



United States Department of Agriculture

Luna Restoration Project

Draft Environmental Impact Statement



Forest Service
Quemado Ranger District

Apache National Forest (Administered by Gila National Forest)
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Cover photo is from the northern portion of Luna planning area. View looking east and south of Spur Lake Basin taken from a point near Bill Knight Gap. To the left is Freeman and Dillon Mountains and to the right is Bishop Mountain. The ranch in the middle is part of the Spur Lake Cattle Company called Gribble Head Quarters.

**Luna Restoration Project
Draft Environmental Impact Statement
Catron County, New Mexico**

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Abstract: The Gila National Forest proposes to conduct restoration activities within the 185,586 acre Luna planning area on the Quemado Ranger District. Four alternatives are being considered. Alternative A proposes no action; there would be no changes in current management. Alternative B, modified proposed action, proposes forest, woodland, fuels, watershed, motorized transportation, and range and wildlife habitat activities, which includes mechanical treatments and prescribed fire. Alternative C includes all of the same proposed in alternative B, but adds the use of herbicides for vegetation treatments of rabbitbrush and alligator juniper. Alternative D includes all of the same activities proposed in alternative B with the exception of not adding closed and user-created routes to the motorized transportation system. This exception does not include the routes required by Tucson Electric Power for utility line maintenance. The Gila National Forest has identified alternative C as the preferred alternative. A description of the preferred alternative may be found in chapter 2 of this document.

Date comments must be received: The 45-day comment period begins the day after the notice of availability is published in the Federal Register. Comments on this draft environmental impact statement must be received or postmarked before the end of the 45th calendar day following publication to participate in the administrative review process (36 CFR 218.25(a)(1)(ii)). The notice of availability will be posted on the forest web site: [Luna Restoration Project, Gila National Forest](#) .

It is important that reviewers provide their comments at such times and in such a way that they are useful to the Agency's preparation of the environmental impact statement. Therefore, comments should be provided prior to the close of the comment period and should clearly articulate the reviewer's concerns and contentions. The submission of timely and specific comments can affect a reviewer's ability to participate in subsequent administrative judicial reviews. Comments received in response to this solicitation, including names and addresses of those who comment, will be part of the public record for this proposed action. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not provide the respondent with standing to participate in subsequent administrative or judicial reviews.

Send Comments to: Gila National Forest; Attn: Luna Restoration Project
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Fax number: 575-388-8222
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Summary

Background

The Gila National Forest proposes to implement a wide range of restoration activities throughout the Luna planning area. Treatments include vegetation and fuels (mechanical and prescribed fire), watershed, motorized transportation, range, and wildlife habitat activities. The area affected by the proposal includes the western portion of the Quemado Ranger District around the area of Luna, New Mexico. Within the planning area, there are electronic and communication sites, the community of Luna and private inholdings, active grazing allotments and associated infrastructure, and natural and cultural resources. Much of the landscape is departed and is at risk to moderate- to high-severity wildfire. Wildfires burning at these intensities and severities could impact watersheds, habitats, infrastructure, the community, and the livelihoods of people living in this landscape. Treatments are designed to restore the structure, function, and resilience in vegetative communities; improve function of riparian areas and streams; improve water quality; and reduce the impacts from roads across the project area.

In response to Congressional, agency, and regional emphasis on all-lands restoration level planning, the Gila and Apache-Sitgreaves National Forests responded by proposing ecological restoration treatments across a large landscape encompassing both national forests. The Luna Restoration Project area was identified by the Gila National Forest as the highest priority for landscape restoration planning. The purpose of the project is to create and maintain a healthy resilient landscape and watersheds capable of delivering benefits to the public, including clean air and water, habitat for native fish and wildlife, forest products, and outdoor recreation opportunities.

Public Involvement

This project has been listed on the Gila's schedule of proposed actions since October 2015 and periodically updated. The Quemado Ranger District staff hosted two open houses and a meeting with members of the Luna Community in Luna, New Mexico, to have discussions with stakeholders on identifying issues, concerns, and restoration and recreation opportunities. Between the open houses, over 200 letters were sent to individuals, Tribes, organizations, and agencies introducing the planning area and providing opportunity to provide input. The notice of intent was published in the Federal Register on May 19, 2016. Gila National Forest staff received 27 comments during the scoping period. Twelve Tribes were consulted with and provided the opportunity to participate in the planning process. Gila National Forest staff will continue to engage in Tribal consultation.

Significant Issues

Significant issues form the basis of alternatives to the proposed action. Three significant issues were identified from the scoping comment letters:

1. Vegetation treatments for rabbitbrush and alligator juniper: Mowing rabbitbrush and cutting alligator juniper may not be effective treatment methods.
2. Fuels treatments: Treatment of mixed conifer stands east of highway 180 may result in high severity fires impacting wildlife and limited burning and thinning may not improve or protect Mexican spotted owl habitat.
3. Motorized transportation system: The 50-inch motorized trail size limits access by utility task vehicles and side-by-side vehicles, Tucson Electric Power needs motorized access for maintenance, and no additional motorized routes should be added to the National Forest System of roads and trails.

Alternatives

Alternative A is the no-action alternative representing the existing condition.

Alternative B is the modified proposed action. This alternative was modified to address all or portions of significant issues related to fuels treatments and motorized transportation system.

Alternative C is the preferred alternative. Alternative C is similar to alternative B except it addresses the significant issue of vegetation treatments by utilizing herbicides to treat rabbitbrush and alligator juniper.

Alternative D is similar to alternative B except it addresses the part of the motorized transportation system significant issue of not adding more miles to the National Forest System of motorized roads and trails.

Conclusions Related to Impacts

Over time, the action alternatives move vegetative trends towards desired conditions. Tree and brush encroachment into grasslands and riparian systems decreases. Tree densities decrease with the trend being stands are more resilient to disturbances. Mechanical and prescribed fire treatments would reduce the crown fire potential from approximately 67 percent of the landscape (alternative A) to approximately 16 percent of the project area.

Trends to the soils, riparian, and water quality resources suggest there could be some short-term impacts to these resources including soil compaction and soil exposure. However, the long-term trend is an improvement of impaired soil conditions as well as help in maintaining satisfactory soil conditions in riparian areas, wetlands, upland wet meadows, and degraded uplands.

The action alternatives show a net road mile reduction of 94 miles of road in alternatives B and C, and 126 miles in alternative D.

As described in chapter 3, implementing the action alternatives would improve forest and woodland stand health and improve wildlife habitat, including habitat for threatened, endangered, and sensitive species. There would be reduction in the risk of large uncharacteristic wildfires and their impacts to the landscape, watersheds, species, and human health and quality of life. As described throughout chapter 3, the overall implementation of the action alternatives would improve resources such as range condition, wildlife and aquatic habitat, soil conditions, and others. Erosion control and reducing risk of wildfire would reduce impacts to sensitive resources like water quality, cultural resources, and air quality.

Based upon the effects of the alternatives, the responsible official will decide whether to select the no-action alternative; whether to select the modified proposed action, another action alternative, or an action alternative that is modified as described in the final decision, and which forest plan amendments to include in the final decision.

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Acronyms

ATV	all-terrain vehicle	NFS	National Forest System
ca	circa	NFSR	National Forest System road
CEQ	Council on Environmental Quality	NHPA	National Historic Preservation Act
CFR	Code of Federal Regulations	NOI	Notice of Intent
DEIS	draft environmental impact statement	NRHP	National Register of Historic Places
EIS	environmental impact statement	OML	operation maintenance level
E.O.	Executive Order	SDI	stand density index
FOIA	Freedom of Information Act	SNOTEL	snow telemetry
FR	Federal Register	SOPA	Schedule of Proposed Actions
FSR	Forest System Road	TEP	Tucson Electric Power
FVS	Forest Vegetation Simulator	TES	terrestrial ecosystem survey
GES	general ecosystem survey	TMDL	total maximum daily load
GIS	geographical information system	USDA	United States Department of Agriculture
MSO	Mexican spotted owl	U.S.C.	United States Code
NEPA	National Environmental Policy Act	UTV	utility task vehicle
NFMA	National Forest Management Act	VSS	vegetation structural stage

Chapter 1. Purpose of and Need for Action

Structure of this Document

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

- **Chapter 1. Purpose of and Need for Action:** This chapter briefly describes this project's background, its purpose and need, and our initial proposal for achieving the purpose and need. It then describes how we informed the public of the proposal and how they responded.
- **Chapter 2. Alternatives, including the Proposed Action:** This chapter describes the proposed action and alternatives—including no action—in detail. These alternatives were developed based on significant issues raised by the public and other agencies. The chapter ends with a summary of the environmental consequences for each alternative.
- **Chapter 3. Affected Environment and Environmental Consequences:** This chapter describes the environmental effects of each alternative in detail.
- **Preparers and Contributors:** This chapter contains a list of preparers and the agencies we consulted with during its development. It contains a list of agencies, organizations, and persons to whom copies of the draft environmental impact statement were sent.
- **Glossary**
- **References**
- **Index**

In addition to this document, there are a series of separate large-size map documents included on a compact disc (CD), displaying the proposed activities by alternatives that are referred to in chapter 2.

Additional documentation, including more detailed analyses of project area resources, may be found in the project planning record located at the Gila National Forest Supervisor's Office, 3005 E. Camino del Bosque, Silver City, New Mexico 88061. Documents are available pursuant to the provisions of the Freedom of Information Act.

Introduction

In response to Congressional, agency, and regional emphasis on all-lands restoration level planning, the Gila and Apache-Sitgreaves National Forests have responded by proposing ecological restoration treatments across a large landscape encompassing both national forests.

The Luna Restoration Project is located along the western portion of the Quemado Ranger District around the community of Luna (figure 1). The 185,586 acre Luna planning area is part of the larger Escudilla Landscape, a 279,470 acre landscape planning area that extends across both the Gila and Apache-Sitgreaves National Forests (figure 2). The two national forests

worked together and identified a number of treatments that cross between the two forest boundaries including vegetation and fuels (mechanical and prescribed fire), watershed, motorized transportation, range, and wildlife habitat activities.

Beginning in 2014, the Quemado Ranger District reached out to the public and County, State, and Federal agencies inviting all to assist with the development of proposed activities within the planning area. These stakeholders identified areas of concern related to wildfire potential and community protection; locations for motorized (for example, all-terrain vehicle and utility task vehicle) trails; maintenance needs for roads and trails; and maintenance needs for sediment control features and structures. Stakeholders also identified locations for vegetation restoration treatments, and locations and type of range and wildlife improvements.

Location and Description of Planning Area

The Luna Restoration Project is located along the western portion of the Quemado Ranger District around the community of Luna (figure 1). The 186,586-acre planning area is bounded to the north by the Gila National Forest boundary, the west by the Arizona and New Mexico state lines, the south by the Quemado Ranger District boundary, and the east along a series of ridgelines along watershed boundaries. There are 14,226 acres of private inholdings within the planning area. The project lies within the area of Townships 2 South through 7 South and Ranges 19 West through 21 West.

The community of Luna is located in the southern portion of the planning area. There is important infrastructure located in the vicinity of Luna. A large electronic and communication site is situated on the San Francisco Divide on the southern boundary of the planning area. This site supports systems for the Forest Service; Catron County Sheriff's Department and Emergency Management Services; New Mexico State Police; and private enterprises. Tucson Electric Power interstate has two transmission lines that extend through the entire length of the project area. The El Paso Electric interstate transmission line runs approximately 3 miles northeast of the planning area. A local service line managed by Navopache Electric Power Company extends in and around Luna.

The community of Luna and key infrastructure and natural resources are located in a forested, ponderosa pine setting and on mountain tops. Prevailing winds, alignment of topography, and dense forest vegetation place the community and infrastructure at risk of a wildfire starting in the southwest corner of the project area and rapidly burning northeast.

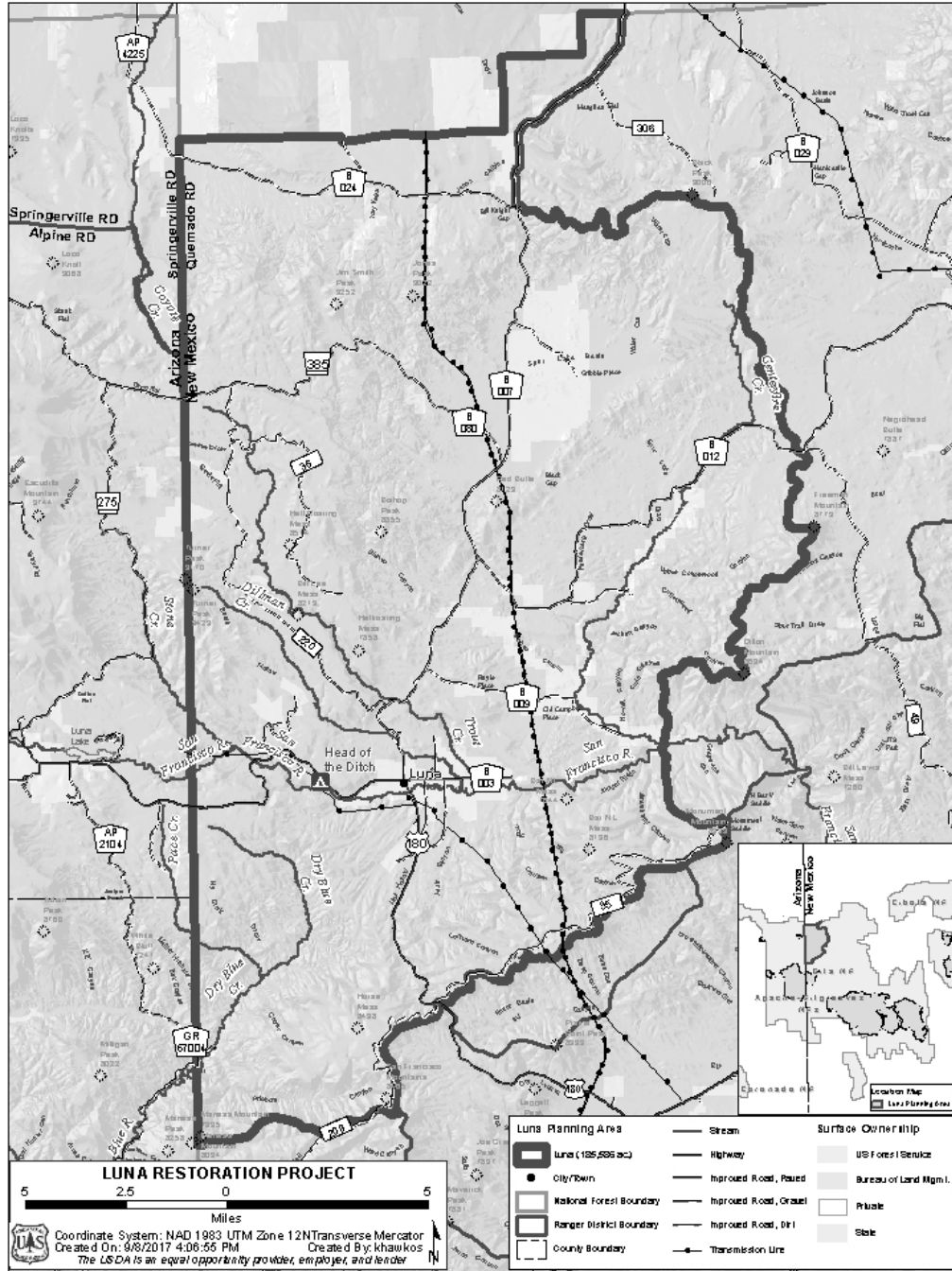


Figure 1. Luna Restoration Project vicinity map and planning boundary.

