action alternatives, the revised plan would contain components to assist the Forest Service in moving toward the management of a sustainable recreation program; they would allow for a better response to current recreation and better adaptation to current and future demands for recreation. All alternatives would enhance recreation opportunities by providing for improved access to visitors, compared with alternative A, due to standards and guidelines for road maintenance. Though economic impacts from recreation are estimated to be similar across alternatives, substantive differences are anticipated in recreation experiences.

No change to the ROS would occur across alternatives; however, alternative E would provide the highest level of support for access to developed recreation sites. It also would designate additional caves for recreational access, thereby providing the highest level of support for benefits associated with developed recreation areas.

The level of mechanical treatment objectives proposed under alternative B, D, and E would result in additional alterations to existing conditions. In contrast, under alternative C, the increase in special areas managed for non-developed, passive recreational use (i.e., wilderness) would support an increased emphasis on services related to this setting, including solitude and quiet recreation experiences.

Potential for a long-term improvement of wildlife habitat under all action alternatives would support benefits associated with these species, including hunting and wildlife viewing. While habitat would be supported for hunting, permit levels would be determined by New Mexico State Fish and Game and would, therefore, not be determined by Forest Service management. Alternatives C and D would support the greatest emphasis on habitat connectivity and provide the most overall support for wildlife and the ecosystem services they provide to communities. Alternative D, in particular, would include the most acres proposed for wildlife habitat treatment projects. Alternative E would provide the least emphasis on habitat support for species, but it would support maintenance for viewing and hunting wildlife.

Given its emphasis on passive recreation and conservation, alternative C would have the greatest acreage for wilderness (402,000 acres). This alternative would increase the scenic integrity on the Lincoln NF through reduced resource use, which would decrease or limit impacts on the scenic character in these areas by limiting human alteration. As a result, services supported by undeveloped areas, such as solitude and opportunities for a quiet recreation experience, would be highest under alternative C. Secondary

impacts, including the ability to attract retirees and second homeowners, would be highest under this alternative. In contrast, alternatives B and D would recommend 40,500 for wilderness designation; services supported by wilderness areas would be supported at a more site-specific level. Alternative E calls for just 21,900 acres for wilderness recommendation and would have impacts similar to those described under alternative A.

Health and Safety: Under all action alternatives, mechanical forest thinning and prescribed burning should reduce the likelihood of uncharacteristic wildfire, which would benefit surface water resources and reduce erosion. In addition, the action alternatives would establish riparian management zones around riparian areas at the project level, as needed, including intermittent and perennial streams, and provide guidelines to reduce impacts from recreation and transportation on erosion. As compared with alternative A, these actions would improve the watershed condition, stream flow, and water quality. This would support benefits provided by improved water quality, including municipal water supply and habitat for aquatic species with economic and cultural importance.

Prescribed wildfire use to restore vegetation and move ERUs toward more natural fire regimes (up to 200,000 acres over a 10-year period under alternatives B–E) would result in the potential for short-term impacts on local air quality for communities, with the potential for impacts on area residents' health. Adherence to State and Federal air quality standards would reduce impacts. In the long term, treatment to move vegetation toward natural fire regimes would reduce the risk of uncharacteristic wildfire and minimize risks for area communities. Use of prescribed wildfire would be combined with mechanical treatments to restore vegetation conditions.

Use of prescribed wildfire would be combined with mechanical treatments to restore vegetation conditions. Between 11,000 and 19,500 acres for various habitat types would be treated with mechanical methods under alternatives B, D, and E. This would further support a long-term reduction in risks from uncharacteristic wildfire for area communities, as compared with alternative A. Under alternative C, between 6,500 to 12,500 acres of mechanical treatment would occur. This would result in an increased opportunity to reduce risks, as compared with alternative A, but to a lesser degree than under the other action alternatives.

Traditional, Cultural, and Spiritual Practices: Across all alternatives, traditional uses such as livestock grazing, timber harvest, and hunting would continue, as discussed under well-being. The Forest Service would maintain access to the Lincoln NF under all alternatives. All action alternatives would provide plan components to ensure access to traditional resources and practices, such as forage for grazing, and forest products that contribute to quality of life for traditional and rural communities. Vegetation management would support forage growth and provisioning of other forest products. As a result, long-term social benefits related to traditional or cultural practices associated with grazing resources and forest products would be supported under this alternative.

Motorized access to forest resources would be reduced under Alternative C due to the highest level of recommended wilderness designation. Possible effects include resource acquisition and site accessibility difficulties for those who require motorized transportation, but also an increased possibility of privacy for ceremonies or sacred sites. Traditional communities that rely on forest resources, such as forage or forest products, would have their values and traditions supported the most under alternative E in the short term. This is due to this alternative's high degree of access and resource output.

Native Americans, including the Mescalero Apache, who use Lincoln NF resources for traditional food sources, medicines, and materials for ceremonial structures, would have access maintained for these uses; however, over the long term, forest resource availability could decline should conflicts with other resources affect the ability to meet desired conditions.

Cumulative Environmental Consequences for Socioeconomics

The cumulative effects study area includes the economic analysis area. The time frame for cumulative effects is the timeline of the plan (10 to 15 years).

Past, present, and reasonably foreseeable future actions that have the potential to cumulatively affect the social and economic setting include demographic changes, such as population changes. An increase in population locally in the region has the potential to affect the demand on the Lincoln NF's resources, including recreation, and fire protection resources for the wildland-urban interface. Market conditions and general economic trends can also affect forest conditions. Economic downturns affect the level and type of spending by recreationists in forest communities. In addition, impacts on the market for livestock or timber could have locally important impacts on the economic feasibility of these resources on National Forest System lands.

The job and income estimates presented in the environmental consequences are based on a static model of the economy. Economic conditions may alter the contribution forecast in this analysis. If additional businesses locate in the area, the local economic impact of activities to occur under the proposed plan would increase. Conversely, if businesses leave the area, or the level of resource use or processing in the economic analysis area were altered, the local economic impact of activities under the proposed plan would decrease.

For forest-dependent communities or those with significant cultural ties to the Lincoln NF, multiagency and governmental efforts supporting landscape-scale restoration may improve the quality of life through maintaining and restoring ecosystem services on the landscape and increasing forest resiliency to disturbance. This could result in continued support for traditional resources and maintenance of cultural or spiritual traditions.

Climate change has the potential to affect a broad spectrum of resources and resource uses on the Lincoln NF, and the corresponding economic and social contributions from these resources. Long-term impacts, to which forest management contributes, may occur. This creates a cumulative positive impact on the health and safety of populations at risk from climate change effects, such as increased fire and drought. Similarly, Forest Service management actions affect water quality and air quality, but these are also affected by the actions of other government, nongovernment, and private entities. The combined actions of these entities all contribute to improving or decreasing the quality of air and water resources available to forest beneficiaries. This applies similarly to all ecosystem services that are provided by cross-boundary resources.

For details on the potential impacts from other management actions, also see corresponding resource sections, including but not limited to sustainable rangelands and livestock grazing, forestry and forest products, sustainable recreation, and wildlife, fish, and plants.

Environmental Justice

Affected Environment

In 1994, President Clinton issued Executive Order 12898, which directs Federal agencies to focus attention on the human health and environmental conditions in minority and low-income communities. The purpose of this order is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Environmental justice is the fair treatment and meaningful involvement of people of all races, cultures, and incomes with respect to the development, implementation, and enforcement of environmental laws,

regulations, and policies. The goal of environmental justice is for Federal agencies to identify adverse impacts that are disproportionately high on minority or low-income populations and identify alternatives that will avoid or mitigate those impacts.

An environmental justice community is a population of people or a community that meets the criteria for being considered either low-income or minority under Executive Order 12898. Guidance on environmental justice terminology and identifying minority populations was developed by the President's Council on Environmental Quality (CEQ 1997) and provides the following definitions:

- Minorities are individuals who are members of the following population groups: American Indian, Alaska Native, Asian, Pacific Islander, Black, or Hispanic.
- A minority population area is so defined if either the aggregate population of all minority groups combined exceeds 50 percent of the total population in the area, or if the percentage of the population in the area comprising all minority groups is meaningfully greater than the minority population percentage in the comparison population.
- Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Census Bureau's Current Population Reports, Series P-60 on Consumer Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.

For the purpose of identifying a minority population concentration, the comparison population used in this report is the state of New Mexico. For the purpose of this analysis, "meaningfully greater" has been defined as 5 percentage points or more above the reference population of the state of New Mexico (Grinspoon et al. 2014). For low-income populations, all populations with median household incomes below the poverty threshold, or populations with the total percentage of individuals above the state poverty level, are examined for further analysis.

As discussed in the Socioeconomics section, the area of influence used during the land management planning process to evaluate social, cultural, and economic conditions is comprised of the four counties overlapping the Lincoln NF: Chaves, Eddy, Lincoln, and Otero Counties.

Census data for racial and ethnic minorities are summarized below in table 3-86 and table 3-87 for the county and community level. At the county level, Chaves County has a higher percentage of the population identifying as Hispanic than that at the state level (55.6 percent and 48.2 percent, respectively). Otero County has a notable Native American population (6.8 percent), although the level remains below that of the state (9.5 percent). At the community level, area communities generally have a lower level of racial or ethnic minorities than the state of New Mexico comparison population. The exceptions include Ruidoso Downs, which has a Hispanic population of 65.2 percent, and Carrizozo, which has a Native American population of 15.3 percent.

The poverty threshold for 2017 was an annual income of \$12,488 for an individual under 65 years of age and \$11,756 for those over 65. For a three-person family with one child and two adults, the poverty threshold was \$19,730, and for a family with two adults and three children the poverty line was \$24,858 (U.S. Census Bureau 2018a). Overall, the percentage of the area of influence population in poverty is slightly higher in Chaves and Otero Counties, compared with New Mexico as a whole. This reflects the lower median incomes. It also may reflect challenges in forest management, as many low-income families may rely more heavily on Lincoln NF products, such as fuelwood, or forest uses, such as hunting for their

Table 3-86. Ethnicity and Racial Diversity – County Level (2017)

	Chaves County	Eddy County	Lincoln County	Otero County	New Mexico
Hispanic (any race)	36,365	26,982	6,224	24,415	1,004,103
	55.6%	47.5%	31.9%	37.5%	48.2%
White	54,212	52,005	17,796	50,892	1,547,843
	82.8%	91.6%	91.3%	78.1%	74.2%
Black/African American	1,093	843	121	2,199	42,187
	1.7%	1.5%	0.6%	3.4%	2.0%
Native American or Alaskan Native	989	793	344	4,399	197,191
	1.5%	1.4%	1.8%	6.8%	9.5%
Asian	490	256	103	876	29,991
	0.7%	0.5%	0.5%	1.3%	1.4%
Native Hawaiian or Pacific Islander	31	23	0	82	1,390
	<0.01%	<0.01%	0.00%	0.1%	0.1%
Some other race	6,930	2,173	681	4,242	197,994
	10.6%	3.8%	3.5%	6.5%	9.5%
Two or more races	1,709	700	452	2,440	68,282
	2.6%	1.2%	2.3%	3.7%	3.3%

Source: U.S. Census Bureau 2017

Note: Percentages provided above may add to more than 100 percent because individuals identifying as Hispanic ethnicity may also identify as white or one or more racial minority.