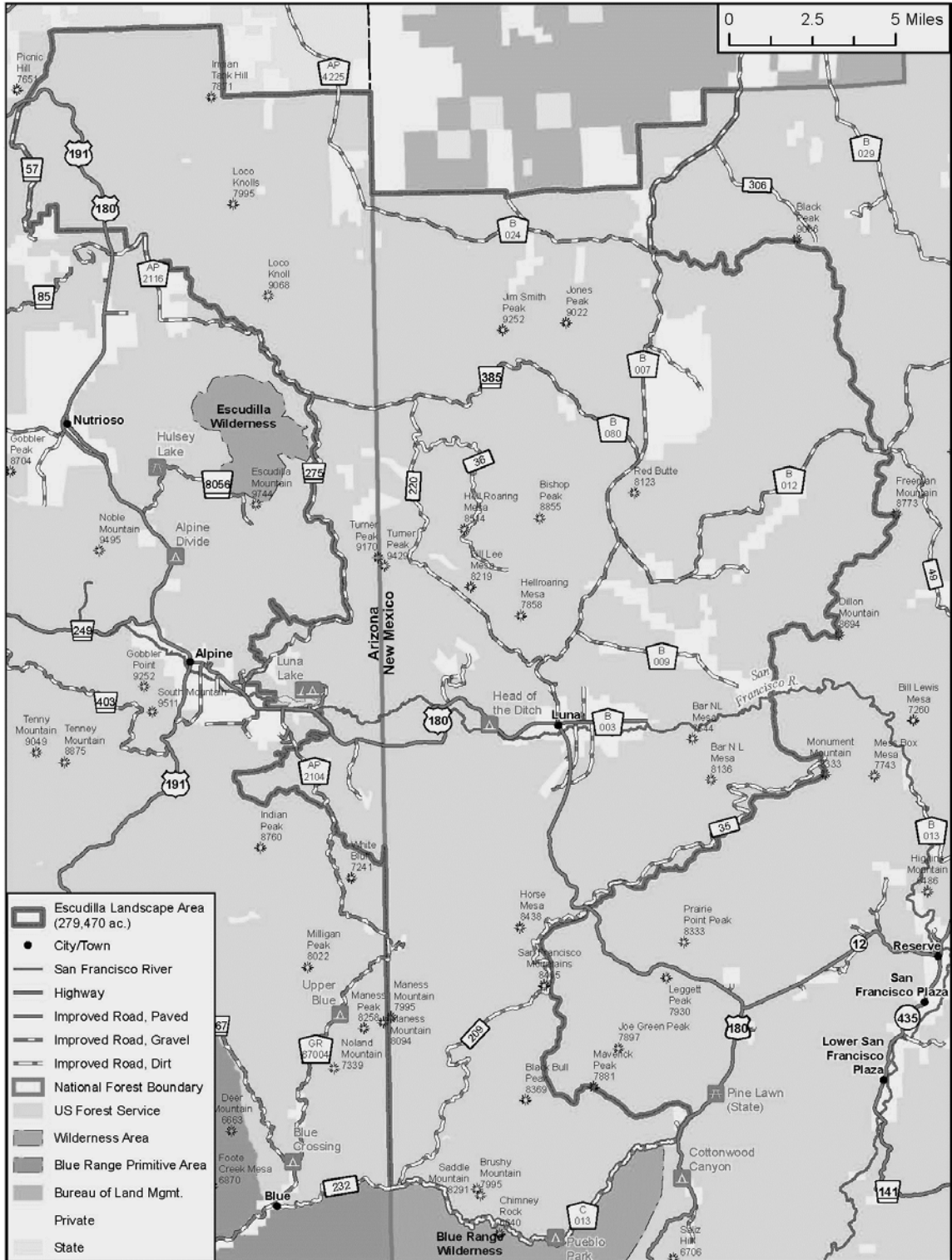


Figure 2. Map displaying the Escudilla Landscape planning boundary which extends across both the Apache-Sitgreaves and Gila National Forests.

Background

Luna and surrounding private inholdings are identified as “high” on the priority list for protection from wildfires in both the 2005 Catron County and 2006 Luna Community Wildfire Protection Plans. In the late 1990s to early 2000s, the Quemado Ranger District personnel implemented some hazardous fuels reduction projects around Luna which included prescribed burning, thinning of ponderosa pine stands, and construction of a 300-foot fuelbreak on the south and west sides of the community.

In 2011, the Wallow Fire burned onto the Gila National Forest from Arizona, west of the community of Luna, burning approximately 15,400 acres in New Mexico. The fire burned across the landscape with varying levels of severity. High-severity fire impacted numerous natural resources. Flooding occurred immediately after the fire, and numerous sediment trap and tanks across the fire area were silted in.

Within the larger Escudilla Landscape area (Arizona and New Mexico), approximately 39,385 acres were burned. Post-fire satellite imagery indicates 1,757 acres were burned by high-severity fire and 4,039 were burned by moderate-severity fire. The impacts of the Wallow Fire have resulted in degraded watershed conditions on thousands of acres; substantially altering future yields of clean water. Future vegetative communities; thus land use opportunities, especially on the heavily impacted areas, will continually change as the severely degraded areas move through successional stages of recovery and various vegetative communities develop.

The Wallow Fire and post-fire impacts on the landscape, watersheds, habitat, forest facilities, infrastructure, and community of Luna highlights the range of possible future impacts from wildfires on stakeholders and land managers.

Existing and Desired Conditions

Vegetation

Forest Cover Types

The Luna planning area contains a wide range of vegetation communities. The broad forest cover types are grassland, Douglas fir, oak woodland, pinyon pine -juniper woodland, ponderosa pine and white fir (table 1).

The desired condition is to maintain a variety of forest cover types within the project area, while increasing acres of grasslands that have been encroached by woodland species (table 1). It is also desired to increase the oak, herbaceous, forb, and shrub components within individual stands and manage for uneven-aged characteristics (multi-storied) across the majority of the landscape with the exception being areas having high levels of dwarf mistletoe and areas adjacent to private land.

Table 1. Existing acres of vegetation types within the Luna planning area. The percent change from existing conditions are shown for each cover type that would maintain variety and reach desired conditions per cover type in the planning area.

Forest Cover Type	Existing Acres	Desired Percent Change from Existing Condition
Grassland/Meadow	21,941	+0-2 %
Douglas fir	6,323	+0-2 %
Engelmann Spruce	109	+0-2 %
Oak Woodland	1,414	± 2 %
Pinyon pine-Juniper	41,713	± 5 %
Ponderosa pine	87,195	± 5 %
Riparian	784	N/A
Southwestern White Pine	69	+0-2 %
White Fir	6,887	+0-2 %
Reforestation Area	3,954	N/A
Rocky Area	942	N/A
Total	171,331 ¹	NA

¹ Acreage does not include private land.

Stand Density Index

Stand stocking density is the measurement of tree spacing within a stand and can be thought of in terms of the degree of crowding among trees in a stand. This can be measured in square feet of basal area, or expressed as an index of stocking, such as stand density index (SDI). For a given tree species of a given size (average stand diameter) there is a maximum number of trees that can be supported on an acre, or maximum stand density index.

Current and desired relative densities within the various zones across the Luna planning area are provided below in table 2. Currently 48 percent of the area is at full site occupancy. Most of the full site occupancy is concentrated in zones 3 and 4; both zones are within their desired respective ranges. The existing condition for zone 2 is slightly above the desired range, while zone 1 is within the desired range.

A variety of density conditions are desired across the landscape to meet various management objectives.

There is a desire to maintain areas in zones 3 and 4 to provide higher tree densities and canopy cover for wildlife species, including northern goshawk and Mexican spotted owl. Zones 3 and 4 also promote the development of old growth characteristics.

Table 2. Existing and desired stand density index (SDI) percent of maximum for the Luna project area.

Zone	Maximum SDI in Percent (%)	Existing Percent of Landscape	Desired Percent of Landscape	Biological Implications
1	0 - 25	19	10-20	Less than full site occupancy, maximum forage No competition among trees, little crown differentiation Maximum individual tree diameter and volume growth Minimum whole stand volume growth Shade intolerant seedlings favored
2	25 - 35	33	20-30	Less than full site occupancy, intermediate forage Onset of competition among trees, onset of crown differentiation Intermediate individual tree diameter and volume growth Intermediate whole stand volume growth Shade tolerant and intolerant seedlings favored
3	35 – 55 ¹	38	30-50	Full site occupancy, minimum forage Active competition among trees, active crown differentiation Declining individual tree diameter and volume growth Maximum whole stand volume growth Shade tolerant seedlings favored Upper range marks the threshold for the onset of density-related mortality
4	55 ¹ - 100	10	10-20	Full site occupancy, minimum forage Severe competition among trees, active competition induced mortality Minimum individual tree diameter and volume growth, stagnation Declining whole stand volume growth due to mortality Shade tolerant seedlings favored

¹ Zones 3 and 4 upper/lower ranges vary between 55-60% based on review of the existing research 55% was used as the respective upper and lower thresholds for zones 3 and 4 for the Luna Analysis.

Vegetation Structural Stage

Vegetation structural stage pertains to how treatments meet or improve wildlife habitat including Mexican spotted owl and northern goshawk. Vegetation structural stage (VSS) is the metric used to show how the treatments move ponderosa pine stands toward the desired conditions (table 3).

Existing conditions shows a surplus of acres in vegetation structural stages 1, 3 and 4 for the ponderosa pine cover type in comparison to the desired condition. All other structural stages are deficit to varying degrees (table 3).

For canopy density classes in the ponderosa pine cover type, class B is in surplus in comparison to the desired condition. Classes A and C are deficit and are not meeting desired conditions (table 4). For the woodland canopy density class A, B, and C do not meet desired condition (table 5).

Both ponderosa pine and woodland cover types are deficit in uneven-aged structure, 46 percent and 40 percent respectively, compared to desired conditions (90 percent and 100 percent). With both being deficit in uneven-aged structure, means both are exceeding their even-aged structures

compared to desired conditions. Ponderosa pine has 54 percent and woodlands 60 percent even-aged structure. The desired is to have 10 percent and 0 percent, respectively, even-aged structure.

Table 3. Vegetation structural stage existing and desired conditions in percent acres of ponderosa pine cover type in the Luna planning area.

Vegetation Structural Stage (Diameter class in inches)	Existing Condition (percent acres)	Desired Condition (percent acres)
VSS 1 (0.0-0.9")	22	10
VSS 2 (1.0-4.9")	<1	10
VSS 3 (5.0-11.9")	30	20
VSS 4 (12.0-17.9")	25	20
VSS 5 (18.0-23.9")	16	20
VSS 6 (24" +)	8	20

Table 4. Ponderosa pine cover type existing and desired conditions for canopy density classes by percent.

Canopy Density Class	Class description	Existing Condition (Percent)	Desired Condition (Percent)
A	Open (0-39%)	36%	40%
B	Moderately Closed (40-59%)	51%	40%
C	Closed (60% +)	12%	20%

Table 5. Woodland cover type existing and desired conditions for canopy density classes by percent.

Canopy Density Class	Class description	Existing Condition (Percent)	Desired Condition (Percent)
A	Open (0-39%)	13%	55%
B	Moderately Closed (40-59%)	63%	30%
C	Closed (60% +)	24%	15%

Habitat Features for Mexican Spotted Owl (Threshold Stands)

There are approximately 48,260 acres that are being managed for Mexican spotted owl habitat which includes protected activity centers, recovery habitat, and threshold habitat. Threshold habitat includes areas to be managed for nest and roost features. Under the Mexican Spotted Owl Recovery Plan, First Revision (2012), the goal is to manage stands identified for nesting and roosting habitat to meet or exceed area requirements outlined in Table C.3 of the recovery plan.

To determine if stands meet area requirements, four features were assessed for Mexican spotted owl nesting and roosting habitat in mixed-conifer and pine-oak forest cover types. Of the stands identified, no stands currently meet all features. However, all of the stands meet some of the minimums, to varying degrees, for the two cover types (table 6). The desire is to have 100 percent of the identified stands meeting or exceeding the area requirements for nest and roost habitat.

Table 6. Percentage of identified Mexican spotted owl threshold stands currently meeting all features and percent of stands meeting each of the features in mixed-conifer and ponderosa pine-oak cover types within the Luna planning area.

Forest Cover Type	% Stands Meeting all Features	Basal Area Size Class of 12-18" DBH	Basal Area Size Class >18" DBH	Stand Avg. Basal Area	Stand Avg. Trees per Acre 18"+
Mixed-conifer	0	52%	6%	48%	30%
Ponderosa Pine-Oak	0	49%	41%	29%	43%

Old Growth Stand Structural Attributes

Old growth stand structure attributes include number of live trees of a given size, snags, basal area, and canopy cover by vegetation type. These minimum criteria for the structural attributes vary between vegetation types for mixed species, ponderosa pine, and woodland species.

The Gila forest plan identifies a minimum of 20 percent of the forest cover types within the planning area must be managed for meeting old growth features. The area of forest cover types identified to be managed are: approximately 7,965 acres of the mixed-species group which includes Douglas fir, white fir, Engelmann spruce, limber/southwestern white pine); approximately 14,952 acres of the woodland group including juniper species; and approximately 20,177 acres of the ponderosa pine group.

Desired future condition in areas identified as potential old growth management areas include reduction of risk of high intensity wildfire while maintaining and increasing key old growth attributes. Existing and desired condition of structural attributes and respective minimum criteria to determine old growth for each cover type for the Luna planning area is displayed in table 7. Presently, approximately 12 percent of the ponderosa pine group; 19 percent of the mixed-species group; and 87 percent of the woodland group designated as old growth simultaneously meet all minimum criteria of the structural attributes (table 7). For the remaining areas, the structural attributes are met to varying degrees.

Table 7. Existing and desired old growth structural attributes by cover type group expressed in percent area within the Luna planning area.

Old Growth Group	Minimum Criteria of Structural Attributes¹	Percent Existing Condition of Designated 20% Old Growth Area	Percent Desired Condition of Designated 20% Old Growth Area
Ponderosa pine	20 live trees in main canopy at least 14 inches in diameter at breast height (DBH)	70	100
Ponderosa pine	1 standing dead tree per acre at least 14 inches DBH and at least 15 feet	46	100
Ponderosa pine	70 to 90 square feet per acre total basal area	98	100
Ponderosa pine	40 to 50% total canopy cover	34	100
Ponderosa pine	Percent area simultaneously meeting all attributes ²	12	100
Mixed-species	12-16 live trees in main canopy at least 18 inches DBH	45	100
Mixed-species	2.5 standing dead tree per acre at least 14 inches DBH and at least 20 feet	85	100
Mixed-species	80 to 100 square feet per acre total basal area	100	100
Mixed-species	50 to 60% total canopy cover	43	100
Mixed-species	Percent area simultaneously meeting all attributes ²	19	100
Woodland	12 to 30 live trees in main canopy at least 9 inches in diameter at root collar (DRC)	99	100
Woodland	1 standing dead tree per acre at least 9 inches DRC and at least 8 feet	88	100
Woodland	6 to 24 square feet per acre total basal area	100	100
Woodland	20 to 35% total canopy cover	97	100
Woodland	Percent area simultaneously meeting all attributes ²	87	100

¹ Low site productivity values were used as threshold for each old-growth group for the Luna planning area.

² Age and down dead trees are unknown for the group.

Fuels and Fire

Fire behavior modeling results suggest current vegetative conditions in the planning area could result in torching and passive and active crown fires that are uncharacteristically intense and severe (table 8, MAP 1). Vegetation and fuel conditions across the planning area include dense stands, closed canopies, ladder fuels (canopy base height), and high surface fuel loadings (table 9).

Table 8. Acres by fire type within the Luna planning area.

Fire Type	Description	Acres at Risk
Surface Fire	Fire that burns predominately across the surface litter and undergrowth	44,183
Torching/Passive Crown Fire	Type of crown fire in which the crowns of individual trees or small groups of trees burn, but solid flaming in the canopy cannot be maintained except for short periods	86,842
Active Crown Fire	Also referred to as running crown fire or continuous crown fire. An active crown fire presents a solid wall of flame from the surface through the canopy fuel layers	36,566

Table 9. Existing fuel conditions by vegetation type within Luna planning area.

Vegetation Type	Surface fuel loading ¹ (tons per acre)	Coarse Woody Debris ² (tons per acre)	Canopy Base Height ³ (feet)	Canopy Bulk Density ⁴ (kg/m ³)
Pinyon juniper	5	4	5	0.08
Ponderosa pine	5	3	11	0.07
Mixed conifer	11-18	7-13	4-7	0.11-0.14

¹Surface fuels include the total amount of fuels on the forest floor. Surface fuels include duff, grass, needles, sticks, and small branch wood. Surface fuel loads are measured in tons per acre.

²Course woody debris consists of fallen dead trees and the remains of large branches on the ground in forests and woodlands. Course woody debris is measured in tons per acre.

³Canopy base height is the average height from the ground surface to a forest stand's canopy bottom.

⁴Canopy bulk density is the mass of the available canopy fuel. Canopy bulk density is used to predict crown fire.

The desired conditions for fuels and fire are to:

- reduce the number of acres at risk to crown fires (table 8);
- use wildland fire as a disturbance agent;
- have the mean fire return intervals ranging from 2 to 24 years in ponderosa pine and dry mixed conifer stands; and
- move the planning area fuel conditions towards values or ranges described in table 10.

Table 10. Desired fuel conditions by vegetation type within Luna planning area.

Vegetation Type	Surface fuel loading¹ (tons per acre)	Coarse Woody Debris² (tons per acre)	Canopy Base Height³ (feet)	Canopy Bulk Density⁴ (kg/m³)
Pinyon juniper	5	5-10	4-6	<0.05
Ponderosa pine	7-14	5-7	>18	<0.05
Mixed conifer	2-4	10-15	>5-10	<0.08

¹Surface fuels include the total amount of fuels on the forest floor. Surface fuels include duff, grass, needles, sticks, and small branch wood. Surface fuel loads are measured in tons/acre.

²Course woody debris consists of fallen dead trees and the remains of large branches on the ground in forests and woodlands. Course woody debris is measured in tons/acre.

³Canopy base height is the average height from the ground surface to a forest stand's canopy bottom.

⁴Canopy bulk density is the mass of the available canopy fuel. Canopy bulk density is used to predict crown fire.

Watershed and Aquatics

All or portions of nine 6th code watersheds are in the Luna planning area (table 11). In 2015, watershed condition ratings were determined by a qualitative assessment of twelve indicators. These indicators include water quality, water quantity, aquatic habitat, aquatic biota, riparian and wetland vegetation, roads and trails, soils, fire regime and wildfire, forest cover, rangeland vegetation, terrestrial invasive species, and forest health. The indicators were given a rating of functioning properly, functioning at risk or impaired. A composite score was derived from these ratings to give an overall watershed condition rating. Watersheds that are rated in Class 2 or Class 3 condition have several indicators that are not functioning properly. Examples of this include poor road drainage, high erosion rates, degraded riparian conditions, fragmented aquatic habitat, recent high severity wildfire, noxious weed infestation, decline in perennial water, and road and stream conflicts.

Aquatic and riparian obligate species are being impacted by impaired watersheds. High sediment loads and temperatures, lack of woody debris in the channel, lack of mature, multi-story riparian vegetation, and exotic species are some of the conditions present.

The desired conditions for watershed and aquatics are:

- all 6th code watersheds are rated as class 1, functioning properly;
- all streams meet New Mexico State water quality standards; and
- have a healthy, diverse riparian corridor that supports aquatic species and riparian obligates

Table 11. 6th code watersheds in the Luna planning area. Summary of the 2015 watershed condition rating and number of streams in non-attainment of New Mexico State water quality standards.

6th Code Watershed ¹	2015 Watershed Condition Rating(*)	Number of Streams / Stream Name in Non-Attainment of State Water Quality Standards (**)
Trout Creek	Class 2	0
Stone Creek-San Francisco River	Class 2	1 / San Francisco River
SA Creek	Class 2	0
Outlet Centerfire Creek	Class 3	1 / Centerfire Creek
Big Canyon-San Francisco River	Class 2	1 / San Francisco River
Headwaters Centerfire Creek	Class 2	1 / Centerfire Creek
Spur Draw	Class 2	0
Dry Blue Creek	Class 2	0
Canovas Creek-Coyote Creek	Class 2	0

¹ The nine watersheds listed make up the majority of the project area. Several other watersheds are impacted by the project, however less than 5 percent of the project area is within each of these watersheds.

(*)Class 1 = Functioning Properly; Class 2 = Functioning at Risk; Class 3 = Impaired Function

(**)2016-2018 State of New Mexico Clean Water Act section 303(d)/305(b) Integrated List and Report: San Francisco River listed for exceedances of benthic-macroinvertebrate bioassessments, water temperature, *Escherichia coli* and turbidity; Centerfire Creek listed for exceedances of *Escherichia coli*, nutrient/eutrophication biological indicators, sedimentation and siltation, specific conductance, water temperature, and turbidity.

Wildlife

The Luna planning area is located in the Upper Gila Mountain recovery unit for the Mexican spotted owl. On the Gila National Forest, the Mexican spotted owl occupies mixed conifer and ponderosa pine/Gambel oak vegetation types, usually characterized by high canopy closure, high stem density, multi-layered canopies within the stand, numerous snags, and downed woody material.

One of the primary concerns for the Mexican spotted owl is the potential loss of habitat from uncharacteristic wildfire (USFWS 2012). Crown fire potential was analyzed, approximately 68 percent of the planning area is at risk to torching and passive and active crown fire (table 7).

The habitat outside Mexican spotted owl protected activity centers is managed for northern goshawk habitat. Portions of the northern goshawk post-fledging family areas is characterized as having dense, small-diameter, young ponderosa pine trees. Many of these stands are also at risk to torching, passive, and active crown fire.

Browse for big game species across the planning area is decadent with little regeneration to provide forage for wildlife.

The desired conditions for wildlife are:

- having a range of diverse habitats for fish and wildlife populations;
- improving habitat for threatened or endangered species;
- reducing the risk of high severity fire within Mexican spotted owl and northern goshawk acres identified for treatment;

- increasing diversity in age, size, and structure of stands within northern goshawk habitat; and
- increasing diversity, productivity, and abundance of browse species (e.g., mountain mahogany, Gambel oak) for wildlife game species

Purpose and Need for Action

The purpose of the Luna Restoration Project is to create and maintain a healthy resilient landscape and watersheds capable of delivering benefits to the public including clean air and water, habitat for native fish and wildlife, forest products, and outdoor recreation opportunities. There is a need to:

- reduce the impacts of high severity fire on natural and cultural resources, private inholdings, communities, infrastructure, and livelihoods within the planning area;
- implement vegetative treatments to restore departed landscapes that are, overstocked, encroached, and at risk to fire, disease, insects, and-climate stressors;
- implement treatments in watersheds that are not properly functioning;
- improve water quality by hardening stream crossings and performing road maintenance;
- continue to provide the wide range of forest products that are important to the culture, tradition and livelihoods of local communities;
- protect and restore threatened and endangered species and habitats;
- provide opportunities for off-highway vehicle use, enjoyment, and access from the community of Luna;
- provide permanent water supplies to support wildlife and livestock; and
- improve rangeland, wildlife, aquatic and riparian habitat.

The Gila forest plan as amended (USDA Forest Service 1986) will need “project-level” amendments specifically applicable to the Luna Restoration Project.

Previous Decisions

This project is proposing restoration to grasslands and watersheds however, this analysis will not change the range management decisions for allotments within the planning area.

The Gila National Forest travel management record of decision was signed in 2013 and has implemented the decision with publication of motor vehicle use maps forestwide. The Travel Management Rule (USDA Forest Service. 2005) provides for flexibility and revision of designations to the motorized system (36 CFR 212.54), which states

Designations...pursuant to section 212.51 may be revised as needed to meet changing conditions. Revisions of designations shall be made in accordance with the requirements for public involvement in section 212.52, the requirements for coordination with governmental entities in section 212.53, and the criteria in section 212.55, and shall be reflected on a motor vehicles use map pursuant to section 212.56.

Modified Proposed Action

The proposed action for the Luna Restoration Project was published on May 19, 2016. The proposed action has been modified and fully described under alternative B in chapter 2.

Changes between the proposed action and the modified proposed action include acres of prescribed fire only; removal of site preparation activities in the Wallow Fire; clarification of stream, riparian, and wet meadow activities; additional water systems and wells; a change in route designations for all-terrain vehicle and utility task vehicle use; no heavy maintenance on level 2 roads; and re-opening roads, decommissioning roads, or both.

The modified proposed action is designed to achieve the purpose and need with proposed treatments to move toward the improvement and restoration of the structure and function of vegetation and watersheds in the project area. Treatments are briefly described below. Restoration treatments and the general locations are described in chapter 2. Initial and maintenance treatments will take place over the next 8 to 10 years, extending up to 20 years or until objectives are met.

Restore the Structure, Function, and Resilience of Forests

- Mechanically treat (cut and remove) trees to reduce tree density and provide age and size class diversity within the stands.
- Use prescribed fire to create and maintain open conditions, restore natural fire, and reduce natural and activity fuels.
- Enhance and promote browse species including gamble oak and mountain mahogany for wildlife through cutting, burning, or both.

Improve the Function of Riparian Areas and Streams, Vegetative Diversity, and Water Quality

- Plant trees, shrubs, and native grasses to enhance native riparian vegetation.
- Place structures, plant vegetation, or both in or near stream channels to stabilize streambanks.
- Improve or harden road and motorized trail crossings at streams to reduce sedimentation.
- Maintain erosion control or stabilization structures located across the planning area.
- Develop waters to improve livestock and wildlife distribution.
- Remove encroaching pine and juniper species from meadow margins to restore and increase meadow habitat.
- Reduce density of rabbitbrush to improve grassland habitat.

Reduce Impacts from Roads and Project-Related Access

- Decommission roads.
- Maintenance of existing National Forest System roads used for project-related access.
- Construct temporary roads and decommission them after use.
- Re-open existing closed roads and close or decommission them after use.

Forest Plan Amendments

Chapter 2 has a detailed discussion of the forest plan amendments needed for implementation.

Decision Framework

The forest supervisor is the responsible official for this decision. Based on the environmental analysis and supporting documents in the project record, the forest supervisor will decide:

- whether to select the no-action alternative;
- whether to select the modified proposed action, another action alternative, or an action alternative that is modified as described in the final decision; and
- which forest plan amendments to include in the final decision

Public Involvement

This project has been listed on the Gila National Forest's schedule of proposed actions (SOPA) since October 2015 and periodically updated. It was originally listed as Luna Planning Area and was changed to its current name of Luna Restoration Project in the July 2016 schedule of proposed actions.

Prior to scoping the proposed action, the Quemado Ranger District staff hosted two open houses in the community of Luna, New Mexico on December 10, 2014 and May 7, 2015 to have discussions with stakeholders on identifying issues, concerns, and restoration opportunities within the planning area. In between those open houses, over 200 letters, dated February 2, 2015, were sent to individuals, Tribes, organizations, and agencies introducing the planning area and requesting help in identifying and shaping the activities needed within the area. Also, on July 21, 2015, Gila National Forest staff met with members of the Luna Community who had great interest in all-terrain vehicle and utility task vehicle recreational-related access opportunities. The comments received during these events assisted in the development of the proposed action.

The notice of intent was published in the Federal Register on May 19, 2016. The notice of intent asked for public comment on the proposal for 45 days ending on July 5, 2016. We mailed the proposed action to approximately 270 people and held an open house on June 8, 2016 at the Luna Community Center, in Luna, New Mexico. The open house provided an opportunity for interested parties to review project maps, ask questions, and provide input to the proposed project. In response, we received 27 letters and emails. The content of the letters and emails formed the basis of the alternatives (see "Issues" section) and environmental analysis.

Tribal Consultation

Tribal consultation for the Forest Service is guided by a variety of laws, executive orders and memoranda, as well as case law. Laws include the National Historic Preservation Act of 1966 and subsequent amendments (Public Law 89-665, 15 October 1966), Archaeological Resources Protection Act of 1979 (Public Law 96-95, 16 U.S.C. 470aa-mm, 31 October 1979), American Indian Religious Freedom Act of 1978 (Public Law 95-341, U.S.C. 1996 and 1996a, 11 August 1978), National Environmental Policy Act of 1969 (NEPA) (Public Law 91-190, 42 U.S.C. 4321-4347, 1 January 1970), Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601, 16 November 1990), and National Forest Management Act of 1976 (NFMA) (Public Law 94-588, 22 October 1976, codified in 36 CFR 219). Executive orders and

memoranda include a 1994 memorandum on government-to-government relations with Native American Tribal Governments (59 FR 85, 4 May 1994), Executive Order 13007 on accommodation of sacred sites (61 FR 104, 29 May 1996), and Executive Order 12898 on environmental justice (59 FR 32, 16 February 1994).

The Gila National Forest staff is committed to, and has conducted, Tribal consultation and provided documents associated with the National Environmental Policy Act during the scoping period. These consultations were carried out at the government-to-government level, ensuring that interested Tribes were given the opportunity to participate in the planning process as required in the National Environmental Policy Act and elsewhere. The Gila National Forest staff will continue to engage in ongoing Tribal consultation through all of the National Environmental Policy Act phases for this project. The following 12 Tribes or chapters were consulted with:

- Alamo Navajo Chapter
- Fort Sill Apache Tribe
- Mescalero Apache Tribe
- Pueblo of Acoma
- Pueblo of Laguna
- Pueblo of Zuni
- Ramah Navajo Chapter
- The Hopi Tribe
- The Navajo Nation
- San Carlos Apache Tribe
- White Mountain Apache Tribe
- Ysleta Del Sur Pueblo

Issues

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, forest plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality National Environmental Policy Act regulations explain this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Section 1506.3)...". A list of non-significant issues and reasons regarding their categorization as non-significant may be found in the project record.

As for significant issues, the Forest Service identified the following issues during scoping:

Vegetation Treatments

- Just cutting juniper is not an effective means of treatment (Comment 7.3)
- Mowing does not reduce rabbitbrush (Comment 11.11; 27.11)

Result: Develop an alternative to include use of herbicides as part of proposed activities within juniper and rabbitbrush treatment areas.

Fuels Treatments

- Burning mixed conifer canyons east of U.S. 180 could result in high-severity fire, impacting wildlife travel routes (Comment 27.16)
- Proposed activities are not improving or protecting Mexican spotted owl habitat (Comment 26.18; Comment 27.12) (less than 9 inches thinning, limited burning)

Result: Modify the proposed action to add acres south of Luna along Frisco Divide for prescribed fire only. Burning prescriptions will include high-moisture and low-intensity parameters.