Table 3-87. Ethnicity and Racial Diversity – Community Level (2017)

	Alamogordo	Capitan	Carrizozo	Cloudcroft	Mayhill	Ruidoso	Ruidoso Downs
Hispanic (any race)	10,656	466	302	113	74	7,740	2,607
	34.4%	35.3%	34.4%	18.4%	33.8%	24.6%	65.2%
White	24,503	1,150	693	594	217	6,963	2,357
	79.1%	87.1%	78.9%	96.9%	99.1%	90.0%	90.4%
Black/African American	1,389	86	10	0	0	11	0
	4.5%	6.5%	1.1%	0%	0%	0.1%	0%
Native American or Alaskan Native	522	16	134	0	2	163	0
	1.7%	1.2%	15.3%	0%	0.9%	2.1%	0%
Asian	599	0	1	0	0	0	79
	1.9%	0%	0.1%	0%	0%	0%	1.0%
Native Hawaiian or Pacific Islander	48	0	0	0	0	0	0
	0.2%	0%	0%	0%	0%	0%	0%
Some other race	2,415	60	0	13	0	0	195
	7.8%	4.5%	0%	2.1%	0%	0%	2.5%
Two or more races	1,478	9	40	6	0	0	306
	4.8%	0.7%	4.6%	1.0%	0%	0%	4.0%

Source: U.S. Census Bureau 2017

Note: Percentages provided above may add to more than 100 percent because individuals identifying as Hispanic ethnicity may also identify as white or one or more racial minority.

daily existence. Access to Forest Service management materials and events may also pose more of a challenge for these groups, who may be more likely to have limited access to transportation, internet, childcare, or time off work.

Communities identified as having higher populations in poverty, when compared with the state of New Mexico reference population, include Carrizozo, Capitan, Cloudcroft, and Ruidoso Downs. Small population size in communities leads to high margins of error for reported data; therefore, information should be interpreted with caution. See table 3-88, table 3-89, and table 3-90, below.

Table 3-88. Poverty – County Level (2017)

	Chaves County	Eddy County	Lincoln County	Otero County	New Mexico
Families Below Poverty	16.7%	10.9%	10.4%	16.2%	15.6%
Individuals Below Poverty	21.2%	14.6%	15.4%	21.4%	20.6%
Median Income	\$42,117	\$60,703	\$42,145	\$43,553	\$46,718

Source: U.S. Census Bureau 2017

Table 3-89. Poverty – Community Level (2017)

	Alamogordo	Capitan	Carrizozo	Cloudcroft	Mayhill	Ruidoso	Ruidoso Downs
Families Below Poverty	13.0%	18.5%	19.0%	21.2%	0.0%	7.7%	26.0%
Individuals Below Poverty	17.3%	22.8%	29.0%	19.9%	0.9%	15.0%	22.8%
Median Income	\$45,531	\$33,750	\$21,667	\$44,276	N/A	\$41,778	\$27,231

Source: U.S. Census Bureau 2017

N/A: not available

Table 3-90. Disabilities – County Level (2018)

	Chaves County	Eddy County	Lincoln County	Otero County	New Mexico
Disability	10,719	7,587	3,573	10,187	311,365
	16.6%	13.4%	18.5%	16.8%	15.1%
Ambulatory difficulty	5,893	1,169	1,836	5,863	164,668
	9.8%	7.9%	9.9%	10.5%	8.5%

Source: U.S. Census Bureau 2018b*

*American community survey data

In addition to geographic communities, area tribes represent a group with unique ties to the Lincoln NF. As discussed in the chapter 4, the Forest Service works closely with the Mescalero Apache Tribe; this is because this tribe considers the plan area as ancestral lands and their reservation is adjacent to the Lincoln NF. This minority population also meets the meaningfully greater CEQ guidelines for identifying a minority environmental justice population when considered in the context of the surrounding county lands (96.8 percent of the population is of a racial or ethnic minority, based on 2017 U.S. census data) (Grinspoon et al. 2014; U.S. Census Bureau 2017b). This tribe has historic, cultural, and spiritual ties to the Lincoln NF and would be considered in environmental justice analysis.

Table 3-91, below, shows a summary of populations for further environmental justice consideration based on poverty or minority thresholds, or both, following CEQ guidance. These data indicate that area of influence counties and communities have been identified for further environmental justice consideration as detailed below.

Table 3-91. Populations for Further Environmental Justice Consideration

	Percentage of Racial or Ethnic Minority, or Both, as Percentage of Total Population	Population below Poverty as Percentage of Total Population	Consider for Further Environmental Justice Analysis?/Rational
State			
New Mexico	61.8%	20.6%	-
Counties			
Chaves	59.6%	21.2%	Yes – poverty level and total percent minority, (predominantly Hispanic)
Eddy	51.5%	14.6%	Yes – total percent minority (predominantly Hispanic)
Lincoln	36.6%	15.4%	No
Otero	50.2%	21.4%	Yes – total percent minority (predominantly Native American)
Communities			
Alamogordo	44.7%	17.3%	No
Capitan	43.7%	22.8%	No
Carrizozo	51.6%	29.0%	Yes – poverty level and total percent minority (predominantly Native American)
Cloudcroft	34.7%	19.9%	No
Mayhill	31.7%	0.9%	No
Ruidoso	31.3%	15.0%	No
Ruidoso Downs	65.2%	22.8%	Yes – poverty level and total percent minority (predominantly Hispanic)

Source: U.S. Census Bureau 2017

Note: The percentage of ethnic or racial minority was determined by the total population minus those identifying as non-Hispanic white only. The remainder of the population identifies as one or more racial or ethnic minority.

Environmental Consequences for Environmental Justice

Methodology and Analysis Process

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

As discussed in the affected environment section, populations at the county and community level have been identified based on CEQ guidance for further consideration in environmental justice analysis. These include Chaves, Eddy, and Otero Counties; the communities of Carrizozo and Ruidoso Downs; and the Mescalero Apache Tribe. All issues identified during scoping could cause an environmental justice effect; therefore, the effects in this section are organized by the applicable indicators of effect identified below.

Assumptions

- All alternatives in the proposed forest plan are expected to achieve desired conditions that contribute opportunity for local Hispanic and Native American communities.
- When needed, projects implemented on the Lincoln NF will require a site-specific analysis of their potential impacts on local Hispanic and Native American communities and the ability to access traditional uses important to their cultures.
- None of the alternatives prohibit future site-specific project planning that contributes to the social, cultural, and economic opportunity.

Indicators

- Disproportionately high or adverse impacts—Environmental justice examines disproportionately high or adverse health effects resulting from a community’s environment. The CEQ has interpreted health effects with a broad definition: “Such effects may include ecological, cultural, human health, economic or social impacts on minority communities, low-income communities, or Indian Tribes ... when those impacts are interrelated to impacts on the natural or physical environment” (CEQ 1997).
- Exposure pathways—An exposure pathway is how an individual or community is exposed to a particular hazard. Exposures may be cumulative (e.g., low-level exposure over a long period of time leading to a buildup of toxins in the system), or the community may be exposed to multiple hazards (e.g., water contamination and smoke inhalation). Identifying major exposure pathways for an environmental justice community can help understand what health effects they may be facing.
- Community ability to participate in NEPA process—Environmental justice communities may be less likely to be able to access public meetings or Forest Service materials due to factors such as a lack of childcare, working multiple jobs, a lack of transportation, and linguistic barriers. This could affect their ability to participate in the forest plan revision process.

Environmental Consequences for Environmental Justice Common to All Alternatives

Under all alternatives, plan implementation would require further site-specific analysis to determine the level of impacts and potentially affected communities. The analysis below provides a general overview of the type of impacts from proposed management and alternatives.

Disproportionately high or adverse impacts

Under all alternatives, the Forest Service will continue to provide opportunities for use of forest resources by area communities, including resources with important cultural or subsistence value for identified environmental justice communities. This would help ensure these communities do not face adverse impacts due to a lack of resources.

In addition, the Forest Service will continue to provide protection and access to areas of cultural and historic importance under all alternatives, minimizing any disproportionate effect on minority communities, including the Mescalero Apache Tribe.

Access for recreation would also be maintained for all communities; however, the level of access and the recreational experience may be affected by variation in objectives to maintain or decommission roads and standards to maintain levels of access. Recreation availability and access may also be affected by variation in management areas that restrict future motorized access (i.e., recommended wilderness). If the time to reach specific resources or sites was affected due to restrictions on use, the travel cost—that is, the total time and travel cost expenses that people incur to visit a site—could be affected. This may result in impacts on all users, but low-income populations may be disproportionately affected.

Management that restricts the size of groups, such as in a wilderness setting, can also affect the social preference of certain groups to use the Lincoln NF in a large group setting. This is notable for Hispanic populations, which statistically have demonstrated a preference for recreation in larger groups and in more developed settings, which is not compatible with a wilderness setting, than other groups (Kruger et al. 2005).

Exposure pathways

Potential short-term impacts on human health for local communities could occur as a result of wildfire and use of prescribed wildfire as a management tool. Across all alternatives, there would be no difference in how the use of prescribed wildfire affects air quality in terms of protecting human health in the long term. This is because National Ambient Air Quality Standards are set at levels that are necessary to meet that objective, and the Lincoln NF must manage its activities to meet the National Ambient Air Quality Standards (see Air Resources section for additional details). As a result, no long-term adverse impacts would occur on any populations, including those identified for environmental justice consideration, from this activity.

Vegetation treatments to reduce wildfire risk also would occur under all alternatives, as would fire control operations by Forest Service personnel that protect the quality of life for all communities; however, variations in vegetation treatments could affect the potential for large-scale fire and the associated impacts on human health and safety and long-term quality of life of Lincoln NF communities. In addition, there is the potential that rural communities with a higher level of minorities or low-income population may be particularly vulnerable due to a historically lower level of public participation in implementation-level management decisions affecting vegetation management (see, for example, Davies et al. 2018).

Community ability to participate in NEPA process

Throughout the planning process, the Forest Service has provided opportunities for public involvement and input. Meetings have been held throughout the area of influence, including in the regional population center of Alamogordo and in the small communities surrounding the Lincoln NF. Advertising for public meetings included a variety of methods to ensure that those without access to computers or internet were informed about the process. Methods included notices on the public website, newspaper advertisements, posting in public buildings, and radio advertisements. Documents for public review were available at public buildings, and comments were accepted in hardcopy and electronic format.

The Forest Service also has worked closely with local stakeholders, including but not limited to local government and tribes, to ensure representation in the planning process.

Details of the public involvement process are included in chapter 4, Consultation and Coordination. Community ability to participate in the process is the same across all alternatives and is therefore not discussed in further detail in the alternative-specific discussion below.

Environmental Consequences for Environmental Justice Under Alternative A

Disproportionately high or adverse impacts

Under alternative A, dispersed and developed recreational opportunities and access for resource use would be available. The lack of forestwide standards or guidelines to direct recreation use and total road miles would result in site-specific variation in management dictated by management areas. As a result, the potential for impacts on access for forest resources and recreation for environmental justice communities would vary on a site-specific basis.

Similarly, lack of objectives for vegetation could result in potential for long-term impacts on the availability of forest resources with traditional cultural and medical uses for environmental justice communities, such as the Mescalero Apache Tribe. The level of impacts would vary on a site-specific basis, based on location of vegetation treatments.

Under alternative A, no areas would be managed as recommended wilderness. This would limit any impact on environmental justice communities related to their ability to use preferred recreation sites. It would minimize constraints on time and costs to travel to recreation; however, communities valuing solitude and naturalness for cultural uses may have limited options in the long term.

Exposure pathways

Alternative A does not provide a forestwide directive for fuels treatments, such as mechanical thinning or prescribed burning. As a result, while vegetation management actions could move some vegetation communities closer to desired conditions and more resilient to wildfire, variations in vegetation treatments may affect the magnitude of fire resilience on the Lincoln NF as a whole over the long term. This could differentially affect the long-term quality of life of Lincoln NF beneficiaries and identified environmental justice communities.

Environmental Consequences for Environmental Justice Common to Alternatives B, C, D, and E

Disproportionately high or adverse impacts

All action alternatives include plan components to promote collaboration and enhance communication with stakeholders (see for example, desired conditions and objectives under the Collaboration, Partnerships, Education, and Relationships section of the proposed plan). This would support collaboration with local communities to ensure that plan implementation takes into account relevant issues and considers the needs for these populations, including those identified as environmental justice communities.