Routes 1

- 50 inches limits access by utility task and side-by-side vehicles (Comment 10.1; Comment 25.1)

Result: Modify the proposed action to change proposed motorized routes less than 50 inches to routes allowing for the use of utility task and side-by-side vehicles.

Routes 2

- Provide motorized access for Tucson Electric Power maintenance (Comments 20.4, 20.5, 20.7)

Result: Modify the proposed action to provide access for Tucson Electric Power (TEP) to perform powerline maintenance activities.

Routes 3

- User routes should not be added to the National Forest System of roads and trails (Comment 26.12; 26.14)
- The proposed loop route roads (4134, 4019 H, etc.) should not be opened to motorized use due to going through wet meadows and Dillman Creek. (Comment 27.29)
- Opening user all-terrain vehicle route down Adair Canyon will increase wildlife disturbance and multiple drainage crossings (Comment 27.30)

Result: Develop an alternative which does not add user routes or closed roads to the open motorized National Forest System roads except for those providing access to Tucson Electric Power powerline.

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes the alternatives considered for the Luna Restoration Project. The interdisciplinary team used the significant issues identified under the “Issues” section of chapter 1 to modify the proposed action or develop alternatives to the modified proposed action.

There are many similarities in proposed activities between all action alternatives. Because of this, the alternatives will be described in the following manner:

- Alternative A, no action, is a stand-alone description.
- Alternatives B, C, and D are displayed and described by each proposed activity type (vegetation, fire, range management, stream and riparian, etc.).

This chapter is outlined this way to minimize describing similarities between alternatives and to maximize attention to the differences of proposed activities within their specific alternative.

Alternatives Considered in Detail

Alternative A – No Action

The no-action alternative is required by 40 CFR 1502.14(d). There would be no changes in current management and the forest plan would continue to be implemented. There are currently no ongoing vegetation, prescribed fire, or other restoration type projects within the planning area. Activities such as road maintenance, recreation, and fuelwood gathering would continue. Activities that have been authorized in separate decisions such as special use permits (for example, powerline corridors, communication towers, etc.), travel management implementation, and authorized livestock grazing would continue. Alternative A is the baseline for assessing and comparing effects of the action alternatives B, C, and D.

Alternatives B, C, and D by Proposed Activity Types

Activities Common to all Action Alternatives

All proposed activities may require the use of varying types and sizes of motorized vehicles off of roads or trails designated open to the public or for administrative use only; that is, travel cross-country or on closed roads during implementation. Cross-country travel will be authorized by the line officer on a case-by-case basis.

Vegetation Treatments

The following vegetation treatments are the same for alternatives B, C, and D (table 12, MAP 2 and MAP 3). There are no differences in the location, acres, or proposed treatments between alternatives.

Table 12. Acres of vegetation treatments by action alternative and map reference number.

Vegetation Treatments	Alternative B	Alternative C	Alternative D	MAP Number
Woodland (juniper and pinyon pine) mechanical treatments [acres]	20,328	20,328	20,328	MAP 2
Forested (ponderosa pine and mixed conifer) mechanical treatments [acres]	53,529	53,529	53,529	MAP 2
Total acres mechanical treatments	73,856	73,856	73,856	NA
Grassland tree removal (ponderosa pine, juniper spp.) [acres]	20,283	20,283	20,283	MAP 3
Grassland wet/upland meadow and valley bottoms tree removal (ponderosa pine, juniper spp.) [acres]	2,842	2,842	2,842	MAP 3
Total acres grassland treatments	23,125	23,125	23,125	NA
Mexican spotted owl protected activity centers - thin trees <9 inches, pile or broadcast burn [acres]	1,319	1,319	1,319	MAP 2
Treat gambel, gray oak and mountain mahogany stands by cutting and/or prescribed burning	Yes	Yes	Yes	N/A

Woodland and Forest – Maintenance and Restoration: Woodland (for example, juniper, pinyon pine) and forest (ponderosa pine and mixed conifer) maintenance and restoration treatments are proposed on approximately 73,856 acres. Cutting of vegetation will be accomplished by hand or mechanized equipment. In forested systems activities would include thinning and group selections (for example, creating 1/8- to 4-acre openings).

Treatments would favor healthy co-dominant and dominant trees for retention

Treatments could be accomplished through commercial, noncommercial, and fuelwood gathering activities.

Grassland – Maintenance and Restoration: Grassland maintenance and restoration treatments are proposed on approximately 23,125 acres. Ponderosa pine and pinyon-juniper have encroached, become established, and continue to spread into the grasslands. Proposed activities consist of cutting ponderosa pine and pinyon-juniper by hand or mechanized equipment, to reduce tree canopy cover to less than 10 percent in grasslands. Treatments located in upland wet meadows and valley bottoms primarily associated with Jenkins Creek, Badger Creek, Romero Creek, Stone Creek, Dry Blue, San Francisco River, Dillman Creek, and Trout Creek areas

Material may be lopped and scattered or chipped and scattered in upland wet meadows and valley bottoms.

Mexican Spotted Owl Protected Activity Centers: Thin small diameter trees less than 9 inches on approximately 1,319 acres within protected activity centers. No activities would take place from March 1 to August 31 to avoid disturbance to owls during the breeding season.

Wildlife Habitat: Cut and prescribe burn Gambel oak and mountain mahogany stands to promote new growth and sprouting in various locations across the planning area. This would occur in conjunction with other vegetation and fuel treatments.

Design Features Common to Vegetation Treatments:

- Follow appropriate best management practices for vegetation management activities (e.g., forestry, logging, roads).
- Retain hardwoods and minimize damage during operations.
- All proposed activities may require the use of motorized vehicles off designated or administrative roads or trails; that is, cross country during implementation.
- To avoid impacts on southwestern willow flycatcher critical habitat, critical habitat would be buffered and no vegetation treatments would be implemented within critical habitat.
- To avoid impacts on narrow-headed gartersnake proposed critical habitat, critical habitat would be buffered and no vegetation treatments would be implemented within critical habitat.

Vegetation Treatments – Herbicide Treatments

The following treatments are for rabbitbrush and treatment of rabbitbrush and alligator juniper using herbicide (table 13, MAP 3 and MAP 4). There are differences in proposed treatments in alternative C. Treatments in alternative B and D are the same.

Table 13. Acres of rabbitbrush, alligator juniper, and herbicide use by alternative and map reference number.

Vegetation Treatments	Alternative B	Alternative C	Alternative D	MAP Number
Rabbitbrush treatment with mowing only [acres]	20,283	0	20,283	MAP 3 ¹
Rabbitbrush herbicide application with or without mechanical assistance (e.g. mowing) [acres]	0	Up to 20,283	0	MAP 4
Alligator juniper herbicide application in grassland meadows [acres] ²	0	30	0	MAP 4
Alligator juniper herbicide application in woodlands and grasslands [acres] ²	0	up to 8,000	0	MAP 4

¹ Grassland polygons on MAP 3 correspond to same treatment areas for rabbitbrush.

² Acres for alligator juniper are a subset of the acres in table 12 describing acres of vegetation treatments.

Rabbitbrush Overview: There are approximately 23,125 acres of grassland vegetation community within the planning area. Of that, approximately 20,283 has been proposed for the treatment of rabbitbrush under all of the action alternatives. Green and rubber rabbitbrush are native shrubs that grow widely across western United States rangelands. Though they can appear as a weedy monoculture (especially following disturbance), they are early colonizers, and their presence can be reduced under improved management regimes (USDA Forest Service, 2015). The objectives of the proposed treatments are to manage rabbitbrush and reduce the occurrence of dense stands or monocultures of rabbitbrush; not to eliminate rabbitbrush across the planning area. The objectives can be met by treating existing stands to allow for the replacement of rabbitbrush by desired herbaceous vegetation and shrubs; and through management of grasslands to prevent the establishment of dense stands of rabbitbrush.

Alternatives B and D

Alternatives B and D would only include mowing for rabbitbrush treatment. Under these alternatives dense stands of rabbitbrush would be identified for mowing and reseeding to break up these communities and allow for the replacement by more desirable vegetation. Mowing alone could require multiple entries into the site to deplete the plants energy stores enough to achieve limited mortality in rabbitbrush. Single-entry mowing would only suppress top growth in rabbitbrush and would not result in long term alteration of the plant community. Mowing would be limited to those areas that are accessible to mowing equipment and where mowing would not result in resource concerns.

Alternative C

Alternative C would incorporate the application of herbicide on rabbitbrush and alligator juniper. Pre-treatment of vegetation may be needed before application of herbicide using such things as chainsaws, mowing, or other type of mechanical equipment to assist in exposing the part of the plant recommended for effective treatment. For alligator juniper, herbicide could be applied in identified acres in conjunction with mechanical treatments. For rabbitbrush, herbicide could be used in conjunction with mowing or on its own in locations where mowing is not feasible. The herbicide selected, timing of application, species and subspecies treated, and soil type are important factors for success.

The application of herbicide would follow all Federal, State, and local laws and all herbicide label requirements. Herbicides selected for use for the management of rabbitbrush and alligator juniper would be those approved through the environmental assessment for noxious weed management on the Gila National Forest (USDA Forest Service 2000).

No aerial application of herbicides will occur. All applications will be by hand spraying (liquid), hand spreading (granular or powder), or broadcast using a small tractor or all-terrain or utility task vehicle towing a spreader. Rubber-tired mechanical equipment will be used.

Design Features Specific to Herbicide Treatments

The following design features and best management practices would be considered in the use of herbicide:

- Avoid or minimize the risk of soil sand surface water or groundwater contamination by complying with all label instructions and restrictions required for legal use.
- Herbicide application would occur under the supervision of a licensed applicator and in accordance with Federal, State, and local laws, regulations, and policies.
- When applying near private lands, maintain a buffer between treatments and private land to avoid effecting vegetation on private lands.
- When applying near private lands, provide adequate notification and post appropriate signing.
- Evaluate surface drainage patterns in treatment area and establish 300-foot buffer zones from surface water, wet meadows, and riparian areas. Avoid treatment in channel or ditch connections that lead to surface water, wet meadows, and riparian areas.
- Do not direct spray toward any open water.
- Mixing and loading would not occur near streams or other standing water.

- To avoid impacts on southwestern willow flycatcher critical habitat, critical habitat would be buffered and no herbicide treatments would be implemented within critical habitat.
- To avoid impacts on narrow-headed gartersnake proposed critical habitat, critical habitat would be buffered and no herbicide treatments would be implemented within critical habitat.
- Apply chemicals under favorable weather conditions as identified in the label instructions and in accordance with equipment manufactures specifications. To reduce the risk of non-target species being impacted, all spraying should occur with winds less than 10 miles per hour and greater than 1 mile per hour unless otherwise indicated in the label instructions.
- Avoid applying chemicals before forecasted severe storm events to limit runoff and ensure the chemical reaches intended targets. Suspend operations if project prescription or weather limitations have been exceeded.
- Select herbicides that are appropriate for treating the target species and prioritize chemicals for use that have the following features limited half-life, limited soil mobility and limited residual activity.
- Identify public water supplies, private domestic water supplies, and threatened, endangered, and sensitive aquatic dependent species and fish populations near or downstream of chemical treatment areas.
- Consider soil type, chemical mobility, distance to surface water, and depth to groundwater to avoid or minimize surface water and groundwater contamination.
- Manage, store and transport chemicals in accordance with all applicable Federal, State, or local regulations, including label directions.
- Prior to herbicide application identify resource concerns and mitigations specific to the individual treatment area.
- Herbicide application including the use of mechanical equipment for application will avoid all known archaeological sites.

Prescribed Fire Treatments

Alternatives B, C, and D propose the same treatment (table 14, MAP 5 and MAP 6). There are no differences in the location, amount or types of treatments between alternatives.

Table 14. Acres of prescribed fire only and activity fuels treatments by alternative and map reference number.

Prescribed Fire Treatments	Alt B	Alt C	Alt D	MAP Number
Prescribed fire only - mixed severity [acres]	11,996	11,996	11,996	MAP 5
Prescribed fire only - low severity [acres]	24,026	24,026	24,026	MAP 5
Prescribed fire only (total)	36,022	36,022	36,022	---
Mexican spotted owl protected activity centers - broadcast burn (subset of prescribed fire only total)	8,399	8,399	8,399	---
Prescribed fire and mechanical treatments – low and mixed severity [acres]	70,000 - 100,000	70,000 - 100,000	70,000 - 100,000	MAP 6

Prescribed Fire - Mixed Severity: Mixed-severity prescribed fire is proposed to treat natural fuels and activity fuels. Mixed severity prescribed fires typically burn in a mosaic, resulting in a highly variable pattern of mortality on the landscape that fosters development of diverse communities. Pockets of tree mortality, and reduction of surface and ladder fuels is desired.

Prescribed fire would be initiated using hand-ignition devices (drip torches, fusees, pen flare or very pistol, terra torch, matches), aerial-ignition devices (helicopter – ping pong balls), or both.

Prescribed Fire - Low Severity: Low-severity prescribed fire is proposed on approximately 24,026 acres on the north aspect of the San Francisco Divide, and southwest of Luna in the Dry Blue and Frieborn Canyon areas extending south to the planning area boundary. This area has limited access, steep topography, sensitive soils, high fuel loads, and potential for high-severity wildfire. The community of Luna and key infrastructure are located to the northeast. The objective of implementing prescribed fire is to create a mosaic of burned and unburned patches of vegetation, of varying acreages, on the landscape to protect values at risk.

Low-severity prescribed fire would be introduced when fuel conditions, weather conditions, or both minimize fire spread across the landscape. These conditions could include rain and monsoon season; fall and early spring when low temperatures, high humidity, and residual snow patches limit fire growth. Ignitions would be patterned after a lightning storm; a number of ignitions (dots) scattered across an area. Desired results would be reduction of surface and canopy fuels. The end state would be areas treated with prescribed would eventually merge together and breakup the fuel continuity across a larger area. Multiple entries and time would be needed to meet these objectives.

Prescribed fire would be initiated using aerial-ignition devices (helicopter – ping pong balls), hand-ignition devices (drip torches, fusees, pen flare or very pistol, terra torch, matches), or both.

Design Features Specific to Low-severity Prescribed Burning Activities

- Coordinate with Natural Resource Conservation Service to manage vegetation and fuels around the snow telemetry (SNOTEL) site.
- There would be no tree removal or burning within 400 feet around the SNOTEL site except to cut hazard trees that have the potential to fall on the facility.
- Notify and coordinate with infrastructure permit holders on the San Francisco Divide.

Design Features Common to All Prescribed Burning Activities

- Prescribed fire would be implemented in any season of the year provided the burn is conducted within the weather and fuel conditions prescribed in the burn plan.
- Consider using ignition patterns that allow fire to back through ponderosa pine and mixed conifer stands, especially on slopes greater than 40 percent, in efforts to reduce burn severity within the watershed.
- All slash piles (hand and machine) will be constructed to minimize disturbance to existing ground cover, surface soil and rock material and any existing surface organic matter material (surface litter and duff and old branches and logs). Piles will be constructed to minimize residual heat, to minimize the effects on soils.
- Firelines would be used to facilitate broadcast burns or pile burning operations as needed.

- Notify and coordinate with Tucson Electric Power and Navopache when burning near or within their powerline rights-of-way.
- During development of burn plans, consult soil scientist and soils map for locations of soils of concern to determine appropriate prescriptions to minimize impacts to sensitive soils.
- Notify and coordinate with allotment permittees when scheduling and implementing treatments.
- All burning would be coordinated and conducted in accordance with New Mexico Environmental Department, Air Quality Bureau smoke management rule. Emission reduction techniques would be utilized when possible to minimize impacts to sensitive receptors.
- Use low-intensity prescribed fire along trails corridors to minimize the creation of snags.
- Prescribed fire can occur within Mexican spotted owl core areas however, prescribed fire ignitions cannot be initiated within Mexican spotted owl core areas. Initiate firing patterns within and adjacent to protected activity centers which result in low-severity prescribed fire. No activities would take place from March 1 to August 31 to avoid disturbance to owls during the breeding season.
- To minimize smoke impacts to nesting northern goshawk, no prescribed fire would take place from March 1 to September 30 within post-fledging family areas.
- To avoid impacts on southwestern willow flycatcher critical habitat, critical habitat would be buffered and no prescribed fire treatments would be implemented within critical habitat.
- To avoid impacts on narrow-headed gartersnake proposed critical habitat, critical habitat would be buffered and no prescribed fire treatments would be implemented within critical habitat.

Range Management

Alternatives B, C, and D propose the same range improvements (table 15, MAP 7). There are no differences in the location, amount or types of improvements between alternatives. The types and quantity of improvements are summarized by allotment in table 16.

Alternatives propose adding new or upgrading existing water systems on the Centerfire, Dillman/Trout Creek, Luna, Mangitas, and Spur Lake allotments to increase livestock and wildlife distribution to benefit rangeland conditions, including watershed, soils, and stream resources. A pasture division fence is proposed on the Spur Lake allotment. The proposed improvements would improve livestock distribution, forage utilization and management flexibility. This proposal would not alter the management (livestock kind, class, number or season of use) or desired conditions outlined in each allotment's corresponding grazing analysis.

Table 15. Rangeland improvements proposed under alternative B, C, and D by allotment and pasture. Map symbols correspond to labels found on MAP 7.

Allotment	Pasture	Map Symbols on MAP 7	Rangeland improvement description
Centerfire	SA Pasture	CF1	Bury .75 miles of existing pipeline.
Centerfire	Centerfire	CF2	Install 1 new well and 1 storage tank, and 1 drinker*.
Centerfire	Freeman Mountain	CF5	Install 2 new trick tanks.
Centerfire	Freeman	CF3	Install 1 new well and 1 storage tank, and 1 drinker*.
Dillman/Trout Creek	Mesa	DTC1	Install 1 new well and 1 storage tank, 2 drinkers*, and 1 mile of pipeline
Luna	Hy Clark	LUNA1	Install 1 storage tank, 2 drinkers* and 1.25 miles of pipeline. Install 1 new well in section 12.
Luna	Sawmill, Kiehne, Adair	LUNA2	Install 1 new well and 2 storage tanks, 4 drinkers*, and 2.75 miles of pipeline.
Luna	Stone Creek	LUNA3	Install 1 new well and 1 storage tank, 2 drinkers*, and .75 miles of pipe.
Luna	Dry Blue	LUNA4	Install 1 new well and 1 storage tank, 4 drinkers*, and 2.5 miles of pipeline.
Mangitas	Jones	MANGITAS1	Install 1 new well and 1 storage tank, 2 drinkers*, and .5 miles of pipeline.
Spur Lake	Canovas	SL5	Install 2.25 miles of pasture division fence.
Spur Lake	Black Peak	SL4	Install 1 new well and 1 storage tank, 2 drinkers*, and 2 miles of pipeline.
Spur Lake	SA	SL1	Install 1 new well and 1 storage tank, 3 drinkers*, and 2 miles of pipeline.
Spur Lake	Jenkins Creek	SL2	Install 1 new well and 1 storage tank, 3 drinkers*, and 2.5 miles of pipeline.

* Additional storage tanks may be placed with drinkers if needed to improve functionality of water systems.

Table 16. Summary of range improvements by type per allotment.

Allotment	Wells (number)	Storage Tanks (number)*	Drinkers (number)	Trick Tanks (number)	Pipeline (miles)	Fence (miles)
Centerfire Allotment	2	4	2	2	0.75	0
Dillman/Trout Allotment	1	1	2	0	1	0
Luna Allotment	4	4	10	0	7.25	0
Mangitas Allotment	1	1	2	0	0.5	0
Spur Lake Allotment	3	3	8	0	6.5	2.25
Total	11	13	24	2	16	2.25

* Additional storage tanks may be placed with drinkers if needed to improve functionality of water systems.

Eleven of the proposed water systems include the installation of new wells (table 16). Installation of these improvements is contingent on the Gila National Forest’s ability to meet the requirements of the New Mexico Office of the State Engineer. The improvements would require the appropriate licenses or water use agreements prior to implementation. In the event the Gila National Forest is unable to obtain a license, an alternative water source could be considered provided the effects of using that water source do not differ from the effects disclosed in this analysis.

Storage tanks are available in a variety of sizes and construction materials. For the purposes of this project, one storage tank refers to approximately 10,000 gallons of storage capacity. This can be achieved through a single tank or multiple smaller tanks. Additional storage capacity may be necessary for the water system to function properly. Design will be reviewed prior to implementation. Drinkers or troughs located away from the water source and primary storage could have an associated 3,000 to 5,000 gallon storage to improve functionality of the water system.

All pipelines proposed within this analysis would be buried unless resource concerns or terrain would not allow for the ability to bury the lines below the frost level. Pipelines are buried to improve the functionality of the system and reduce maintenance needs.

Drinkers would be maintained to provide a year-round water source to wildlife except:

- where the possibility of freezing could compromise the integrity of the water system;
- where the water source is limited and not adequate to support year-round use;
- for resource management purposes; limit water or availability so livestock, wildlife, or both have to disperse; or
- for general maintenance needs.

Implementation of proposed improvements will require using motorized equipment. Motorized equipment will vary depending on improvement type, ranging from all-terrain vehicles and utility task vehicles, full-size vehicles, large trucks, up to small dozers. A helicopter may be used to deliver materials into some locations.

Fence construction or reconstruction will be wildlife-compatible; that is, constructed in a manner to facilitate wildlife access over, under, or through the fence while minimizing chances of becoming entangled. The following specifications (or the most current Forest Service specifications) would be used during construction, where needed:

- a top wire or rail preferably no more than 38 inches above the ground, and absolutely no more than 42 inches
- at least 12 inches between the top two wires
- at least 16 inches between the bottom wire or rail and the ground
- smooth wire on the bottom
- posts 16 to 20 foot intervals
- utilize gates, drop-downs, or other passages where wildlife concentrate and cross

Motorized Transportation System

Alternatives B, C, and D

The following transportation activities are the same for alternatives B, C, and D (table 17, MAP 8 and MAP 9). There are no differences in the location, miles, or proposed treatments between alternatives.

Table 17. Types of treatments to the motorized transportation system in miles common to alternatives B, C, and D; and map reference number for each alternative.

Transportation Treatments	Alternative B	Alternative C	Alternative D
MAP Number	MAP 8	MAP 8	MAP 9
Road decommissioning	116	116	116
Change Admin/Written Authorization road segments from open to decommissioned (Tucson Electric Power) (miles subset of decommissioning)	1.7	1.7	1.7
Leave horse, hiking and foot trail tread during decommissioning of roads	4.23	4.23	4.23
Reopen maintenance level 1 closed roads for administrative or permitted use for proposed treatment activities and close or decommission after activities are completed	34.5	34.5	34.5
Maintenance Level 1 Administrative or permitted use roads to be closed after activities completed	22.6	22.6	22.6
Maintenance Level 1 Administrative or permitted use roads to be decommissioned after activities completed (miles are subset of total road decommissioning)	12	12	12
Add user-created route and designate as administrative use or written authorization only (Tucson Electric Power)	0.5	0.5	0.5
Construct temporary roads - obliterate after vegetation treatments are completed	3-5	3-5	3-5
Reopen closed roads for periodic administrative use or written authorization only (Tucson Electric Power)	3.5	3.5	3.5

Road decommissioning are activities that result in the stabilization and restoration of unneeded roads to more natural states (36 CFR section 212.1). Decommissioning includes utilization of heavy equipment to install signs, gates, rock barriers, or ripping and recontouring of slopes and installing drainage features such as water bars. Routes that have established vegetation may need minimal treatment while others may need to be entirely ripped, seeded and slopes recontoured.

A trail tread for horse and hiking or foot access would be maintained on National Forest System Roads 4023 V, 4029 E, and 4030 W during design and implementation of decommissioning.

Heavy equipment would be used to re-open closed roads for project activities or administrative uses. These roads would be returned to closed status once activities are completed except for those needed by Tucson Electric Power Company to access powerlines. To restrict motorized access such things as berms, gates, or other barriers would be installed.

Add user routes as part of the national forest road system to facilitate Tucson Electric Power Company to access lines. These roads would be designated administrative use only.

Construct temporary roads to access treatment activity areas and obliterate after treatments are completed. Obliteration is a full restoration of entire temporary roadbed, utilizing the same equipment and methods described in decommissioning.

Alternative D

Alternatives B and C provide the same motorized transportation opportunities to address recreation and public motorized uses (table 17, MAP 8). Alternative D was developed in response to a scoping comment to not increase miles of forest system roads (table 18, MAP 9). The decision for re-opening of 0.2 miles of National Forest System Road 3050 was made in the 2013 travel management record of decision, so remains in alternative D unlike the other routes (table 18). The type of work and equipment to re-open 3050 is the same as described in alternatives B and C.

Under alternative D, the 13.6 miles of maintenance level 1 road will be added to the decommissioning miles, bringing the total miles of roads to be decommissioned to 130 miles for alternative D.

Table 18. Changes to road system in miles by alternative.

Transportation Treatments	Alternative B	Alternative C	Alternative D
Reopen national forest system maintenance level 1 closed roads to open to all motor vehicle types	13.8	13.8	0.2
Add user-created routes and designated as National Forest System roads open to all motor vehicle types	4.2	4.2	0
Construct motorized 4x4 trail (Dillman Creek Re-route)	0.3	0.3	0

The Dillman Creek reroute is a 4x4 motorized trail, to be constructed to a maximum trail tread width of 60 inches, with an obstacle clearing limit width of 72 inches, utilizing mechanized equipment. Barriers would be installed at each end of the 4x4 trail segment to limit vehicle size access.

Design Features Common to All Road Activities

- All roads, temporary or permanent, will be located sufficiently far from streams or other water bodies (except for portions of such roads which must cross water bodies) to minimize discharges of dredged or fill material into waters.
- All temporary roads would be designed to minimize impacts to natural resources.
- Follow appropriate best management practices for roads management.

Stream and Riparian Treatments

Alternatives B, C, and D propose the same stream and riparian treatments (table 19, MAP 10). There are no differences in the type, number or location of treatments between alternatives. Although route LATV-9 would not be implemented under alternative D, work is still proposed on the crossing in alternative D to address sedimentation concerns.

Table 19. Summary of the type, number and location, including MAP 10 reference symbols, in [], of stream and riparian treatments for all action alternatives.

Type of Work	Number	Location
Crossing	10	National Forest System Road 882 Head of Ditch CG; [Map Symbol X2] Dry Blue Trail #61 (6 crossings); [Map Symbol DB1-DB6] County Road B-012; [Map Symbol X1] FSR4127U; [Map Symbol X3] LATV-9; [Map Symbol X4]
Diversion	1	Luna Ditch Diversion point in Head of Ditch Campground; [Map Symbol X2]
Exclosure	4	Stone Creek Centerfire Creek Spur Lake Draw Adair Spring
Barriers	2	Construct motor vehicle barriers Frieborn Trail [Map Symbol DB7] Construct motor vehicle barriers Blue Spring Trail; [Map Symbol DB8]
Riparian	2	Centerfire Creek, Spur Lake Draw
Erosion Control Maintenance	157	Existing erosion control features located across the planning area [Map symbol yellow triangles]
Seeding	multiple	Spur Lake Draw
Stream and bank structures	9 streams, multiple	Instream structures, bank stabilization, or both: Bishop Canyon, Romero Creek, Dry Blue, Pace Creek, Centerfire Creek, San Francisco River, Stone Creek, Spur Lake Draw, Jenkins Creek, Canovas Creek
Surface erosion reduction	2	Head of the Ditch Campground roads; [Map Symbol X2] Trout Creek dispersed camping area; [Map Symbol Trout Creek]

Crossings: Within the Dry Blue, harden 6 motorized trail crossings to reduce impacts to aquatic habitat and improve water quality. Hardening of crossing may consist of such things as interlocking concrete blocks, concrete planks, prefabricated bridges, rock rip-rap, or other engineered design. Equipment such as a Kabota or small backhoe may be used to dig footings for bridge type structures or carrying in construction materials. A helicopter may be used to transport pre-fabricated structures.

Road crossings at County Road B-012; National Forest System Road 4027 U, LATV-9 will be designed to facilitate adequate water passage and reduce erosion. Work may include such things as replacement or upgrade of existing structures or material or placement of structures or material (for example, culverts, rock, rip-rap, and fill). All work will utilize some type of heavy equipment such as dozers, backhoe, trucks, etc.

National Forest System Road 882 (Head of Ditch campground road) will be relocated due to being located within the proposed Luna Irrigation Ditch diversion facility project area. The new crossing will be located upstream of its current location and hardened to provide safe ingress and egress for the public and landowners, and improve aquatic habitat and water quality. All work will utilize some type of heavy equipment such as dozers, backhoe, trucks, etc.

Diversion: The Luna Irrigation Ditch Association owns water rights on the San Francisco River which allows them to store water in Luna Lake, upstream in Arizona, and release this water downstream into New Mexico during irrigation season. The diversion is located in the Head of Ditch Campground downstream of National Forest System Road 882.

The current diversion is a “push-up” style native soil dam located on the Gila National Forest that requires frequent maintenance by heavy equipment, particularly following flood events. The diversion takes all of the stream flow (except for floods) from May 1 to September 30th of each year, leaving no water in the main channel until the stream reaches the first tributary downstream.

The proposal is to construct a permanent diversion facility in the same location, replacing the existing diversion, out of durable material, such as concrete, steel, etc. The base would extend the width of the stream channel and be tied into the stream banks and protected with concrete wings, riprap, or both. The facility would be a dual channel system with easy to move and install panels for easy channel switching between irrigation and non-irrigation periods. The proposal includes construction of a sediment retention pool upstream of the facility. Construction of the diversion facility, sediment retention pool and any other associated activities would require use of heavy equipment (for example, backhoe, dozer). There would be activities within and adjacent to the stream channel to implement this project. Best management practices and design features will be implemented to reduce impacts to stream resources and appropriate permitting obtained to conduct instream work.

Exclosures: Exclosure fences are proposed to be constructed along segments of Stone Creek, Centerfire Creek, Spur Lake Draw, and Adair Spring. Exclosures would exclude both wildlife and livestock providing time for proposed riparian, stream and bank restoration projects to establish. Exclosures would be from 0.5 acres up to 200 acres. Once the area stabilizes or vegetation becomes established, the exclosure would be relocated to the next reach to continue restoration work.

Where access to water is needed for livestock management, the Gila National Forest staff and permittees will coordinate to identify appropriate location(s) for water access points.

Fencing would be 8 feet or taller to exclude both wildlife and livestock. Motor vehicles may be needed to haul fencing materials. A small drill rig or hand drill rig may be used for digging post holes.

Barriers: The Frieborn and Blue Spring Trails are designated and constructed for use by hikers and horses. These trails intersect the Dry Blue Trail, which is designated for all-terrain vehicle use. Motorized vehicles off of the Dry Blue Trail have been accessing the nonmotorized Frieborn and Blue Spring Trails causing resource concerns and conflict of recreational uses.