In addition, plan language recognizes and provides for continued traditional and cultural uses for area communities and tribal populations. This direction would enhance support for access to forest products with traditional cultural and medical uses (i.e., medicinal plants, piñon nuts, and teepee poles), and limit the potential for adverse impacts on communities dependent on these resources. In addition, this management supports the continued availability of forage for livestock grazing, which represents an important traditional cultural use. See further discussion of traditional and cultural values in the socioeconomic section.

Variation in recreation and transportation plan components by alternative would result in varying potential for impacts on recreation access for environmental justice communities. All action alternatives would also contain an objective to maintain 100 miles of level 3 passenger car roads and 60 miles of level 2 high-clearance roads per year. Alternative E would involve a higher frequency of road maintenance and

prioritize land acquisitions that improve recreational access. These actions would provide improved access to visitors, compared with alternative A. This would decrease the potential for adverse impacts on environmental justice communities related to the ability to access resources.

All action alternatives would include a greater level of recommended wilderness than alternative A. Recommending 40,500 acres under alternatives B and D could result in impacts on the access for recreation and the type of recreational uses available, which may disproportionately affect environmental justice communities in terms of costs for access. The greatest potential for impacts would occur under alternative C, with 402,000 acres of recommended wildernesses, while the lowest impacts would occur under alternative E, with only 21,900 acres of recommended wilderness. While the ability to use specific sites for preferred recreation may be affected, it is anticipated that under all alternatives a variety of recreational experiences would remain available. In addition, communities valuing solitude for cultural uses would have more opportunities for solitude when compared to Alternative A, especially under Alternative C.

Exposure pathways

All action alternatives propose to treat up to 200,000 acres with prescribed wildfire over 10 years. Compared with no specific vegetation treatment objectives under alternative A, emissions from these alternatives would be greater and potentially have more short-term impacts for local communities. Poor air quality can negatively affect forest health, water quality, scenic resources, and fisheries that Lincoln NF users depend on or value.

Compared with alternative A, all action alternatives propose a greater amount of mechanical vegetation treatment, ranging from 6,500 to 19,500 acres over 10 years. The greatest level of potential mitigation of fuel and the associated risks for area communities would occur under alternatives B, D, and E, proposing between 11,000 and 19,500 acres of treatment over 10 years. Alternative C would have a reduced level of risk mitigation for local communities. This is because of the lower level of potential treatment (6,500 to 12,500 acres) due to the reliance on natural processes.

Treatments would contribute to the safety of community homes and infrastructure and thereby increase quality of life in communities next to the Lincoln NF, particularly those on the wildland-urban interface, where fire-risk is high. Smoke can cause health problems in humans and wildlife, and it can adversely affect visibility, all of which can adversely affect the quality of life. The impacts on specific communities cannot be determined at this time due to a lack of site-specific treatment locations.

Cumulative Environmental Consequences for Environmental Justice

Past, present, and reasonably foreseeable plans and actions with potential to affect the cumulative setting for local communities are detailed in the Socioeconomic section and in specific resource and resource use sections. With regard to environmental justice, the potential for cumulative contributions to significant adverse impacts on specific communities would be dictated at the implementation level.

Short-Term Uses and Long-Term Productivity

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

This DEIS discloses the analysis of effects for a range of alternatives, including no action. It considers effects on the significant issues and other resources for this time frame. Overall, under all alternatives, designing and implementing projects and activities consistent with the direction in this forest plan would ensure the short-term uses, long-term productivity, and ecological integrity and diversity of National Forest System lands on the Lincoln NF.

Unavoidable Adverse Effects

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

Irreversible and Irrecoverable

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

None of the alternatives would cause an irreversible or irrecoverable commitment of resources.

Other Required Disclosures

The regulations for implementing the National Environmental Policy Act at 40 CFR 1502.25(a) direct “to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with . . . other environmental review laws and executive orders.” As a proposed Federal project, the proposed plan decisions are subject to compliance with other Federal and State laws. Determinations and decisions made in the proposed plan have been evaluated in the context of relevant laws and executive orders. Various State and Federal agencies collaborated throughout the development of the proposed plan.

The following actions have been taken to document and ensure compliance with laws that require consultation or concurrence with other Federal agencies:

- Endangered Species Act, section 7—The Forest Service is in consultation with the U.S. Department of the Interior, Fish and Wildlife Service, regarding federally listed threatened, endangered, and proposed species and designated and proposed critical habitat.
- National Historic Preservation Act—Consultation with the New Mexico State Historic Preservation Officer is mandated by section 106 of the NHPA. Region 3 of the Forest Service also subscribes to a programmatic agreement with the New Mexico State Historic Preservation Office for ways to consult. The various appendices of that programmatic agreement are particularly directed to Region 3 projects and issues (Forest Service 2019b).
- Government-to-government consultation was completed with Native American tribes who have aboriginal territory of the lands that are now part of the Lincoln NF. This is required by the NHPA, Executive Orders 13007 and 13175, and the 2010 First Amended Programmatic Agreement (Forest Service 2010b).

Chapter 4. Public Engagement

Introduction

The 2012 Planning Rule places great emphasis on collaboration and public involvement during the planning process and the plan's implementation. The Forest Service has conducted public engagement throughout each phase of the planning process. Following the guidance in the 2012 Planning Rule, this engagement has included collaboration with tribes, cooperating agencies, youth, underrepresented populations (including low-income and minority), private landowners, local, State, and Federal agencies, nongovernmental organizations, and local governments and soil and water conservation districts.

The Forest Service's vision of robust public engagement initially came from a series of community conversations before the revision process began in May 2015. From those conversations, the following themes emerged:

- Stakeholders desire a clear understanding of their role in the decisionmaking process, especially concerning their influence in the process and how their comments are addressed.
- Safe opportunities for shared learning among diverse stakeholders should be created by using a third-party professional facilitator, being inclusive, and having a clear focus and purpose.
- Local culture and customs are important.
- Good communication is essential; be open, transparent, and timely, speak plainly, and use multiple communication methods, including emails, letters, phone calls, social media, local media, a website, and field trips, and provide meeting materials and summaries for those who cannot attend.

Public Engagement Activities and Milestones by Date

Following is a summary of public engagement activities organized by milestones to date that illustrate the Lincoln NF's public engagement since 2015. See table 4-1 for a list of these milestones, including tribal consultation milestones. Detailed tribal consultation since the plan revision began in 2015 is available in the administrative record under Consultation.

Public outreach meeting notes and additional information can be found in the planning record or on the website: <https://www.fs.usda.gov/detail/lincoln/landmanagement/planning/?cid=STELPRD3814307>. Comments received since the publication of the notice of intent to begin plan revision can be found in the project record.

March 2015: Plan Revision Kickoff

During March 2015, Forest Service personnel held a total of five public meetings held in various locations on the Lincoln NF to announce the kickoff of plan revision activities, to inform the public about the plan revision process and timeline, and to obtain comments from the public on issues important to them during the plan revision process.

June 2018: Draft Assessment Release

In June 2018, the Forest Service released the draft Lincoln National Forest Assessment Report, in which it presented and evaluated information about relevant ecological, economic, and social conditions, trends, and risks to sustainability and their relationship to the 1986 Forest Plan, within the context of a broader landscape. Developing the Lincoln NF assessment allowed the Forest Service to evaluate current

management and identify needs for change in the plan revision. The agency held four public meetings in July 2018 to present the draft assessment to the public and to obtain comments to assist with developing the final assessment.

2018–2019: Wilderness Inventory

The draft inventory criteria and the draft evaluation criteria posted to the website were released June 28, 2019, and the comment period closed on July 31, 2019. Draft inventory maps of lands that may be suitable for inclusion in the National Wilderness Preservation System and the draft inventory process paper were released in September 2019. The draft maps included three broad categories— size, roads, and improvements. The comment period for the draft inventory maps and process paper ended on October 20, 2019.

2019–2020: Wilderness Evaluation

Comments received during the 2019 informal comment periods on the draft wilderness inventory evaluation criteria, maps, and process paper informed the final inventory maps. In addition to the static maps, the Forest Service released an interactive collaborative mapping tool online. The Forest Service conducted meetings with each ranger district during November to December 2019. The evaluation criteria were applied to the phase 3 inventory maps, and the final inventory process paper and maps were posted on January 21, 2020. The public comment period for the final inventory maps and process paper was from March 10 to April 30, 2020.

2018–2020: Species of Conservation Concern

Species of conservation concern are species (other than federally recognized threatened, endangered, proposed, or candidate species) that are known to occur in the plan area. The regional forester has determined that the best available scientific information indicates substantial concern about these species' capability to persist over the long term in the plan area. Designating species of conservation concern ensures that plan components provide the coarse filter and fine filter ecological conditions necessary for the species' viability on the national forest.

Lincoln NF staff developed a proposed species of conservation concern list and presented that list in the draft assessment report that was released in May 2019. Additions have been made to the list several times, based on public comments, more information becoming available, and the release of the directives in the final Forest Service Handbook 1909.12.

Species of conservation concern are ultimately a regional forester decision, unlike other pieces of the plan revision process for which the forest supervisor is the responsible official. The regional forester concurred with the proposed species of conservation concern list in November 2019. The list does not become final until the record of decision for the proposed forest plan is signed.

May 2019: Needs for Change Development, Final Assessment, and Draft Proposed Forest Plan

The Lincoln NF published a notice of intent in the *Federal Register* on May 30, 2019 (84 *Fed. Reg.* 104, 2019), of the needs for change statement, the final assessment, and the draft proposed forest plan. The public scoping period lasted 60 days, and the Forest Service held four scoping meetings during that period. These meetings informed the public about the needs for change and the draft proposed forest plan.

2019–2020: Development of the Draft Plan and Alternatives

The Lincoln NF initiated the development of the draft EIS in February 2020. Components of the draft plan that were further developed and refined between 2019 and 2020 included the plan language, the location, and descriptions of proposed management areas on the Lincoln NF; timber suitability, including modeling and calculations by alternative; objectives and measures; and plan monitoring.

The significant issues and proposed alternatives were developed further throughout this time frame. Lincoln NF resource specialists compiled and addressed public comments received during the scoping comment period in 2019 on the release of the preliminary draft plan.

Table 4-1. Public Engagement Milestones

Dates	Meeting Type	Description¹	Location
3/6/2020	2020 plan and EIS update presentation to the Lincoln National Forest Allotment Owners Association	Targeted Forest Plan Revision meeting	Alamogordo, New Mexico
12/13/2019	Interview with the <i>Alamogordo Daily News</i> on the wilderness process	General	Alamogordo, New Mexico
11/14/2019	Briefed Otero County Commissioners on cooperating agency status	Targeted Forest Plan Revision meeting	Alamogordo, New Mexico
9/14/2019	Update presentation on the proposed forest plan, need for change and wilderness process to the Lincoln National Forest Allotment Owners Association	Targeted Forest Plan Revision meeting	Alamogordo, New Mexico
7/19/2019	Public scoping meeting for the final assessment, needs for change document, and draft proposed forest plan	General	Alamogordo, New Mexico
7/18/2019	Public scoping meeting for the final assessment, needs for change document, and draft proposed forest plan	General	Cloudcroft, New Mexico
7/17/2019	Public scoping meeting for the final assessment, needs for change document, and draft proposed forest plan	General	Carlsbad, New Mexico
7/16/2019	Public scoping meeting for the final assessment, needs for change document, and draft proposed forest plan	General	Ruidoso, New Mexico
7/12/2019	Interview with the <i>Alamogordo Daily News</i> on the wilderness process	General	Alamogordo, New Mexico

Dates	Meeting Type	Description¹	Location
6/24/2019	Briefed the Joint Land Use Study, a cooperative planning effort conducted as a joint venture between an active military installation and surrounding jurisdictions	Targeted Forest Plan Revision meeting	Alamogordo, New Mexico
10/2018	Community meetings to discuss “substantially noticeable criteria” for the wilderness inventory	General	Alamogordo, Carlsbad, Cloudcroft, Ruidoso, and Weed, New Mexico
10/26/2016	Desired conditions workshop	General	Smokey Bear and Sacramento Ranger Districts
8/26/2016	Otero County Fair	Open house	Alamogordo, New Mexico
6/30/2016	Mescalero Youth	Youth outreach	Mescalero, New Mexico
3/22/2016	Meeting with Tularosa Rotary Club	Targeted Forest Plan Revision meeting	Tularosa, New Mexico
1/15/2016	Rock Hounds Club	General	Las Cruces, New Mexico
12/4/2015	El Paso, Texas State Parks	General	El Paso, Texas
12/1/2015	National Park Service	Targeted Forest Plan Revision meeting	White Sands National Monument
11/19/2015	White Sands Rotary Club	General	Alamogordo, New Mexico
11/2015	Public workshops	General	Carlsbad, Mayhill, Alamogordo, and Carrizozo, New Mexico and Eastern New Mexico University
10/21/2015	Carlsbad Senior Center	General	Carlsbad, New Mexico
10/13/2015	Meeting with the Village of Cloudcroft	Targeted Forest Plan Revision meeting	Cloudcroft, New Mexico
9/30/2015	Meeting with the Southwest Consolidated Sportsmen’s Group	Targeted Forest Plan Revision meeting	Las Cruces, New Mexico
9/26/2015	Public Lands Day—March for Parks	Open house	Carlsbad, New Mexico
9/24/2015	Alamo Senior Center Health Fair	Open house	Alamogordo, New Mexico
9/16/2015	Meeting with the Upper Hondo and Carrizozo Soil and Water Conservation District Board	Targeted Forest Plan Revision meeting	Capitan, New Mexico
9/16/2015	Meeting with the Otero County Wildland-Urban Interface Working Group	Targeted Forest Plan Revision meeting	Cloudcroft, New Mexico
9/15/2015	Meeting with the Lincoln County Commission	Targeted Forest Plan Revision meeting	Ruidoso, New Mexico

Dates	Meeting Type	Description¹	Location
8/25/2015	Meeting with the Lincoln County Wildland-Urban Interface Working Group	Targeted Forest Plan Revision meeting	Ruidoso, New Mexico
7/30/2015	Information booth at the Ruidoso Library	Open house	Ruidoso, New Mexico
July 2015	Multiple meetings with college students at New Mexico State University, Alamogordo Campus	Youth outreach	Alamogordo, New Mexico
7/8/2015	Meeting with Natural Resource Conservation Service Board members	Targeted Forest Plan Revision meeting	Alamogordo, New Mexico
7/7/2015	Public presentation at Eastern New Mexico University	Open house	Ruidoso, New Mexico
5/11/2015	Meeting with the Mesilla Valley Fly Fishers	Targeted Forest Plan Revision meeting	Las Cruces, New Mexico
4/23/2015	Tularosa High School	Youth outreach	Tularosa, New Mexico
4/22/2015	Meeting with college students and staff at New Mexico State University, Alamogordo Campus	Youth outreach	Alamogordo, New Mexico
4/7/2015	Public presentation at Eastern New Mexico University	Open house	Ruidoso, New Mexico

¹ The description column describes the meeting goal. For example, general meetings were those targeted to the general public and open to all; targeted Forest Plan Revision meetings were those with specific user groups or interested parties who invited the planning team to discuss Forest Plan Revision; open houses were informal public meetings where the Forest Plan Revision team made themselves available to answer questions and hand out informational documents.

Cooperating Agencies

Cooperating agencies are various Federal, state, local, and tribal governmental entities that lend technical assistance or other resources to the development of the draft forest plan. The National Environmental Policy Act of 1969 (42 U.S.C. 4231 et seq.) allows certain governmental organizations to be granted cooperating agency status when the agency has “special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment” (40 CFR 1508.5). All decision-making authority for management of the National Forest is held by the Forest Service and the U.S. Department of Agriculture.

During the forest plan revision process, the Lincoln NF solicited interest from Federal, state, local and tribal governments in their being cooperating agencies for the plan revision process. Currently, three agencies signed on as cooperating agencies in early 2020. The cooperating agencies for the Lincoln NF’s plan revision process include:

- Otero Soil and Water Conservation District
- New Mexico Game and Fish
- New Mexico Department of Agriculture

Cooperating agencies attended technical and general public meetings to engage in discussions and provide input regarding initial work products with the Lincoln NF, other cooperating agencies,

nongovernmental groups, and the general public. They also provided feedback on pre-draft and draft products, technical expertise, information on the Lincoln NF's forest plan's consistency with their own management plans (if they exist), and represented the interests and needs of their constituents.

Tribes

Tribal government to government consultation has been with the Mescalero Apache. The Hopi Tribe and the Pueblo of Zuni were invited to consult. The Hopi Tribe declined, and the Pueblo of Zuni did not respond. The Hopi and Zuni had additional opportunities to comment on the Assessment, Need for Change and Preliminary Draft Plan, but no comments were received.

The Mescalero Apache have expressed interest in maintaining access to sacred places and resource gathering sites. They also have concern for vegetation management across boundaries to prevent insect and disease transmission and the prevention of wildfire. The draft plan contains direction to develop collaborative proposals and partnerships with American Indian Tribes to implement projects of mutual benefit and economic development. Plan direction address insect and disease transmission and the prevention of wildfire on to reservation lands.

Comment Review Process

In addition to the formal scoping comment period that began in May 2019, the Forest Service has informally requested comments from the public at each milestone and with the release of each draft product during the plan revision process to date. These comments were integral fore developing the draft land management plan and alternatives for the environmental analysis process. Comments were submitted via email, via the U.S. Postal Service or other carrier, in person to the Forest Service, to the Forest Service internet portal, in person at public meetings, or via fax.

The comment analysis and response application is a web-based tool that the Forest Service uses to track, analyze, and respond to public comments on projects. One of the most useful features of the tool is the public reading room, which allows the public to read any or all of the comments received on a particular project. Use of this public reading room has been integral to the Forest Service's efforts to be open and transparent during plan revision.

In addition to the public reading room function, the Forest Service used the comment analysis and response application to track, analyze, and summarize comments. Interdisciplinary teams assigned resource- or process-specific codes to each comment. This allowed the comments to be easily sorted and summarized and the issues to be identified. These issues were then used to drive alternatives development during the environmental analysis process.

Interdisciplinary teams analyzed comments on the notice of intent in 2019. The teams consisted of core planning team members; Forest Service specialists at the Forest Supervisor's office and district offices; district rangers; staff officers; cooperating agencies; and the Forest Supervisor. The comment content analysis followed a systematic process of reading, coding, and summarizing the submitted comments. This process ensured that every comment was read, analyzed, and considered. The comments that were most helpful were unique and specifically related to the particular topic or product released for public review.

After the comment period on the draft EIS, the Forest Service will review the comments to determine whether changes need to be made to the draft plan or the EIS. Forest Service responses to substantive comments will be included in this appendix in the final EIS.

Chapter 5. Preparers, Consultation, and Coordination

Preparers and Contributors

The list of preparers below is limited to those people who were members of the interdisciplinary team working on the final documents or who made significant contributions during the draft EIS (table 5-1). Preparation of these documents could not have been completed without the support and assistance of numerous employees on the Lincoln NF past employees who have retired or moved to other positions, and colleagues in the regional office. In addition, Environmental Management and Planning Solutions, Inc assisted with preparation of the draft EIS. We also recognize the regional and forest leadership teams as providing guidance during this process.

Table 5-1. List of preparers

Name	Role
Lincoln National Forest	
Travis Moseley	Forest Supervisor
Diane Prather	IDT Leader, Designated Areas, Wilderness Areas, Wild and Scenic Rivers
David Baker	Vegetation Communities, Fire and Fuels, Timber Suitability
Andres Bolanos	Infrastructure, Roads, and Trails
Jasper Colcord	Range
Neil Fairbanks	Geographical Information Services
Wesley Hall	Air Quality, Vegetation Communities, Fire and Fuels
Pete Haraden	Water Resources and Riparian Areas
Jennifer Hickman	Soils, Geologic Hazards
Lisa Jones	Infrastructure, Roads, and Trails, Scenery, Recreation, Designated Areas, Wilderness Areas, Wild and Scenic Rivers, Minerals and Nonrenewable Energy Resources
Peggy Luensmann	NEPA Coordinator
Laura Rabon	Public Affairs Coordinator
Aurora Roemmich	Botany
Bill Sapp	Cultural and Historic Resources/Tribal Liaison
Rhonda Stewart	Wildlife and Fish
Aaron Stockton	Caves and Karst Resources
Environmental Management and Planning Solutions, Inc	Subcontractor assisting with draft EIS preparation
Regional Office	
David Anderson	Regional Analyst, Analysis/VDDT modeling Lead
Marjorie Apodaca	Engineering Staff, Regional Transportation Planner
Ken Born	Regional Social Scientist
Roy Jemison	Regional Hydrologist, Soil/Water Lead
Kyung Koh	Recreation Specialist, Recreation Lead
Yvette Paroz	Fisheries Program Leader
Sadie Runge	Fire Specialist, Fire Ecology Lead
Ernest Taylor	Wildlife Biologist, Species Diversity Lead
Jack Triepke	Regional Vegetation Ecologist, Vegetation/Air Lead
Jim Youtz	Regional Silviculturist, Timber Suitability/Calculation modeling Lead
Gary Ziehe	Regional Rangeland Management Specialist

Name	Role
Contractor-Environmental Management and Planning Solutions Inc. Core Team	
Holly Prohaska	Project Manager
Matthew Smith	Assistant Project Manager. IDT Lead, Riparian Areas, Water Quality and Water Resources
Kevin Rice	Quality Assurance Lead
Jennifer Thies	Quality Assurance and Quality Control
Kevin Doyle	Forest Planning Specialist, Cultural and Historic Resources Lead, Areas of Tribal Importance Lead
Zoe Ghali	NEPA Specialist, Social and Economic Conditions, Environmental Justice
Contractor-Environmental Management and Planning Solutions Inc. Interdisciplinary Team	
Theresa Ancell	Lands, Lands Special Uses
Ann Anderson	Fire and Fuels, Sustainable Forestry and Forest Products
Lindsay Chipman	Wildlife, Fish and Plants
Amy Cordle	Air Resources
Sean Cottle	Designated Areas Lead
Francis Craig	Minerals and Mining, Cave and Karst Resources
Peter Gower	Transportation and Forest Access, Facilities, and Infrastructure
Derek Holmgren	Soils Lead
Carter McBride	Planning Record
Kim Murdock	Writer/ Editor
Julie Remp	Wildlife, Fish and Plants Lead
Marcia Rickey	GIS Lead
Cindy Schad	Word Processor
Josh Schnabel	Recreation, Scenery
Kirsti Settas	Soils
Andy Spellmeyer	Sustainable Rangelands and Livestock Grazing
Alexis Tarantino	Comment Analysis, Designated Areas
Morgan Trieger	Upland Vegetation Communities
Adam Young	Cultural and Historic Resources, Areas of Tribal Importance Lead
Randy Varney	Writer/ Editor Lead

Consultation and Coordination

The Forest Service consulted with the following federally recognized tribes, Federal, State, and local agencies; special interest groups; and individuals during development of this draft EIS.

Federally Recognized Tribes and Pueblos

Mescalero Apache Tribe

There are no other tribes that we have traditionally consulted with. And no other invitations were sent.