Barriers are proposed to block access by motorized vehicle to these trails. Access for hikers and horses would be maintained.

Motor vehicles may be needed to haul barrier construction materials. A hand drill rig (auger) may be used for digging post holes.

Riparian: Proposed riparian restoration includes planting riparian species in Spur Lake Draw in areas above Centerfire Bog and in Centerfire Creek near the vicinity known as Pinpoint 40 and within perennial headwater reaches. Planting would provide bank stabilization, improve water temperature, and enhance overall water quality.

Motor vehicles may be needed to haul equipment and plants. Most planting activities would utilize handtools, but there may be a need for a small backhoe to dig trenches.

Erosion Control Features: Numerous erosion control or stabilization structures exist within the planning area. It is proposed to conduct maintenance on existing structures. Maintenance of structures will vary depending on condition of the structure. Work may include such things as removing

accumulated sediment, repairing or replacing breeched sections where new head cuts and gullies are developing.

Seeding: Improve water quality and quantity by seeding the uplands in multiple locations in Spur Lake Draw. The objective is to increase herbaceous ground cover to slow down overland flow and reduce erosive processes. Sourcing of seed material will follow Region 3 guidance on weed free materials. Seeding activities would be by hand or trailer type seeders pulled behind motorized vehicles appropriately sized for the trailer type.

Stream and Bank Stabilization Structures: Structures in the uplands may be constructed out of on-site native material, rock rip-rap, rock and wire rip-rap, or other proven methods. In-channel structures may be constructed utilizing on-site native material, rock rip-rap, rock weirs, bendway weirs, wooded material or other proven methods.

Surface Erosion Reduction: To reduce surface erosion, gravel would be placed on roads within Head of Ditch Campground and on the access route to the dispersed camping area along Trout Creek. Heavy equipment would be used to transport and spread gravel over the proposed locations.

Design Features Common to Stream and Riparian Treatments

- Surveys for loach minnow and narrow-headed and northern Mexican gartersnakes will occur prior to implementation of stream and riparian treatments within Dry Blue Creek and its tributaries, where applicable. Appropriate methods to reduce impacts to the species would be applied prior to implementation if detected.
- Surveys for narrow-headed and northern Mexican gartersnakes will occur prior to implementation of stream and riparian treatments within the San Francisco River and its tributaries, where applicable. Appropriate methods to reduce impacts to the species would be applied prior to implementation if detected.

Forest Plan Amendments

Alternatives B, C, and D propose the same forest plan amendments. There are no differences in amendments between alternatives.

Project-specific amendments to the Gila forest plan will be prepared under the 2012 Planning Rule. These project-specific amendments are a one-time amendment to the Gila forest plan for related activities proposed and to be implemented under the Luna Restoration Project only. These project-specific amendments include:

- Allow a one-time, project-specific amendment to the forest plan to allow the Gila National Forest to deviate from forest plan standard and guidelines for Management Areas 3B (p. 105-106), 3C (p. 112), and 3D (p.118) to exceed the acres per decade for the amount of activity fuels treated (10,000, 4,000, and 12,000 respectively) and fuels treated with prescribed fire (10,000, 3,000, and 10,000 respectively).
- ◆ Replace with: “No more than 25 percent of a 6th code watershed within a 3-year period would be treated. Percentage may be adjusted up or down based on monitoring and assessment of watershed conditions, after treatments.”

- Allow a one-time, project-specific amendment to the forest plan to allow the Gila National Forest to deviate from forest plan standard and guidelines in Management Area 3D (p. 115) to exceed the amount of wildlife habitat development numbers (water developments-1 structure; wetland developments-8 structures; brush pile development-10 structures; prescribed burns-1,000 acres; planting browse/riparian-10 acres; control of habitat access-10 miles).
 - ◆ The standard and guidelines will be removed and will not be replaced with another.
- Allow a one-time, project-specific amendment for Mexican spotted owl protected activity center fuel accumulation treatments to abate fire risk (page 29a 1995 Mexican spotted owl recovery plan elements):
 - ◆ Select for treatment 10 percent of the protected activity centers where nest sites are known in each recovery unit having high fire risk conditions. Also select another 10 percent of the protected activity centers where nest sites are known as a paired sample to serve as control areas.
 - ◆ Select and treat additional protected activity centers in 10 percent increments if monitoring of the initial sample shows there were no negative impacts or there were negative impacts which can be mitigated by modifying treatment methods.
 - Replace with 2012 Mexican spotted owl recovery plan (page 74): Conduct restoration and fuels treatments in up to 20 percent of the protected activity center's within each ecological management unit that exhibits high fire risk conditions.
 - ◆ Designate a 100-acre "no treatment" area around the known nest site of each selected protected activity center. Habitat in the no-treatment area should be as similar as possible in structure and composition as that found in the activity center.
 - ◆ Use light prescribed burns in nonselected protected activity centers on a case-by-case basis. Burning should avoid a 100-acre "no-treatment" area around the activity center.
 - Replace with 2012 Mexican spotted owl recovery plan (page 263): Planned ignitions (prescribed fire) and unplanned ignitions (wildland fire) should be allowed to enter core areas only if they are expected to burn with low fire severity and intensity. Fire lines, check-lines, backfiring, and similar fire management tactics can be used to reduce fire effects and to maintain key habitat elements (e.g., hardwoods, large downed logs, snags, and large trees).

Design Features Common to All Action Alternatives

The Forest Service also developed the following design features to be used as part of all of the action alternatives. The following were developed to protect and enhance various resources during and after proposed activities.

Forest Stakeholders

- Project activities will be coordinated with all affected stakeholders including grazing permit holders, private landowners, federal, state, and local governments.
- Advanced notification of projects, especially prescribed fire, will be completed through methods such as letters, emails, flyers, or newspaper or world wide web publications.

Watershed, Water Quality, Riparian, and Soils

- Appropriate best management practices would be properly implemented for all project activities to prevent or minimize impacts to soil and water resources and to maintain or improve water quality on National Forest System lands.
- Limit ground disturbance by all heavy equipment work when soils are wet or are saturated to reduce compaction and soil displacement (rutting).

Invasive and Noxious Weeds

- Prevent the spread of potential and existing noxious or invasive weeds by vehicles used in management activities by incorporating weed prevention and control into project contracts, layout, design, and implementation.
- Avoid existing noxious or invasive weeds during soil disturbing activities to reduce the risk of spread.

Wildlife

- Strive to retain snags of various size and condition for various wildlife species.
- Mitigate loss of individuals and groups of sensitive plants during management activities by avoiding or buffering known locations. If found during implementation, plants will be avoided or buffered.
- Mexican gray wolf
 - ◆ The U.S. Forest Service will coordinate with the Mexican gray wolf field team on wolf activity, especially denning detection during implementation of projects.
 - ◆ If denning activities are detected within vicinity of projects, appropriate actions would be implemented in coordination with Mexican gray wolf field team to minimize or avoid impacts. Actions may include such things as temporarily suspending work or moving activities to another part of the treatment area.
- Mexican spotted owl protected activity centers - Avoid noise disturbing or other activities within protected activity centers during the breeding season (March 1 – August 31).
- Northern goshawk post-fledging family areas - Avoid noise disturbing or other activities within post-fledging family areas during the breeding season (March 1 – September 30).
- Helicopter operations will be coordinated with wildlife biologist.

Cultural Resources

- All archaeological sites will be avoided and protected to avoid potential impacts.
- Avoid piling slash or activity fuels on sites. For prescribed burning, no ignition points will be within archaeological sites.
- If cultural or historic sites are discovered during implementation, work will cease until appropriate treatment is identified and consultation with the State Historic Preservation Office is completed.
- Use of mechanical treatments for all project types will avoid all known cultural and historic sites.

Recreation and Scenery Management:

- Closure and information signs will be placed on all trail access points and along the trail where activities are occurring.
- Shape of individual units, edges of individual units, and patterns created by multiple units will appear natural when viewed by forest visitors.
- Character trees and trees that define the trail corridor would be retained wherever feasible.
- Minimize both short and long-term impacts to recreation infrastructure and use. Keep temporary roads, skid trails, and landing construction to a minimum. Minimize the long term visual impact of access roads, skid trails, and landings along trail corridors.
- Where feasible activity slash will be piled 150 feet from system trails.
- Minimize “leave tree” marking along Highway 180 corridor, County roads, concern level 1 roads, trails, and Head of the Ditch Campground.
- When trails are temporarily closed due to harvesting, trail tread will be cleared of all slash. Changes to trail alignment and surfacing will be minimized; the trail will not be straightened nor its surface be changed with an alternate material unless such actions are needed to enhance the trail and protect resources.
- When skid trails intersect national forest system trails, after implementation skid trails will be obscured with slash. If skid trails don’t revegetate naturally, then ripping and seeding would be considered.
- Stump heights within 150 feet of trails will be cut to 6 inches or less. Ideally, stumps immediately adjacent to trail would be flush cut.
- Where the trail tread crosses the transmission line corridor, a distinguishable trail tread across the corridor would be maintained to ensure users stay on the trail system. If activities involving mechanized equipment or ground disturbance obscures or alters the trail tread, the trail tread will be restored to maintain its trail class design parameters. Additionally, any access used to cross a system trail will be maintained at right angles to the trail.

Implementation

Implementation is estimated to begin in late 2018 with initial treatments over the next 8 to 10 years and extending 20 years or until objectives are met, including maintenance. Amount, frequency and duration of work would occur as funding, favorable conditions, or both allow.

Monitoring

- Conduct implementation and effectiveness monitoring for best management practices. Review of a selection of effectiveness monitoring sites will be accomplished as a part of either the annual project review or Gila National Forest activity review by Gila National Forest watershed personnel.
- Monitoring projects, including effectiveness monitoring for best management practices, 5-year review of forestwide watershed condition classification documentation, or both, would be reviewed to determine if the limitation of landscape treatment acres to no more than 25 percent of a 6th code watershed within a 3-year period could be adjusted. Documentation and consensus by review team and approval by the district ranger is required for percentage adjustment.

- Mexican spotted owl habitat implementation and effectiveness monitoring – In coordination with U.S. Fish and Wildlife Service personnel, monitoring of treatments will be accomplished to determine the effects of treatments on constituent elements of Mexican spotted owl habitat.
- Surveys to detect presence of loachminnow and narrow-headed and northern Mexican gartersnakes will occur prior to implementation of stream and riparian treatments. Appropriate methods to minimize impacts to species will be applied during implementation.
- After treatments are completed, areas will be periodically monitored for detection of invasive and noxious weed infestations and the effectiveness of implementing weed prevention and control measures during activities.
- Conduct implementation and effectiveness monitoring of avoidance and protection design features for heritage resources. If sites are found to be impacted, appropriate mitigation measures will be developed in coordination with the appropriate agencies and applied to relative remaining project implementations.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in table 20 through table 29 is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 20. Comparison of the vegetation resources by alternative.

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Forest Composition - Forest Cover Type	No vegetation management activities would occur under this Alternative. Tree densities would continue to increase and there would be an associated decline in understory species diversity and herbaceous growth, which may lead to increased conifer encroachment in grassland/meadow areas. Without disturbance active-competition induced mortality could occur in high density areas and predispose areas to bark beetle outbreaks. Fuels would continue to build and could increase the fire hazard within the project area.	Group Selection, thinning and prescribed burning treatments would reduce density, and create more open forest conditions, with increased herbaceous, forb, and woody vegetation production. These treatments would favor seral species retention and would create conditions conducive for seral species regeneration establishment in openings. Grassland and meadow treatments would also see increased grass and forb production. Change in vegetation composition will increase diversity at both the stand- and landscape-scale.	In addition to activities listed in alternative B, herbicide use is proposed to treat rabbitbrush in grassland/meadow restoration treatments, and sprouting juniper in forested areas. Herbicide use will increase treatment effectiveness by creating growing space for desirable species to regenerate such as grasses and forbs in grassland/meadow treatments, and conifer seedlings in forested areas. Herbicide application would also be targeted within the wildland urban interface where sprouting of juniper post-thinning could create ladder fuels. In this case herbicide treatment will help increase the effectiveness of fuel reduction treatments with treatments lasting longer than with tree cutting alone.	Effects same as alternative B

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Forest Diversity and Structure – Relative Stand Density	No vegetation management activities would occur under alternative A. in the absence of disturbance stand density levels would continue to increase over time. A large portion of the project area will be at or above 55 percent of SDI max in the long-term and there will be active competition induced mortality. Stand growth and individual tree vigor will decline as density increases as there is increased competition for site resources. Risk of loss from bark beetles could also increase at high densities.	Vegetation management activities under alternative B will move the landscape towards the desired condition more than the no action alternative over time. Stand density will be reduced, individual tree vigor and stand growth would be enhanced in forested areas. Stand structural complexity and heterogeneity would be increased at both the stand-and landscape-scale under alternative B. This will help create more resilient ecosystems that are better suited to future disturbances	Effects are the mostly the same as alternative B except for treatment of rabbitbrush and alligator juniper. Under alternative C, herbicide use will increase the length of time targeted species are controlled reducing competition related tree mortality more effectively than alternative B.	Same effects as alternative B.

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
<p>Forest Diversity and Structure for Wildlife Habitat Improvement – Vegetation Structural Stage</p>	<p>No vegetation management activities would occur under alternative A. The existing distribution of vegetation structural stages for ponderosa pine and woodland cover types would change slowly through time without disturbance and would trend towards denser stages and canopy density classes. The risk of loss of trees and possibly entire stands from insect epidemic or wildfire could increase as stand densities within the project area continue to increase. Over time tree mortality from disturbance, or competition-induced mortality would create large enough openings for regeneration establishment and representation of the vegetation structural stages¹ and A canopy density class.</p>	<p>There are approximately 76,218 acres of proposed treatments within forested areas managed for northern goshawk under alternative B. A variety of treatments are proposed including thinning, group selection and/or prescribed burning. These treatments will help promote uneven-aged structure and increase heterogeneity at the stand- and landscape-scale. This will help move the project area towards desired conditions which is to create diverse stand structures at both the stand- and landscape scale for northern goshawk management.</p>	<p>Effects are the mostly the same as alternative B except for treatment of rabbitbrush and alligator juniper. Under alternative C, herbicide use will increase the length of time targeted species are controlled reducing competition related tree mortality more effectively than Alternative B.</p>	<p>Same effects as alternative B.</p>

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
<p>Forest Diversity and Structure for Wildlife Habitat Improvement – Stand Density</p>	<p>No wildlife habitat improvement treatments including thinning and prescribed fire activities would occur in Mexican spotted owl threshold stands. There would not be a reduction in stand densities or fuel loadings. The risk of loss of habitat for the Mexican spotted owl due to high intensity wildfire would not be reduced and could increase over time as stand densities continue to increase.</p>	<p>Alternative B proposed wildlife habitat improvement activities on approximately 4,073 acres including thinning and prescribed fire to move Mexican spotted owl threshold stands to desired conditions. Treatments would be designed to enhance diversity in both species composition and structure to increase key habitat components for the owl. Fuel loadings would be reduced and the risk of loss of habitat from future disturbance(s); for example, wildfire may be reduced under alternative B.</p>	<p>This alternative would not use herbicide in stands targeted to be managed for Mexican spotted owl nest characteristics (target threshold stands) or in mixed-conifer stands. Effects of this alternative in these areas would be the same as alternative B. In Mexican spotted owl ponderosa pine – Gambel oak recovery habitat that is not managed for the threshold nest roost characteristics, herbicide use when needed to control juniper sprouting in openings will increase the length of time sprouting is controlled more effectively than alternative B.</p>	<p>Same effects as alternative B.</p>

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Old Growth – Stand Density, Canopy Cover, and Snag Density	There would be no vegetation management activities under alternative A. As a result as stand densities continue to increase over time there would be a high risk of loss of dead and down material, dead standing material, and live vegetation from disturbance(s) e.g., wildfire occurrence due to the high average tree densities. Individual tree growth and vigor would also decline and could predispose areas with high densities to competition-induced mortality and other biotic agents such as bark beetle outbreaks.	Alternative B proposes to treat approximately 24,780 acres of areas designated to be managed to develop old growth characteristics with a variety of treatments including thinning, regeneration treatments and/or prescribed burning. Density reduction would increase residual tree vigor and increase old-growth characteristics at a faster rate than untreated areas. Density reduction would lower the average basal area and provide a reduction of fuels which may reduce potential damage to old growth components in the event of a wildfire. Treatments would increase structural heterogeneity with project design features emphasizing clumps, gaps and openings.	Alternative C proposes to treat a maximum of 333 acres of stands designated to be managed toward an old growth condition with herbicide in ponderosa pine and woodland areas. Herbicide use when needed to control juniper sprouting in openings will increase the length of time sprouting is controlled more effectively than alternative B. Effects of this alternative in the remaining 24,447 acres designated for management toward an old growth condition would be the same as alternative B.	Same effects as alternative B.