Federal and State Agencies

Bureau of Land Management

New Mexico Land Grant Council

New Mexico Game and Fish

National Park Service

Holloman Air Force Base

Natural Resources Conservation Service

White Sands Missile Range	New Mexico State Lands Office
Fort Bliss Army Base	New Mexico Environment Department
New Mexico State Forestry	National Science Foundation
New Mexico Department of Agriculture	New Mexico Department of Transportation
New Mexico State Historic Preservation Office	New Mexico Department of Game and Fish

County and Local Government and Agencies

Otero County	Village of Ruidoso
Lincoln County	Upper Hondo and Carrizozo Soil and Water Conservation District
Chaves County	Otero Soil and Water Conservation District
Eddy County	City of Alamogordo
Village of Cloudcroft	

Nongovernmental Organizations and Others

- Southwest Consolidated Sportsmen's Group
- Mesilla Valley Fly Fishers
- Rock Hounds
- Lincoln National Forest Allotment Owners Association

Cooperating Agencies with Memoranda of Understanding

- New Mexico Department of Game and Fish
- New Mexico Department of Agriculture
- Otero Soil and Water Conservation District

Distribution of the Environmental Impact Statement

At the time of formal release for this draft EIS, it has been distributed to, or made electronically available to, individuals and groups who specifically requested a copy of the document or commented during public involvement opportunities. In addition, copies were sent (or in some cases made electronically available) to Federal agencies, federally recognized tribes, State and local governments, and organizations that have requested to be involved in the development of this analysis.

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Glossary

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

Administratively closed roads: The Forest Service defines these roads as maintenance level 1 roads; as defined in the Forest Service Handbook 7709.59, section 62.32, “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. . . . Roads receiving level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic.”

The only traffic management strategy that is appropriate for maintenance level 1 roads is to prohibit them.

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

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

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

Best management practices: Methods, measures, or practices selected by an agency to meet its nonpoint source control needs. Best management practices include structural and nonstructural controls and operation and maintenance procedures. They can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (36 Code of Federal Regulations 219.19).

Bulk density: The weight of soil in a given volume, which increases with compaction.

Candidate species: For species under the purview of the U.S. Fish and Wildlife Service, a species for which the agency possesses sufficient information on vulnerability and threats to support a proposal to list it as endangered or threatened, but for which no proposed rule has yet been published by the agency’s personnel (36 Code of Federal Regulations 219.19). For species under the purview of the National Marine Fisheries Service, a candidate species is one of the following:

- The subject of a petition to list as threatened or endangered and for which the National Marine Fisheries Service has determined that listing may be warranted, pursuant to section 4(b)(3)(A) of the Endangered Species Act (16 U.S. Code 1533(b)(3)(A))
- Not the subject of a petition but for which the National Marine Fisheries Service has announced in the *Federal Register* the initiation of a status review

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

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

Climax species, also called late seral species: Plants that will remain essentially unchanged in terms of species composition for as long as a site remains undisturbed.

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

Critical habitat: For a threatened or endangered species, one of the following:

- The specific geographical area occupied by the species, at the time it is listed and in accordance with the provisions of section 4 of the Endangered Species Act (16 U.S. Code 1533), on which are found those physical or biological features essential to the conservation of the species and those that may require special management considerations, or protection
- Specific areas outside the geographical area occupied by the species at the time it is listed, in accordance with the provisions of section 4 of the Endangered Species Act (16 U.S. Code 1533), upon a determination by the Secretary of the Interior that such areas are essential for the conservation of the species (Endangered Species Act, section 3 (5)(A) [16 U.S. Code 1532 (3)(5)(A)])

Critical habitat is designated through rulemaking by either the Secretary of the Interior or of Commerce (Endangered Species Act, section 4 (a)(3) and (b)(2) [16 U.S. Code 1533 (a)(3) and (b)(2)]).

Cultural resources: The present expressions of human culture and the physical remains of past activities, such as buildings, structures, districts, landscapes, archaeological sites, and objects. They can also include locations that can be significant in national, regional, or local history, architecture, archaeology, engineering, or culture. Cultural resources include sacred sites and natural features significant to contemporary communities or peoples.

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

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

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

Designated area: An area or feature identified and managed to maintain its unique special character or purpose. Some areas may be designated only by statute and some 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 recreation 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 Code of Federal Regulations 219.19).

Designated road, trail, or area: A National Forest System road, trail, or lands designated for motor vehicle use, pursuant to 36 Code of Federal Regulations 212.51 on a motor vehicle use map (36 Code of Federal Regulations 212.1).

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

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

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

Ecosystem services: Benefits people obtain from ecosystems, such as the following:

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

Edaphically influenced: Resulting from or influenced by soil factors, such as salinity, alkalinity, or drainage, as opposed to climatic factors.

Endangered species: Any species that the Secretary of the Interior or the Secretary of Commerce has determined to be in danger of extinction throughout all or a significant portion of its range. Endangered species are listed at 50 Code of Federal Regulations 17.11, 17.12, and 224.101.

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

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

Eutrophication: An excessive amount of nutrients in a waterbody, which depletes the level of oxygen, causing plant species to proliferate.

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

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

- Fire regime I—0 to 35-year frequency and low severity (surface fires most common, isolated torching can occur) to mixed severity (less than 75 percent of dominant overstory vegetation replaced)
- Fire regime II—0 to 3-year frequency and high severity (greater than 75 percent of dominant overstory vegetation replaced)
- Fire regime III—35- to 100+ year frequency and mixed severity
- Fire regime IV—35- to 100+ year frequency and high severity
- Fire regime V—200+ year frequency and high severity.

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

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

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

Frequent fire-dependent ecosystem: A vegetation community that requires a fire regime 1 (a greater than 35-year fire frequency) to maintain its natural function, structure, and species composition.

Headcutting: In stream geomorphology, an erosional feature of some intermittent and perennial streams with an abrupt vertical drop, also known as a knickpoint, in the streambed. The knickpoint where a head cut begins can be as small as an overly steep riffle zone or as large as a waterfall. When it is not flowing, the head cut resembles a very short cliff or bluff. A small plunge pool may be at the base of the head cut due to the high energy of falling water. As erosion of the knickpoint and the streambed continues, the head cut migrates upstream. Headcutting often generates or worsens stream incisement.

High-risk soils: Soils that have a high departure and are trending away from reference conditions, as defined by the Lincoln NF ecological assessment.

Incisement: The narrow erosion caused by a river or stream that is far from its base level.

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

Historic property: Any prehistoric or historic district, site, building, structure, or object on or eligible for listing on the National Register of Historic Places.

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

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

Impaired waters: Polluted or degraded waterbodies (for example, lakes, streams, and segments of streams) that do not meet State water quality standards.

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

Leadership in Energy and Environmental Design Certification: Provides independent verification of a building or neighborhood's green features, allowing for the design, construction, operations and maintenance of resource-efficient, high-performing, healthy, cost-effective buildings.

Mechanical damage: Generally, mechanical damage refers to physical damage inflicted on vegetation from trampling. This can be crushing, breaking, or otherwise damaging aboveground or underground plant parts.

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

Mollisol soils: Temperate grassland soils with a dark, humus-rich surface layer, containing high concentrations of calcium and magnesium.

Monitoring: A systematic process of collecting information to evaluate the effects of actions or changes in conditions or relationships (36 Code of Federal Regulations 219.19).

Motor vehicle use map: A map reflecting designated roads, trails, and areas on an administrative unit or a ranger district of the National Forest System (36 Code of Federal Regulations 212.1).

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

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

Natural fire regime: The fire regime that existed before humans facilitated the interruption of frequency, extent, or severity of fires.

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

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

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

Perennial stream: A stream or reach of a channel that flows continuously, or nearly so, throughout the year and whose upper surface is generally lower than the top of the zone of saturation near the stream. These streams are identified as solid blue on the U.S. Geological Survey 7 1/2-minute quadrangle maps.

Plan components: The parts of a land management plan that guide future project and activity decision-making. Specific plan components may apply to the entire plan area, to specific management areas or geographic areas, or to other areas identified in the plan. Every plan must include the following components: desired conditions, objectives, standards, guidelines, and suitability of lands. A plan may also include goals as an optional component.

Plant propagule pressure: Propagule pressure, or introduction effort, is a measure of the number of individuals introduced into a region they are not native to (Lockwood et al. 2005; Carlton 1996). Propagules are any plant material used for plant propagation, such as seeds, fruits, or stem or root fragments.

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

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

Projected timber sale quantity and projected wood sale quantity: The estimated amounts of timber and other wood products that are expected to be produced under a plan's direction, based on objectives; thus, the estimation of these two quantities must be consistent with the components of the final plan or the unique mix of components under each alternative, and the fiscal and organizational capability of the unit.

The planned management objectives are also limited, based on constraints described in Forest Service Handbook 1909.12, chapter 60, section 64.32.

Properly functioning condition: A method for assessing the physical functioning of riparian and wetland areas. The term is used to describe both the assessment process and a defined, on-the-ground condition of a riparian-wetland area. In either case, properly functioning condition defines a minimum or starting point.

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

Reference condition: An ecosystem with characteristic disturbances, such as fire, insects, and disease, in characteristic climate conditions. This ecosystem would have characteristic seral state proportions, in the absence of human use.

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

Responsible official: The authority responsible for overseeing the planning process and approving a plan, plan amendment, and plan revision (36 Code of Federal Regulations 219.62).

Riparian area: A three-dimensional transition zone between two adjoining communities that includes terrestrial and aquatic ecosystems that extend into the groundwater, above the canopy, outward across the floodplain, up the near-slopes that drain to the water, laterally into the terrestrial ecosystem, and along the water course at variable widths (36 Code of Federal Regulations 219.19).

Riparian management zone: The portion of a watershed around lakes, perennial and intermittent streams, and open water wetlands that has characteristic riparian vegetation and provides riparian function.

Road decommissioning: Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 Code of Federal Regulations 212.1). It includes a range of activities, from ripping and seeding to full reclamation by restoring the original topography. Road decommissioning results in the removal of a National Forest System road from the forest transportation atlas.

Road maintenance levels:

- Maintenance level 1—Roads closed to vehicular traffic intermittently for periods that exceed 1 year; can be operated at any other maintenance level during periods of use
- Maintenance level 2—Roads open and maintained for use by high-clearance vehicles; surface smoothness is not a consideration and most have native material surface (not paved and no aggregate surface)

- Maintenance level 3—Roads open and maintained for use by standard passenger cars; most have gravel surface
- Maintenance level 4—Roads open and maintained for use by standard passenger cars and to provide a moderate degree of user comfort and convenience at moderate travel speeds; most are paved or have an aggregate surface
- Maintenance level 5—Roads open and maintained for use by standard passenger car operators

Scenery management system: A classification system that recognizes scenery as the visible expression of dynamic ecosystems functioning within places that have unique aesthetic and social values. It recognizes that naturally occurring features, positive scenery attributes associated with social, cultural, historic, and spiritual values—such as human presence and the built environment—can be valued elements of the scenery. It also allows for “seamless” analysis and conservation beyond National Forest System lands into adjacent communities and other jurisdictions, through the application of varying scenery “themes” within a single analysis. It is structured to emphasize natural appearing scenery.

Scenic character: A combination of the physical, biological, and cultural images that gives an area its scenic identity and contributes to its sense of place. Scenic character provides a frame of reference from which to determine scenic attractiveness and to measure scenic integrity (36 Code of Federal Regulations 219.19).

Scenic integrity objective: A desired level of excellence, based on physical and sociological characteristics of an area; the degree of acceptable alterations to the valued attributes of the characteristic landscape. Objectives are deemed very high, high, moderate, or low.

Section 106 process: Regulations implementing section 106 of the National Historic Preservation Act of 1966, which describe the procedures for identifying and evaluating historic properties, for assessing the impacts of Federal actions on historic properties, and for project proponents consulting with appropriate agencies to avoid, reduce, or minimize adverse effects.

Seral stage (seral state): One of a series of transitional plant communities that develop during gradual successive change following disturbance.

Seral state proportion: The relative amounts of an ecological system or type in generalized structure, age, and size classes.

Silviculture: The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands using species silvics to meet the diverse needs and values of landowners and society on a sustainable basis. Under this definition, silvicultural treatments include all management activities that control the establishment, growth, composition, health, and quality of forested lands to achieve stated land management objectives. The use of prescribed fire on forested lands qualifies as a silvicultural treatment in the context of this definition.

Site potential: Plant communities that may become established on an ecological site, taking into account the current climate and physical environment and the competitive potential of native plant species.

Soil condition rating: A qualitative rating developed in the Southwestern Region of the Forest Service that provides an overall picture of soil condition vital in sustaining ecosystems. It is based on three soil functions: the ability of soil to resist erosion, infiltrate water, and recycle nutrients. There are four soil condition ratings, as follows:

- Satisfactory—Soil function is being sustained and soil is functioning properly and normally
- Impaired—The ability of the soil to function properly and normally has been reduced, or there exists an increased vulnerability to degradation
- Unsatisfactory—Degradation of vital soil functions result in the inability of the soil to maintain resource values, sustain outputs, or recover from impacts
- Inherently unstable—Soils are eroding faster than they are being renewed themselves

Soil disturbance: When the soil no longer functions because of the loss of surface organic material (affecting nutrient cycling), compaction (affecting regulation and partitioning of water and air flow), and severe burn (affecting nutrient cycling and biology).

Soil productivity: The inherent capacity of the soil to support appropriate site-specific biological resource management objectives, which include the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses.

Species of conservation concern: A species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long term in the plan area (36 Code of Federal Regulations 219.9(c)).

Species diversity: Abundance of different plant and animal species on a national forest and adjoining lands; species richness. The National Forest Management Act requires that land management plans provide for diversity of plant and animal communities.

Subwatershed: A 12-digit hydrologic unit code, the smallest subdivision considered in this assessment.

Succession: The process by which a plant community is replaced by another.

Suitable timberlands: Land to be managed for regulated timber production. Such lands have been determined to meet the following criteria:

- Are available for timber production (not withdrawn for wilderness or other official designation by Congress, the Secretary of Agriculture, or Chief of the Forest Service)
- Are physically capable of producing crops of industrial wood without irreversible resource damage to soils productivity or watershed conditions
- Has adequate and reasonably assured tree restocking within 5 years of final harvest
- Are where there is adequate information about responses to timber management activities
- Are where timber management is cost efficient over the planning horizon in meeting forest objectives that include timber production
- Are where timber production is consistent with meeting the management requirements and multiple use objectives specified in the land management plan or plan alternative
- Are where other management objectives do not limit timber production activities to the point where it is impossible to meet management requirements set forth in 36 Code of Federal Regulations 129.27 (per Forest Service Handbook 2409.13, WO amendment 2409.13-92-1, zero code and chapter 20)

Sustainability: The capability to meet the needs of the present generation without compromising the ability of future generations to meet their needs. For the purposes of the land management planning regulation at 36 Code of Federal Regulations 219, ecological sustainability refers to the capability of ecosystems to maintain ecological integrity; economic sustainability refers to the capability of society to produce and consume or otherwise benefit from goods and services, including contributions to jobs and market and nonmarket benefits; and social sustainability refers to the capability of society to support the network of relationships, traditions, culture, and activities that connect people to the land and to one another and support vibrant communities (36 Code of Federal Regulations 219.19).

Sustainable yield limit: An estimate of the amount of commercial wood products that may be sustainably harvested over a long period.

Temporary road or trail: A road or trail necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or trail and is not included in a forest transportation atlas (36 Code of Federal Regulations 212.1).

Terrestrial ecosystem: All interacting organisms and elements of the abiotic environment in those vegetation and soil types that are neither aquatic nor riparian.

Terrestrial ecosystem survey: An inventory of soil types or terrestrial ecosystem units on the Lincoln NF. It contains predictions and limitations of soil and vegetation behavior for selected land uses. This survey also highlights hazards or capabilities inherent in the soil and the impact of selected uses on the environment.

Terrestrial ecosystem unit: The classification unit used in the terrestrial ecosystem survey; a spatially explicit area with a similar combination of soils, land types, and vegetation.

Threatened species: Any species that the Secretary of the Interior or the Secretary of Commerce has determined to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Threatened species are listed at 50 Code of Federal Regulations 17.11, 17.12, and 223.102.

Timber production: Purposefully growing, tending, harvesting, and regenerating regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use (36 Code of Federal Regulations 219.19).

Traditional community: A land-based rural community that has a long-standing history in and around the lands managed by the Forest Service.

Traditional cultural properties: Historic properties that are in the main or in part eligible for listing on the National Register of Historic Places 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).

Tribal consultation: The timely, meaningful, and substantive dialogue between Forest Service officials, who have delegated authority to consult, and the official leadership of federally recognized Indian tribes, or their designated representatives, pertaining to Forest Service policies that may have tribal implications.

Uncharacteristic wildfire: An increase in wildfire size, severity, and resistance to control, compared with reference conditions that occurred historically. These fires result as a consequence of more continuous canopy cover, ladder fuels, and accumulated live and dead woody material. Uncharacteristic

wildfires burn with more intensity, cause higher tree mortality, degrade watersheds, sterilize soils, and threaten adjacent communities, forest infrastructure, and wildlife habitat. (See reference conditions.)

Ungulate: A hooved animal, such as wildlife (for example, pronghorn, deer, and elk) and domestic livestock (for example, sheep, cattle, and horses).

Unplanned ignition: The start of a wildland fire by lightning or unauthorized and accidental human-caused fires. (See wildfire.)

Upland: Refers to areas, species, systems, or conditions that are characteristic of terrestrial ecosystems, as opposed to riparian or aquatic ecosystems.

Vegetation dynamics development tool: A software program that provides a state and transition modeling framework to examine the role of various transition agents and the effects of management actions that alter vegetation communities (ESSA Technologies Ltd. 2007).

Watershed: A region or land area drained by a single stream, river, or drainage network; a drainage basin (36 Code of Federal Regulations 219.19). Specifically, a 10-digit hydrologic unit code, larger than a subwatershed, and nested in a subbasin.

Watershed condition: The state of a watershed, based on physical and biogeochemical characteristics and processes (36 Code of Federal Regulations 219.19).

Wetlands: A specific subtype in the wetland/riparian group of vegetation communities. In wetlands, saturation with water is the dominant factor determining the nature of soil development and plant and animal communities. “For regulatory purposes under the Clean Water Act, the term wetlands means ‘those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas’” (Environmental Protection Agency regulations listed at 40 Code of Federal Regulations 230.3(t). The wetland/riparian vegetation community, as defined in this plan, is slightly more inclusive and includes open water wetlands and cienegas that may not be considered wetlands for regulatory purposes.

Wild and scenic river: A river designated by Congress as part of the National Wild and Scenic Rivers System, established in the Wild and Scenic Rivers Act of 1968 (16 U.S. Code 1271 (note), 1271–1287; 36 Code of Federal Regulations 219.19). Wild and scenic rivers are categorized as follows:

- Wild—Those rivers or segments of rivers free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive, and waters unpolluted. These represent vestiges of primitive America.
- Scenic—Those rivers or segments of rivers free of impoundments, with shorelines or watersheds still largely primitive, and shorelines largely undeveloped but accessible in places by roads.
- Recreational—Those rivers or segments of rivers readily accessible by road or railroad that may have some development along their shorelines and that may have undergone some impoundment or diversion in the past.

Wilderness: Any area of land designated by Congress as part of the National Wilderness Preservation System that was established in the Wilderness Act of 1964 (16 U.S. Code 1131–1136; 36 Code of Federal Regulations 219.19).

Wildfire: Unplanned ignition of a wildland fire (for example, fires caused by lightning or unauthorized and accidental human-caused fires) and escaped prescribed fires. (See unplanned ignition.)

Wildfire hazard: A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree or ease of ignition and of resistance to control.

Wildland fire: A general term describing any nonstructure fire that occurs in vegetation, natural fuels, or both. The two types of wildland fire are wildfires and prescribed fires. Other terms, such as fire-use fires, resource benefit fires, or suppression fires, are not used in this plan.

Wildland-urban interface: That area where human development adjoins public or private natural areas, or an intermix of rural and urban land uses. From a natural resource perspective, the wildland-urban interface is where increased human influence and land use conversion are changing natural resource goods, services, and management techniques (Hermansen-Baez et al. 2009).

Index

- access, S-2, 7, 8, 9, 14, 16, 31, 38, 42, 47, 48, 52, 71, 72, 83, 85, 86, 90, 91, 94, 95, 99, 100, 108, 109, 110, 111, 112, 139, 144, 156, 168, 169, 173, 181, 190, 206, 209, 223, 224, 225, 229, 235, 236, 238, 240, 263, 271, 272, 274, 275, 276, 279, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 306, 311, 313, 315, 317, 318, 319, 320, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 339, 340, 341, 342, 345, 346, 347, 349, 352, 353, 354, 357, 359, 361, 364, 365, 366, 367, 368, 369, 370, 372, 373, 374, 382, 390, 394, 399, 403, 404, 405, 406, 407, 408, 412, 414, 415, 416, 417, 424, 447
- active management, S-2, 17, 41, 87, 133, 232, 288, 406
- adaptive management, S-1, 4, 5, 10, 116, 144, 169, 231, 242, 264, 278, 331
- administrative site, 200, 336
- air quality, 18, 78, 79, 108, 244, 246, 247, 248, 249, 250, 251, 252, 253, 254, 263, 264, 351, 404, 408, 409, 415, 417
- airshed, 243, 244, 246, 248, 249, 250, 253
- alternatives, S-1, 1, 12, 14, 17, 18, 21, 31, 45, 46, 47, 48, 54, 55, 56, 59, 60, 61, 62, 63, 65, 67, 68, 71, 73, 74, 76, 77, 78, 79, 80, 81, 83, 84, 85, 92, 100, 101, 102, 105, 106, 107, 108, 111, 112, 115, 116, 138, 142, 143, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 159, 163, 164, 166, 168, 169, 171, 180, 182, 183, 184, 185, 188, 189, 200, 201, 203, 204, 205, 206, 207, 208, 209, 211, 212, 213, 223, 225, 226, 228, 229, 231, 232, 233, 234, 235, 236, 238, 239, 240, 241, 249, 250, 251, 252, 262, 263, 264, 266, 267, 271, 272, 273, 274, 276, 277, 278, 279, 280, 284, 285, 287, 288, 289, 292, 294, 295, 296, 304, 306, 310, 311, 312, 313, 314, 315, 316, 317, 324, 325, 326, 327, 333, 334, 336, 337, 338, 340, 341, 344, 345, 346, 348, 349, 350, 352, 353, 354, 357, 358, 359, 361, 363, 364, 365, 367, 368, 369, 370, 371, 372, 373, 374, 378, 379, 380, 382, 383, 384, 395, 396, 397, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 410, 413, 414, 415, 416, 417, 418, 421, 424
- aquatic species, 21, 108, 162, 164, 204, 213, 214, 222, 229, 230, 232, 234, 239, 243, 247, 399, 408
- areas of tribal importance, 290, 291, 292, 293, 294, 295, 296
- aspen, 31, 38, 55, 118, 120, 121, 122, 143, 146, 147, 148, 149, 156, 214, 216, 219, 221, 233, 237, 254, 255, 256, 269, 276, 278, 330, 366, 371, 382
- at-risk species, 6, 18, 21, 48, 72, 74, 75, 76, 77, 100, 141, 168, 213, 215, 222, 223, 225, 226, 228, 229, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 296, 312, 315, 347, 362, 363, 364
- best management practices (BMPs), 178, 180, 181, 183, 188, 201, 202, 211, 212, 230, 231, 309
- Billy the Kid National Scenic Byway, 18, 228, 269, 319, 371, 374
- canopy, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 135, 137, 138, 142, 143, 150, 151, 152, 153, 175, 216, 259, 275, 286, 289, 295, 326, 451, 454
- canopy cover, 120, 121, 122, 123, 124, 126, 127, 128, 129, 130, 131, 132, 133, 135, 137, 151, 175, 216, 289, 295, 454
- caves and karst, 8, 24, 32, 42, 49, 72, 94, 185, 187, 219, 223, 225, 233, 238, 240, 241, 283, 296, 329, 351, 352, 353, 354, 367, 394, 407, 447, 449
- climate change, 4, 5, 116, 118, 141, 144, 159, 174, 221, 226, 231, 233, 234, 237, 239, 243, 246, 277, 278, 284, 292, 330, 331, 383, 384, 399, 404, 409, 446
- coarse woody debris, 5, 117, 215
- Code of Federal Regulations (CFR), 1, 4, 12, 13, 17, 45, 46, 47, 94, 115, 280, 284, 303, 304, 325, 331, 347, 352, 357, 362, 399, 417, 418, 423, 445, 446, 447, 449, 450, 451, 452, 453, 454, 455
- connectivity, 5, 6, 16, 21, 23, 31, 38, 41, 46, 48, 52, 67, 73, 74, 77, 143, 164, 168, 173, 195, 201, 206, 231, 237, 238, 239, 242, 243, 341, 365, 447
- cooperating agencies, 419, 421, 423, 424