Table 21. Comparison of the fire and fuels resources by alternative.

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Reduce Impact of High Severity Fire – Percent of modeled crown fire (passive and active)	67%	16%	16%	16%
Reduce Impact of High Severity Fire – Percent of modeled surface fire	24%	84%	84%	84%

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Restore Departed Landscapes that are at Risk of Fire – Total acres treated in Fire Regime Group I	0	116,000	116,000	116,000
Fire and Fuels Management	<p>Fuel conditions and crown fire potential in the project area would continue to be of concern and may be exacerbated by on-going insect and disease activity, natural disturbances and the progression of forest growth and change. Canopy and ladder fuels and surface fuel loading levels would continue to increase throughout the project area. There would be no reduction in potential fire behavior and it would be expected crown fire potential would increase. No progress would be made toward reducing the impact of high severity fire. This alternative would not assist in returning fire as a natural process in fire-dependent ecosystems. It would not allow land managers to help to restore or maintain desired conditions. Ecosystems, that are not adapted to high intensity/high severity wildfires, would remain at risk.</p>	<p>Treatments would decrease potential crown fire activity, reduce fuel loading levels and understory ladder fuels thereby reducing the impacts of high severity wildfire on resources. Approximately 36,022 acres would be prescribed burned. Additionally, 95,997 acres would receive mechanical treatments, of which may also include a subsequent prescribed burning treatment (pile, under burning). Potential crown fire behavior and the threat of high severity fire would be reduced. Modeling results show approximately 16% of the project area would exhibit crown fire and 84% would exhibit surface fire, as compared to 67% and 24% respectively with the existing condition. Approximately 115,926 acres would be treated in fire regime group I. Initiating prescribed burning on the landscape will help initiate the restoration of ecological processes in fire-dependent ecosystems.</p>	Same effects as alternative B	Same effects as alternative B

Table 22. Comparison of the wildlife resources by alternative

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Mexican Gray Wolf	No project activities would be implemented and therefore there would be no effect to the Mexican gray wolf.	Under all action alternatives, disturbance to potential denning sites are minimized through avoidance or other features developed in coordination with the field team in relation to the activity being implemented. There are beneficial effects to the species and its habitat through reduction of habitat fragmentation through road decommissioning and improvement of native ungulate (prey species) habitat. A determination of “not likely to jeopardize” is made for all action alternatives.	Same effect as alternative B	Same effect as alternative B

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Mexican Spotted Owl	<p>No project activities would be implemented and therefore there would be no effect to the Mexican spotted owl. However the habitat would continue to be at risk of being impacted by wildfires.</p>	<p>Thinning and burning activities associated with the Luna Restoration Project will reduce basal area in protected activity centers during the short term (but not drop below threshold values) and will adjust the structure and thermal characteristics. Reducing fuel loading in designated critical habitat could impact prey species in the short term. Reducing juniper could reduce food sources for prey species. Performing actions outside of the breeding season, or after confirming non-breeding status, will prevent disturbing nesting owls.</p> <p>The Luna Restoration Project would reduce habitat needs in protected activity centers in the short term, but improve conditions in the long term, therefore the Luna Restoration Project may affect, likely to adversely affect the Mexican spotted owl.</p> <p>Treatments in designated critical habitat would align with the forest plan, which complements the 1995 Mexican spotted owl recovery plan, therefore the Luna Restoration Project may affect, not likely to adversely affect the designated critical habitat for the Mexican spotted owl.</p>	Same effect as alternative B	Same effect as alternative B

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Southwestern Willow Flycatcher	<p>There will be no effect to the species due to southwestern willow flycatchers not being observed within the project area for the last 10 years and the designated critical habitat within the planning area does not contain the primary constituent elements to support the birds.</p> <p>No activities are being implemented, therefore there will be no effect to designated critical habitat.</p>	<p>There will be no effect to the species due to southwestern willow flycatchers not being observed within the project area for the last 10 years and the designated critical habitat within the planning area does not contain the primary constituent elements to support the birds.</p> <p>The removal of riparian vegetation and short-term disturbances from other stream restoration activities and decommissioning within designated critical habitat would be insignificant and discountable. These sites are small and localized, but have the potential to provide long-term benefits, although would not greatly improve or change the primary constituent elements of the critical habitat. Project activities may affect, not likely adversely affect the designated critical habitat.</p>	<p>Same effect as alternative B. Application of design feature for buffering the critical habitat from herbicide treatments would not change the habitat constituents or alter the vegetation.</p>	<p>Same effect as alternative B</p>

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Narrow-headed Gartersnake	No activities are being implemented, therefore there will be no effect to the narrow-headed gartersnake or its proposed critical habitat.	The removal of riparian vegetation and short-term disturbances from other stream restoration activities and decommissioning within proposed critical habitat would be insignificant and discountable. These sites are small and localized, but have the potential to provide long-term benefits. Surveying for the gartersnake prior to implementation and applying buffer around habitat will reduce the risk of disturbance and harm. Project activities may affect, not likely adversely affect the narrow-headed gartersnake and its proposed critical habitat.	Same effect as alternative B. Application of applicable design features for water related resources and the buffer for proposed critical habitat from herbicide treatments would minimize risk of impacts to the narrow-headed gartersnake and its proposed critical habitat.	Same effect as alternative B.
Northern Mexican Gartersnake	No activities are being implemented, therefore there will be no effect to the northern Mexican gartersnake.	The removal of riparian vegetation and short-term disturbances from other stream restoration activities and decommissioning are small and localized, but have the potential to provide long-term benefits. Surveying for the gartersnake prior to implementation and applying design feature buffers and other water related measures will reduce the risk of disturbance and harm. Project activities may affect, not likely adversely affect the northern Mexican gartersnake.	Same effect as alternative B. Application of applicable design features for water related resources and the buffer for proposed critical habitat for the narrow-headed gartersnake; minimizes the risk of impacts to the northern Mexican gartersnake	Same effect as alternative B.

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Loach Minnow	No activities are being implemented, therefore there will be no effect to loach minnow or its designated critical habitat, but the risk of being impacted by wildfires would continue.	Project activities will cause short-term negative impacts to loachminnow and its critical habitat. Stream, riparian, and hardening crossings activities, and reducing the risk sedimentation, ash, and debris from uncharacteristic wildfires through vegetation and prescribed fire, will provide long-term benefit to the specie and habitat. The project will result in a may affect, likely to adversely affect to the loachminnow and its designated critical habitat.	Same effect as alternative B.	Same effect as alternative B.
Spikedace	There will be no effect to spikedace. Spikedace have not been found occupying streams within the planning area. No activities are being implemented, therefore there will be no effect to designated critical habitat, but the risk of being impacted by wildfires would continue.	There will be no effect to spikedace. Spikedace have not been found occupying streams within the planning area. Project activities will cause short-term negative impacts to spikedace critical habitat. Stream, riparian, and hardening crossings activities, and reducing the risk sedimentation, ash, and debris from uncharacteristic wildfires through vegetation and prescribed fire, will provide long-term benefit to the habitat. The project will result in a may affect, likely to adversely affect to the designated critical habitat.	Same effect as alternative B.	Same effect as alternative B.

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Region 3 Sensitive Species	No activities are being implemented, therefore there will be no impact to Region 3 sensitive species that occur or may occur within the planning area.	Implementation of activities result in a determination of may impact individuals or habitat, but will not likely contribute to trend in federal listing for Region 3 sensitive species that occur or may occur within the planning area.	Same effect as alternative B.	Same effect as alternative B.
Migratory Bird Species	For migratory bird species that occur or potential to occur in the planning area, there would be no change to the habitat or disturbance to the species, but there is still exists the risk of wildfire impacts to forested and woodland cover types. A determination of “no impact” for migratory bird species.	Individuals may be disturbed by project equipment noise and human presence in the short term. Proposed treatments would improve habitat and reduce wildfire threat in long term. There may be short-term impacts to individual migratory birds, but alteration to their habitats or being disturbed during treatments, will not negatively affect population levels.	Same effect as alternative B. Herbicide application may disturb individuals by noise and human presence in the short term. Rabbitbrush and alligator juniper would be reduced, providing opportunity for growth and increase of herbaceous plants in treatment areas. There may be short-term impacts to individual migratory birds, but alteration to their habitats or being disturbed during treatments, will not negatively affect population levels.	Same effect as alternative B. Not adding user-proposed routes would not impact habitat nor disturb the species. There would be beneficial effects by not having routes crossing through habitats causing fragmentation. Although routes are not added under this alternative, other activities are still being implemented, therefore there may be short-term impacts to individual migratory birds, but alteration to their habitats or being disturbed during treatments, will not negatively affect population levels.

Table 23. Comparison of management indicator species resources by alternative

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Mule Deer	No activities are being implemented within associated vegetation types, therefore there would be no impact to mule deer.	Foraging would be disrupted in the short term, but there would be long term improvement of habitat conditions for this species. Individuals may be affected, but at the forest level, these affects would not adversely affect population trends on the Gila National Forest.	Same effect as alternative B. Applying design features and best management practices pertaining to herbicide treatments will reduce or prevent impacts to the species.	Same effect as alternative B. Also, not adding routes would result in less habitat fragmentation.
Mearn's Quail	No activities are being implemented within associated vegetation types, therefore there would be no impact to Mearn's quail.	Forage and nesting and hiding cover would be reduced in the short term, but would increase in the long term. Individuals may be affected, but at the forest level, these affects would not adversely affect population trends on the Gila National Forest.	Same effect as alternative B. Additional forage may be established in treated areas for Mearn's quail. Applying design features and best management practices pertaining to herbicide treatments will reduce or prevent impacts to the species.	Same effect as alternative B. Not adding routes would result in less habitat fragmentation.
Long-tailed vole	No activities are being implemented within associated vegetation types, therefore there would be no impact to the long-tail vole	Some long-tail voles may be inadvertently crushed during implementation, but proposed activities will improve conditions in and surrounding habitat in the long term for this species. Individuals may be affected, but at the forest level, these affects would not adversely affect population trends on the Gila National Forest.	Same effect as alternative B. Applying design features and best management practices pertaining to herbicide treatments will reduce or prevent impacts to the species. Wet meadows will be buffered 300 feet, and no herbicide would be used in the buffer zone, reducing risk to the species.	Same effect as alternative B. Not adding routes would not impact the species.

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Beaver	No activities are being implemented within associated vegetation types, therefore there would be no impact to beaver.	Some disturbance and loss of riparian vegetation in the short term, but will have improved habitat conditions in the long term for this species. Individuals may be affected, but at the forest level, these affects would not adversely affect population trends on the Gila National Forest.	Same effect as alternative B. Applying design features and best management practices pertaining to herbicide treatments and water and aquatic resources will minimize effects to beaver.	Same effect as alternative B. Not adding routes would not impact the species.
Plain Titmouse	No activities are being implemented within associated vegetation types, therefore there would be no impact to plain titmouse.	Since fire has the potential to increase the number of snags, there would be long-term improvement of habitat conditions for this species. Individuals may be affected, but at the forest level, these affects would not adversely affect population trends on the Gila National Forest.	Same effect as alternative B. Herbicide utilization may affect some food sources in the short-term. Applying design features and best management practices pertaining to herbicide treatments will reduce or prevent impacts to the species.	Same effect as alternative B. Not adding routes would not impact the species.
Hairy Woodpecker	No activities are being implemented within associated vegetation types, therefore there would be no impact to beaver.	Since snags will primarily be retained and fire has the potential to increase the number of snags there would be long term improvement of habitat conditions for this species. Individuals may be affected, but at the forest level, these affects would not adversely affect population trends on the Gila National Forest.	Same effect as alternative B. Herbicide utilization may affect some food sources in the short-term. Applying design features and best management practices pertaining to herbicide treatments will reduce or prevent impacts to the species.	Same effect as alternative B. Not adding routes would not impact the species.

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Air Quality – Clean Air Act Compliance	Compliance with Clean Air Act. No activities are being implemented, so no air quality impacts from fugitive dust. But still higher risk of air quality impacts from uncharacteristic high-intensity wildfire.	Overall, compliance with Clean Air Act is maintained. For vegetation and prescribed fire activities, short-term additional particulate matter, but long-term benefit from reduced wildfire risk. Short-term fugitive dust from road-related treatments.	Same effect as alternative B. No additional impacts from herbicide use.	Same effect as alternative B.

Table 24. Comparison of the watershed and soils resources by alternative

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Soil Resources	No short term disturbance and no long-term benefit to soil condition or trend.	For treatments excluding decommissioning, there would be short-term impacts to soils resources, but long-term benefit to soil condition and trend. Short-term impacts to soils resources from decommissioning; long-term localized impacts from increased routes. Project-wide long-term benefits to soil condition and trend outweigh minor localized impacts.	Same effects as alternative B; no additional impacts from herbicide use.	Same effects as alternative B. Short-term impacts to soils resources from decommissioning. Project-wide long-term benefits to soil condition and trend. Slightly better than alternatives B and C.

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Riparian Areas and Wetlands / Wet Meadows	No short-term or long-term benefit to riparian functionality. Without vegetation and prescribed fire treatments, no long-term benefit to riparian functionality; higher risk of downward trend in event of uncharacteristic wildfire.	<p>With vegetation and prescribed fire implementation, there would be no negative impacts with implementation of best management practices; long-term benefit to riparian functionality with reduced risk of uncharacteristic wildfire. With stream, riparian, and erosion control treatments will have positive benefit to riparian functionality; upward trend and improved conditions.</p> <p>With range management treatments, there would be no benefit to riparian functionality.</p> <p>With motorized transportation treatments will be minor impacts to riparian areas that will be mitigated with implementation of best management practices.</p> <p>Project-wide long-term benefits to riparian areas, wetlands, wet meadows outweigh minor localized impacts</p>	Same effects as alternative B; no additional impacts from herbicide use.	Same effects as alternative B. Motorized transportation treatments - Project-wide long-term benefits to riparian areas, wetlands, wet meadows. Slightly better than alternatives B and C.