- cultural resources, 18, 83, 84, 85, 116, 238, 279, 280, 281, 284, 285, 286, 287, 288, 289, 293, 339, 340, 352
- cumulative effects or impacts, 159, 172, 173, 188, 189, 210, 211, 212, 222, 241, 243, 253, 267, 268, 279, 289, 296, 308, 318, 336, 338, 346, 351, 354, 361, 365, 370, 374, 380, 384, 409
- dams, 203, 377
- designated areas, 65, 71, 108, 164, 184, 185, 201, 208, 224, 228, 229, 313, 326, 345, 360, 447
- desired condition, S-1, S-2, 4, 5, 7, 10, 11, 12, 14, 17, 18, 21, 28, 32, 41, 45, 46, 47, 48, 54, 55, 56, 57, 58, 60, 64, 70, 75, 77, 81, 84, 88, 91, 100, 103, 110, 114, 115, 117, 138, 142, 144, 145, 146, 147, 148, 150, 156, 157, 159, 162, 168, 169, 182, 183, 184, 185, 186, 205, 207, 208, 222, 226, 228, 229, 230, 231, 233, 234, 235, 237, 238, 241, 242, 251, 252, 259, 261, 262, 263, 264, 266, 268, 271, 272, 273, 274, 277, 286, 287, 288, 293, 295, 296, 297, 302, 303, 304, 306, 308, 313, 314, 315, 316, 317, 318, 323, 327, 328, 344, 346, 353, 359, 364, 369, 370, 374, 382, 399, 406, 407, 408, 414, 416, 450
- developed recreation, S-2, 7, 14, 24, 25, 28, 42, 48, 49, 56, 71, 89, 91, 109, 139, 144, 145, 168, 202, 205, 230, 233, 240, 263, 271, 274, 292, 318, 319, 320, 321, 326, 328, 335, 336, 361, 383, 407, 416, 447
- dispersed recreation, 11, 23, 24, 25, 28, 71, 81, 100, 139, 162, 167, 184, 205, 206, 224, 230, 232, 271, 273, 274, 285, 286, 288, 294, 314, 320, 322, 327, 345, 383, 403
- ecological integrity, 4, 6, 9, 117, 167, 225, 302, 418, 454
- ecological response unit (ERU), S-2, 4, 5, 28, 31, 32, 38, 41, 48, 55, 56, 57, 58, 59, 65, 69, 71, 72, 77, 81, 87, 116, 117, 118, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 162, 163, 170, 171, 173, 174, 178, 182, 184, 185, 186, 189, 205, 207, 208, 209, 211, 213, 214, 215, 222, 223, 225, 226, 227, 228, 233, 234, 235, 236, 237, 238, 241, 242, 254, 255, 256, 258, 264, 266, 304, 306, 308, 315, 316, 317, 382, 407, 408, 447
- economic sustainability, 90, 375, 389, 454
- ecosystem function (processes), 6, 159, 168, 189, 221, 261, 263, 275, 447
- ecosystem services, S-2, 108, 138, 160, 173, 184, 185, 194, 203, 208, 243, 362, 393, 395, 398, 399, 403, 407, 409
- employment, 108, 349, 385, 388, 391, 394, 396, 398, 399, 400, 401, 403, 405, 406, 407
- endangered species, 9, 168, 312, 323, 341, 364, 446, 454
- Endangered Species Act (ESA), 215, 216, 235
- energy development, 53, 291, 346
- Environmental impact statement (EIS), S-1, S-2, 1, 12, 13, 115, 116, 201, 230, 418, 421, 424, 425, 426, 427
- environmental justice, 111, 113, 114, 410, 412, 413, 414, 415, 416, 417
- facilities, 8, 14, 15, 38, 81, 83, 84, 91, 94, 96, 139, 144, 172, 173, 197, 225, 230, 233, 253, 271, 272, 275, 276, 285, 292, 301, 314, 320, 321, 322, 326, 331, 332, 336, 337, 338, 343, 344, 345, 351, 353, 354, 358, 390, 445, 447
- fire intensity, 258, 448
- fire regime, S-2, 7, 21, 28, 42, 117, 122, 146, 173, 189, 190, 207, 211, 233, 237, 252, 254, 258, 259, 261, 262, 264, 267, 268, 276, 296, 297, 359, 369, 408, 448, 450
- fire severity, 141, 254, 257, 258, 263, 448
- fishing, 7, 15, 320, 328, 332, 386, 389, 391, 394, 397, 404
- forest products, 8, 9, 10, 23, 28, 38, 42, 87, 108, 110, 142, 144, 159, 231, 240, 274, 290, 291, 292, 295, 298, 301, 302, 306, 307, 308, 309, 389, 390, 391, 393, 398, 402, 403, 405, 406, 408, 409, 416
- Forest Service Handbook (FSH), 6, 32, 46, 105, 117, 303, 304, 313, 343, 378, 379, 380, 384, 420, 445, 451, 453
- Forest Service Manual (FSM), 200, 201, 262, 325, 343, 382, 450
- fragmentation, 9, 14, 224, 226, 233, 340, 342, 345
- Geographic Information System (GIS), 55, 118, 138, 160, 163, 170, 175, 178, 180, 185, 186, 187, 188, 190, 192, 194, 197, 200, 222, 229, 236, 270, 275, 303, 304, 310, 331, 332, 339, 360, 361, 362, 371, 378, 379, 426
- geomorphic, 168, 174, 190, 201, 202, 203
- government-to-government consultation, 293
- grazing, S-1, S-2, 4, 5, 8, 9, 15, 16, 23, 25, 28, 31, 42, 45, 48, 54, 55, 57, 64, 70, 75, 84, 88, 98, 108, 124, 131, 133, 134, 139, 141, 142,

- 144, 147, 153, 162, 163, 164, 165, 166, 167, 168, 169, 172, 173, 180, 183, 184, 188, 189, 197, 201, 203, 204, 205, 208, 210, 211, 223, 226, 227, 231, 235, 241, 257, 258, 259, 271, 275, 286, 295, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 337, 343, 359, 360, 361, 378, 389, 391, 393, 394, 395, 396, 397, 399, 400, 402, 403, 404, 405, 406, 407, 408, 409, 416, 445
- grazing allotments, 16, 42, 54, 55, 318, 319
- groundwater, 5, 160, 162, 172, 189, 194, 195, 197, 200, 201, 449, 451, 455
- Guadalupe Backcountry Byway, 18, 269, 277, 278, 319, 330, 371, 372
- Guadalupe Escarpment Wilderness Study Area, 1, 18, 32, 55, 93, 94, 95, 97, 115, 160, 167, 183, 237, 269, 274, 276, 288, 289, 347, 350, 356, 358, 359, 361, 381
- guideline, 21, 31, 47, 48, 61, 168, 169, 182, 183, 184, 185, 206, 228, 232, 233, 354
- habitat, 4, 6, 14, 15, 21, 23, 31, 41, 42, 46, 47, 48, 49, 51, 52, 63, 68, 71, 72, 73, 74, 75, 77, 100, 108, 109, 141, 143, 144, 147, 159, 160, 162, 165, 166, 168, 169, 171, 190, 192, 194, 201, 202, 203, 204, 207, 208, 210, 212, 213, 214, 215, 216, 217, 218, 219, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 254, 277, 284, 291, 292, 302, 309, 312, 313, 315, 316, 328, 330, 339, 341, 342, 344, 359, 364, 365, 377, 393, 399, 400, 404, 407, 408, 418, 446
- habitat connectivity, 31, 41, 48, 49, 51, 52, 63, 73, 74, 100, 108, 165, 169, 223, 227, 229, 234, 235, 237, 239, 315, 316, 359, 364, 365, 407
- herbaceous, 120, 121, 124, 126, 127, 128, 129, 130, 131, 132, 134, 135, 137, 140, 141, 142, 152, 154, 155, 159, 216, 226, 227, 248, 258
- Hopi Tribe, 10, 13, 290, 291, 424
- hydrologic function, 190
- infrastructure, 7, 8, 16, 23, 28, 31, 38, 48, 54, 81, 84, 91, 94, 96, 99, 113, 142, 148, 166, 168, 170, 181, 204, 208, 229, 231, 235, 238, 259, 263, 266, 287, 292, 301, 303, 308, 311, 312, 316, 321, 330, 336, 337, 338, 340, 342, 344, 345, 347, 351, 353, 354, 360, 363, 370, 379, 406, 417, 455
- invasive species, 5, 6, 7, 9, 31, 83, 85, 101, 213, 221, 234, 243
- inventoried roadless areas (IRAs), 18, 100, 228, 273, 275, 326, 344, 345, 357, 362, 363, 364, 365
- issues, S-1, 4, 5, 11, 12, 13, 14, 16, 17, 28, 47, 144, 230, 261, 285, 291, 292, 303, 324, 327, 333, 337, 352, 395, 414, 416, 418, 419, 421, 424
- leasable minerals, 9, 10, 347, 350, 351
- locatable minerals, 18, 93, 294, 349, 351
- low-income population, 409, 410, 415
- management area, S-1, S-2, 4, 11, 17, 21, 23, 28, 42, 47, 48, 55, 57, 64, 69, 70, 71, 75, 76, 85, 115, 144, 145, 148, 157, 167, 170, 171, 182, 183, 187, 205, 223, 229, 230, 231, 232, 262, 264, 269, 271, 273, 276, 285, 287, 288, 289, 293, 295, 306, 313, 314, 326, 327, 329, 334, 345, 354, 356, 357, 358, 359, 360, 361, 365, 373, 399, 405, 415, 416, 421, 450
- management practices, 21, 89, 123, 159, 164, 166, 175, 181, 184, 188, 202, 207, 208, 211, 229, 235, 267, 287, 289, 294, 302, 316, 326, 369, 445
- mechanical treatment, 14, 18, 31, 38, 48, 54, 55, 56, 59, 65, 69, 72, 77, 78, 80, 81, 83, 85, 88, 91, 101, 108, 113, 140, 144, 157, 170, 181, 182, 186, 189, 205, 207, 209, 211, 226, 236, 238, 250, 251, 252, 263, 266, 272, 273, 289, 294, 296, 306, 315, 316, 317, 318, 327, 334, 335, 368, 369, 372, 374, 383, 407, 408, 449
- Mescalero Apache Tribe, 9, 10, 13, 279, 283, 290, 291, 292, 294, 320, 321, 338, 406, 408, 412, 414, 416, 424, 426
- Mexican spotted owl, 23, 71, 123, 213, 214, 216, 223, 224, 228, 229, 230, 232, 233, 234, 235, 236, 237, 239, 302
- mining, 8, 9, 15, 28, 45, 46, 84, 188, 197, 200, 241, 276, 284, 287, 289, 295, 296, 332, 343, 347, 348, 349, 350, 351, 356, 359, 361, 389, 390, 391
- minority, 409, 410, 411, 412, 413, 414, 419
- minority population, 410, 412
- monitoring, S-1, 1, 4, 6, 10, 11, 18, 45, 115, 163, 242, 244, 247, 248, 253, 261, 262, 284, 293, 320, 325, 352, 367, 380, 388, 397, 421, 445
- motorized travel, 108, 209, 274, 285, 336, 362, 378
- National Forest System (NFS), 15, 52, 54, 158, 173, 178, 180, 189, 197, 200, 209, 212, 225, 241, 242, 246, 259, 269, 279, 286, 292, 293, 294, 304, 308, 323, 331, 332, 333, 336, 338,

- 339, 340, 341, 342, 343, 344, 346, 348, 352, 356, 362, 370, 374, 380, 384, 385, 393, 397, 404, 409, 418, 447, 449, 450, 451, 452
- National Forest System road, 173, 209, 212, 225, 269, 286, 293, 294, 323, 331, 332, 333, 447, 451
- national recreation trail, 18, 228, 273, 319, 320, 326, 366, 367, 370
- National Wild and Scenic Rivers System (NWSRS), 58, 105, 143, 166, 182, 203, 228, 229, 287, 313, 326, 345, 375, 376, 378, 379, 380, 455
- natural range of variation, 7, 214
- New Mexico meadow jumping mouse, 214, 216, 223, 224, 225, 226, 227, 234, 235
- nonattainment area, 244, 247
- objective, 21, 23, 38, 47, 62, 90, 103, 167, 171, 183, 184, 186, 200, 205, 206, 228, 230, 233, 234, 237, 240, 252, 259, 261, 273, 274, 276, 294, 297, 314, 317, 325, 327, 345, 372, 393, 415, 416, 452
- oil and gas activities, 38, 170, 172, 200, 241, 246, 247, 248, 278, 287, 347, 351, 354, 393
- outstandingly remarkable value (ORV), 28, 345, 375, 376, 378, 379, 380
- primitive recreation, 7, 14, 38, 89, 323, 328, 358
- proper functioning condition, 162, 163, 167, 169, 171, 173, 214, 231
- public meetings, 12, 394, 414, 415, 419, 420, 423, 424
- rangeland management, S-1, 9, 15, 180, 223, 310, 312, 315, 316, 395
- recommended wilderness areas, 76, 115, 145, 148, 170, 186, 236, 240, 266, 277, 289, 328, 329, 350, 451
- Recreation Opportunity Spectrum (ROS), 47, 71, 223, 224, 232, 322, 323, 330, 407
- Recreation Opportunity Spectrum (ROS), roaded natural, 323, 325, 326, 327, 330, 369
- Recreation Opportunity Spectrum (ROS), semiprimitive motorized, 323, 325, 326, 327, 330, 363, 364, 369
- Recreation Opportunity Spectrum (ROS), semiprimitive nonmotorized, 89, 323, 325, 326, 327, 328, 329, 355, 364, 367, 369
- renewable energy, 8, 9, 93, 343, 344, 345, 346
- Research Natural Area (RNA), 24, 25, 32, 36, 41, 47, 55, 76, 106, 107, 228, 229, 232, 236, 239, 344, 345, 360, 380, 381, 382, 383, 384
- resilience, 58, 113, 142, 165, 225, 226, 229, 236, 243, 259, 262, 268, 273, 302, 368, 369, 372, 384, 394, 399, 400, 404, 416
- restoration, S-2, 4, 5, 8, 14, 15, 16, 21, 23, 32, 38, 41, 47, 48, 54, 58, 59, 63, 65, 68, 73, 74, 80, 83, 108, 142, 144, 146, 147, 148, 159, 164, 165, 167, 169, 170, 171, 172, 175, 180, 186, 188, 192, 201, 202, 203, 205, 207, 208, 210, 211, 225, 228, 229, 231, 234, 236, 237, 239, 240, 241, 242, 259, 261, 263, 266, 268, 271, 273, 274, 275, 277, 288, 289, 291, 295, 296, 297, 301, 302, 303, 306, 308, 309, 312, 313, 315, 316, 317, 318, 330, 333, 359, 360, 368, 369, 370, 372, 383, 405, 406, 407, 409, 451
- riparian area, S-2, 6, 9, 14, 15, 18, 21, 28, 31, 32, 41, 42, 47, 48, 49, 50, 59, 60, 62, 63, 64, 65, 67, 91, 100, 116, 160, 162, 164, 165, 166, 167, 168, 169, 171, 173, 181, 187, 194, 195, 204, 207, 214, 215, 216, 217, 219, 227, 228, 231, 236, 237, 239, 240, 273, 274, 288, 314, 315, 316, 317, 334, 338, 364, 408
- riparian management zones, 15, 21, 23, 48, 62, 63, 67, 167, 168, 169, 205, 206, 207, 231, 232, 234, 295, 313, 315, 316, 408
- road maintenance, 14, 61, 108, 407, 416
- rural, 8, 9, 10, 21, 86, 172, 188, 211, 224, 288, 293, 309, 322, 323, 328, 369, 370, 374, 387, 389, 390, 391, 403, 408, 415, 454, 456
- sacred sites, 8, 10, 86, 108, 292, 293, 294, 295, 296, 363, 408, 446
- scenery, 8, 9, 21, 81, 101, 102, 103, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 319, 326, 338, 341, 342, 368, 369, 370, 372, 373, 374, 404, 405, 452
- scenic byway, 18, 103, 273, 277, 278, 279, 319, 326, 330, 370, 371, 372, 373, 374, 447
- scenic character, 81, 268, 269, 271, 272, 273, 275, 276, 277, 278, 407
- Scenic Integrity Objective (SIO), 21, 22, 81, 91, 101, 103, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 337, 368, 369, 370, 372, 373, 374, 407, 452
- sensitive species, 23, 212, 218, 229, 230
- smoke, 78, 108, 238, 246, 247, 249, 251, 253, 268, 353, 368, 404, 405, 414
- soil productivity, 24, 25, 182, 183, 185, 383
- special cave management area, S-2, 28, 41, 42, 47, 58, 72, 76, 95, 170, 171, 186, 239, 240, 241, 276, 328, 329, 345, 346, 353

- species of conservation concern, 6, 21, 212, 215, 218, 229, 230, 233, 315, 420, 445
- springs, 15, 23, 166, 172, 189, 192, 194, 195, 197, 203, 204, 208, 215, 217, 218, 219, 221, 235, 242, 243, 257, 258, 269, 283, 284, 290, 292, 294, 295, 360, 366, 449
- Sunspot Highway National Forest Scenic Byway, 18, 228, 277, 319, 371
- sustainability, 4, 8, 9, 10, 12, 17, 85, 117, 160, 167, 259, 269, 272, 293, 294, 296, 298, 355, 362, 375, 390, 419, 454
- sustainable recreation, S-2, 21, 28, 83, 101, 295, 314, 324, 327, 370, 403, 407, 409
- thinning, 18, 31, 38, 49, 56, 72, 103, 108, 125, 139, 140, 141, 145, 146, 149, 150, 151, 154, 156, 158, 159, 184, 185, 186, 201, 207, 223, 225, 226, 233, 234, 235, 238, 239, 240, 241, 242, 252, 264, 266, 272, 276, 297, 302, 306, 312, 313, 314, 315, 327, 328, 360, 368, 369, 373, 374, 408, 416, 449
- timber suitability, 274, 303, 304, 398, 421
- traditional cultural properties, 86, 365
- trails, 6, 8, 12, 23, 28, 62, 64, 66, 71, 79, 101, 102, 134, 139, 140, 162, 164, 167, 168, 169, 173, 181, 182, 183, 190, 201, 202, 203, 205, 206, 212, 222, 223, 224, 225, 230, 232, 236, 238, 246, 250, 253, 261, 262, 269, 272, 273, 274, 275, 279, 283, 285, 288, 292, 294, 311, 313, 314, 315, 319, 320, 321, 322, 325, 326, 327, 328, 331, 332, 333, 334, 360, 362, 365, 366, 367, 368, 369, 370, 388, 447, 449
- Travel Management Rule, 18, 46, 325, 331
- uncharacteristic wildfire, 5, 6, 7, 69, 80, 81, 83, 85, 91, 108, 143, 144, 159, 189, 205, 207, 209, 211, 229, 236, 241, 251, 252, 264, 266, 267, 268, 272, 297, 340, 345, 394, 399, 404, 405, 406, 408
- unplanned ignition, 254, 264, 326, 456
- Upper McKittrick Research Natural Area, S-2, 25, 32, 42, 55, 106, 107, 228, 232, 236, 238, 241, 289, 315, 345, 346, 381, 383, 384
- urban, 7, 247, 267, 291, 322, 323, 324, 328, 365, 369, 370, 374, 386, 387, 456
- watershed, 15, 21, 31, 46, 48, 68, 69, 73, 108, 147, 163, 164, 165, 172, 180, 189, 190, 192, 194, 195, 201, 202, 205, 207, 208, 209, 210, 211, 212, 234, 272, 288, 291, 297, 302, 316, 342, 405, 408, 448, 449, 451, 453, 455
- watershed condition framework, 31, 68
- wetlands, 15, 31, 41, 51, 62, 63, 68, 73, 74, 116, 118, 160, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 190, 192, 194, 197, 208, 210, 214, 216, 218, 219, 223, 224, 225, 226, 227, 231, 234, 235, 237, 239, 243, 309, 312, 315, 339, 377, 449, 451, 455
- White Mountain Wilderness, 24, 97, 244, 246, 247, 253, 281, 321, 323, 347, 350, 355
- wild and scenic river (WSR), 28, 32, 41, 42, 58, 143, 166, 180, 182, 202, 203, 228, 229, 232, 287, 313, 326, 345, 375, 378, 379, 380, 447
- Wilderness Characteristics, 358
- Wilderness study area (WSA), 359, 360, 361
- wildfire risk, 261, 415
- wildland-urban interface, 7, 242, 259, 261, 262, 263, 264, 267, 268, 340, 387, 409, 417, 456
- wildlife, S-2, 5, 6, 7, 9, 14, 15, 16, 21, 23, 24, 25, 28, 31, 38, 41, 42, 45, 46, 48, 50, 51, 52, 53, 71, 73, 74, 76, 77, 108, 109, 116, 123, 144, 147, 159, 160, 162, 166, 172, 188, 192, 194, 195, 200, 203, 204, 211, 212, 215, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 272, 275, 297, 302, 320, 325, 327, 328, 330, 341, 342, 359, 362, 365, 371, 375, 378, 379, 383, 386, 395, 397, 401, 403, 404, 406, 407, 409, 417, 455
- wildlife habitat, S-2, 9, 15, 16, 23, 24, 25, 28, 31, 41, 45, 48, 50, 73, 74, 77, 108, 123, 144, 147, 159, 160, 172, 188, 211, 225, 226, 228, 230, 231, 234, 235, 236, 237, 239, 240, 241, 242, 272, 275, 297, 302, 325, 330, 341, 342, 365, 379, 383, 406, 407, 455
- woody debris, 141, 162, 215, 226, 251

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