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Water Quality and Quantity	<p>Without vegetation and prescribed fire treatments - no short-term disturbance; no changes in compliance with Clean Water Act, no long-term benefit to water quality; continuation of potentially less stable hydrologic regime.</p> <p>Without stream, riparian, and erosion control treatments - no short-term disturbance; no changes in compliance with Clean Water Act, no long-term benefit to water quality; continuation of unstable hydrologic regimes</p> <p>Without range management - No changes in compliance with Clean Water Act, no changes to water quality; no changes to hydrologic regime</p> <p>Without motorized transportation treatments - no short term disturbance; no changes in compliance with Clean Water Act, and no long term benefit to water quality</p>	<p>With vegetation treatments - short-term additional sediment, long-term benefit to water quality and hydrologic regime with reduced risk of uncharacteristic wildfire and no changes in compliance with Clean Water Act.</p> <p>With prescribed fire - short-term added sediment and ash, long-term benefit to water quality and hydrologic regime with reduced risk of uncharacteristic wildfire and no changes in compliance with Clean Water Act.</p> <p>With stream, riparian, and erosion control treatments - short-term additional sediment; long-term benefit to water quality and improved hydrologic regime. Improved compliance with Clean Water Act. Potential to meet State water quality standards</p> <p>Range management treatments would result in no changes in compliance with Clean Water Act.</p> <p>With motorized transportation treatments - short-term impacts to water quality from decommissioning; long-term localized impacts from increased routes. Project-wide long-term benefits to water quality and quantity outweigh minor localized impacts.</p>	Same effects as alternative B; no additional impacts from herbicide use.	Same effects as alternative B. Short-term impacts to water quality from decommissioning; Project-wide long-term benefits to water quality. Slightly better than alternatives B and C.

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
<p>Watershed Cumulative Effects</p>	<p>Without vegetation and prescribed fire treatments - no change to watershed condition classification; higher risk of downward trend in event of uncharacteristic wildfire.</p> <p>Without other treatments – no change to watershed condition classifications</p>	<p>With vegetation and prescribed fire treatments - Improvement in terrestrial biological indicators resulting in minor upward trend in watershed condition classification in multiple watersheds; reduced risk of downward trend resulting from potential uncharacteristic wildfire.</p> <p>With stream, riparian, and erosion control treatments - Improvement in aquatic biological and aquatic physical indicators resulting in upward trends and improved watershed condition classifications in multiple watersheds.</p> <p>Range management treatments would result in no change to watershed condition classification</p> <p>With motorized transportation treatments - Improvement in Terrestrial Physical indicators resulting in upward trends and improved watershed condition classifications in multiple watersheds</p>	<p>Same effects as alternative B</p>	<p>Same effects as alternative B. With motorized transportation treatments, slightly more improvement in terrestrial physical indicators than alternatives B and C.</p>

Table 25. Comparison of the National Forest System roads by alternative.

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Miles added to the national forest road system on the Gila	0	22	22	4
Net reduction in miles of national forest system roads on the Gila	0	94	94	126

Table 26. Comparison of the range resources by alternative

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Range Resources	No activities are being implemented, therefore there are no effects to range resources. Without vegetation and prescribed fire treatments, there would be continued encroachment into grasslands and risk of wildfire would continue.	With vegetation and prescribed fire activities, there may be a need to rest all or part of pastures for a short duration. Long-term benefit from grassland restoration and water improvement.	Effects same as alternative B. Herbicide application would move the landscape toward desired conditions in a shorter timeframe compared to only mowing in alternatives B and D.	Effects same as alternative B.

Table 27. Comparison of recreation resources by alternative

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Recreation Opportunity – Quality of national forest system trails	0 miles constructed	4.5 mile of trail is constructed through road to trail conversion and 0.3 mile of new construction connecting motorized trail in Dillman Creek area	4.5 mile of trail is constructed through road to trail conversion and 0.3 mile of new construction of connecting motorized trail in Dillman Creek area	4.2 mile of trail is constructed through road to trail conversion. No new construction of connecting motorized trail (0.3 miles)
Recreation Opportunity – Increased opportunity for motorized recreation for off-highway vehicles	0 miles added to the motorized transportation system	18 total miles of national forest system roads (13.8 mi) and user-created routes (4.2 mi) added to the motorized transportation system	18 total miles of closed national forest system roads (13.8 mi) and user-created routes (4.2 mi) added to the motorized transportation system	0.2 miles added to the motorized transportation system from previous travel management decision

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Inventoried Roadless Areas	No activities would be implemented, therefore current roadless character would be unchanged. Without prescribed fire, the risk of wildfire would continue. The potential of a wildfire could impact naturalness and/or recreation values of roadless areas.	With low severity prescribed fire there would be some short term effect to the undeveloped, natural, and opportunities for solitude or primitive unconfined recreation attributes of the Nolan and Mother Hubbard Inventoried Roadless Areas; but would result in a long term beneficial effect. Temporary effects to solitude and recreation could occur along the roadless boundaries, by such things as sights and sounds of people working, chainsaws, dust, and smoke. Approximately 0.46 miles of road would be changed to trail during decommissioning in Frisco Box Inventoried Roadless Area, improving undeveloped quality.	Same effect as alternative B. No herbicide treatments are located in any of the roadless areas.	Same effect as alternative B.

Table 28. Comparison of heritage resources by alternative

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Heritage Resources – Relative Risk	No activities would be implemented, therefore would be no relative risk of potential impact to sites. Without vegetation and prescribed fire treatments, the risk of wildfire and erosion episodes following fire events would continue. With that, the probability that heritage resources may be adversely affected in the future increases.	The relative risk of potential impacts to sites based on acres of archaeological inventory is approximately 76,554 acres of projects using heavy equipment; a subtotal of prescribed fire acres (130,000 to 160,000 acres) determined by high site probability; and approximately 20,283 acres of mowing rabbitbrush. There is a potential for direct and indirect effects to heritage resources with implementation of the various types of projects and associated equipment. Effects would be minimized or prevented through application of design features and best management practices.	The relative risk is the same as alternative B. Herbicide acres are the same as rabbitbrush mowing area. Plus an additional 8,030 acres may be treated with herbicide for alligator juniper. Effects are same as alternative B.	The relative risk and effects are the same as alternative B.

Table 29. Comparison of the social and economic resources by alternative

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Environmental Justice – Economics	No activities would be implemented, therefore there would be no change from the current condition and therefore no disproportionate adverse economic effects to minority or low-income populations.	With implementation of various projects there is potential for economic benefit to local contractors or industries and increased employment including timber or other forest products, fire, or other restoration projects that could be contracted. With potential increase in employment opportunities, there would be no disproportionate adverse economic effects to minority or low-income populations.	Same effects as alternative B	Same effects as alternative B

Resource Element	Alternative A	Alternative B	Alternative C	Alternative D
Environmental Justice – Health and Quality of Life	Without implementation of prescribed burning, smoke emissions would not have health and quality of life consequences to vulnerable populations such as children, the elderly, and individuals with health and respiratory issues. The risk of wildfire would continue and the intensity and duration of smoke emissions will be greater than prescribed burning treatments and will have consequences to vulnerable populations.	With prescribed fire treatments, vulnerable populations will be affected by smoke emissions. But intensity and duration of smoke emissions will be minimized with implementing burn prescriptions, coordination with the state Air Quality Department and advanced notification to allow individuals to engage other methods of reducing smoke impacts.	Same effects as alternative B	Same effects as alternative B
Environmental Justice – Fuelwood as Household Heat Source	Without vegetation treatments, opportunities for fuelwood collection would continue and would not affect low income families who depend on fuelwood for primary heat source.	With vegetation treatments, the opportunity for additional sources of fuelwood would become available. Families who depend on fuelwood for primary heat source would not be affected.	Same effects as alternative B	Same effects as alternative B

Chapter 3. Affected Environment and Environmental Consequences

Introduction

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. The complete analysis documents are part of the project record. It also presents the scientific and analytical basis for comparing alternatives as presented in chapter 2. Analyses looked at changes from the no-action alternative (alternative A).

Notes on Effects Analysis

This draft environmental impact statement examines effects on a landscape scale.

Specialists presented any limitations and assumptions in their analyses in accordance to the Council on Environmental Quality; Regulations for Implementing the National Environmental Policy Act; 40 CFR section 1502.22; and incomplete or unavailable information [51 FR 15625, Apr. 25, 1986].

There may be variations in values displayed by some of the resource areas for alternatives. The numbers may vary due to resource spatial data compared to planning area data not matching perfectly. Also, depending on the resource area and measure for analysis of effects, the resource area of consideration may be more, less, or a subset of the planning area.

Assumptions and Limitations Common to All Resources

For analysis purposes, the average width of roads and trails by type or maintenance level used were as shown in table 30.

Table 30. Average width of roads and trails by type or maintenance level.

Existing and Proposed Roads and Trails	Average Width (feet)
Decommissioned*	0
Operation maintenance level 1 – Closed	12
Operation maintenance level 2	12
Operation maintenance level 3	14
Operation maintenance level 4	20
Operation maintenance level 5	20
Unauthorized roads	16
4x4 trail	6
Temporary roads	10

*Decommissioned is defined as a route in its natural (pre-road) condition

Vegetation

Assumptions and Limitations

Model Limitations

The Forest Vegetation Simulator (FVS) model is a semi-distance-independent, individual tree growth yield model. Stand exam data was used as the model input. For this project, a limitation of Forest Vegetation Simulator modeling is that the forest does not have a 100 percent sample of the project vegetation by stand and alternative. The intensity and level of stand exam data collected versus the amount of acres proposed for treatment is not a one-to-one relationship; rather, the data is an inventory to represent stand-level conditions by proposed activity.

For stands in which data was not collected, data from stands exhibiting similar features based upon National Agricultural Imagery Program in geographic information systems was used for analysis. Field validation was then performed on a limited number of stands for accuracy. A minimum of 20 stands was selected per treatment model run, or if less than 20 stands was available for a given model run then all stands were used in simulations. Professional judgement based on local experience has verified that model outputs are reasonable with values and indicators aligned with desired conditions.

Model results and interpretations must still be tempered with professional judgment for full analysis of effects. Model outputs display per-acre average results for the specific data sets that were modeled for each project treatment category. These per-acre results can generally be applied to represent the full acres listed for each forest type within the appropriate treatment category. All numbers, acres, and percentages used throughout this document are strictly estimates.

Analysis Assumptions

There are basic assumptions associated with modeling silvicultural prescriptions and stand growth. It is important to understand that parameters describing stand conditions and the underlying growth of stands are outcomes of an empirical growth model (Forest Vegetation Simulator). These outcomes are statistical in nature and are an attempt to represent future stand conditions over time. Outputs from the modeling represent an average of “what” might occur over time and interpretation should consider the modeling a tool in understanding ecological processes. The output data reflects silvicultural assumptions (model’s underlying equations) and the variability inherent in the input data (common stand exam inventory plots).

- **Assumption 1:** The collected inventory plot data (common stand exam) represent the current “average” stand conditions in the project area.
- **Assumption 2:** The Forest Vegetation Simulator model and the underlying equations of the chosen variant statistically represent future tree and stand growth and mortality. The model’s output of stand conditions provides a statistically non-biased representation of silvicultural activities and stand conditions over time.

- **Assumption 3:** The modeled outputs from Forest Vegetation Simulator should not be assumed to be exact for all stands where the outputs are applied due to limitations in data collection mentioned above. The results are meant to be interpreted as general trends on the landscape. During implementation site-specific stand level prescriptions will be written for each stand and will be in compliance with authorized activities.
- **Assumption 4:** Forest Vegetation Simulator was used to model the first entry for treatments however some stands may require subsequent entries to move towards or attain desired conditions. Anticipated effects are displayed 20 and 40 years post-harvest; however, it is plausible and likely that future planning efforts will overlap with the project area and could identify areas needing re-treatment to maintain or move towards desired conditions.

Data Limitations

To describe current conditions for Mexican spotted owl habitat available stand data was used. There is limited stand data therefore; the stand information does not encompass the entire acreage of designated Mexican spotted owl habitat within the planning area.

Environmental Consequences

The vegetation affected environment is described in chapter 1, “Existing and Desired Condition” section.

Alternative A

Forest Cover Types

Forest cover type changes would occur over time as trees die through natural mortality and disturbance events from insect, disease, or wildfire. Tree growth, sprouting, regeneration of other species, and climatic variation may also cause a change in the forest cover type.

Under the no-action alternative, there would not be an increase in growing space and conditions would remain the same in the short-term. In the long-term where existing density levels are currently high competition-induced mortality would occur as densities continue to increase. Depending on the extent of the mortality newly created growing space would either create openings large enough for new regeneration to establish or be quickly occupied by residual trees. Many of the forest cover types within the Luna project area don't tend to persist at high densities for long periods as they are generally affected by natural disturbance events such as insects, disease and wildfire.

Under the no-action alternative, the grassland cover type would experience a decline from the existing acreage by about 1 percent in 20 years as woody vegetation continues to regenerate into the grassland and meadow edges (table 31). The grassland would undergo little or no change over the remaining 40-year period due to the slow rate of regeneration and tree canopy closure. All other cover types would be within desired ranges over the 20- and 40-year periods. Ponderosa pine and pinyon-juniper woodlands would experience a slight decrease. Oak woodland, southwest white pine and white fir cover types would experience a slight increase over the 20- and 40-year periods. There would also be a slight decrease in 20 years and overall increase in the 40-year period for the Douglas fir cover type.

Table 31. Forest cover type acres and percent change in 20 and 40 years under alternative A, no action.

Forest Cover Type	Acres	Percent Change (%) in 20 years	Percent Change (%) in 40 years
Grassland/Meadow	21,941	-1	-1
Douglas fir	6,323	-0.4	+0.2
Engelmann Spruce	109	0	0
Oak Woodland	1,414	+1.3	+1.7
Pinyon-Juniper	41,713	-0.2	-0.1
Ponderosa pine	87,195	-0.4	-1.2
Riparian	784	N/A	N/A
Southwestern White Pine	69	+0.4	+0.4
White Fir	6,887	+0.2	+0.2
Reforestation Area	3,954	N/A	N/A
Rocky Area	942	N/A	N/A
	171,331¹		

¹ Acreage does not include private land.

Stand Density Index

As density continues to increase, competition among trees would result in density-induced mortality. Health and vigor of the trees would also decline as density increases and stands approach maximum stand density index. Existing grasses, shrubs, and forbs would decline in vigor and growth and individual trees would begin to die creating small openings in the tree canopy as stands reach the threshold of density dependent mortality. Minimum forage would likely be produced under tree canopies without a large-scale disturbance and existing trees would quickly capture the newly available growing space.

Under the no-action alternative, in 20 years, approximately 70 percent of the Luna project area would reach full site occupancy in zones 3 and 4 (table 32). In 40 years, approximately 80 percent of the landscape would reach full site occupancy in zones 3 and 4 (table 32). The percent of the landscape in zones 1 and 2 do not meet desired conditions over the 40-year period.

Table 32. Stand density index (SDI) percent of landscape in 20 and 40 years under alternative A, no action.

Zone	Maximum SDI (%)	Percent of Landscape Existing	Percent of Landscape in 20-years	Percent of Landscape in 40-years	Percent of Landscape Desired
1	0 - 25	19	12	9	10-20
2	25 - 35	33	18	11	20-30
3	35 - 55	38	46	41	30-50
4	55 ¹ - 100	10	24	39	10-20

¹ Zones 3 and 4 upper and lower ranges vary between 55 and 60percent based on review of the existing research 55 percent was used as the respective upper and lower thresholds for zones 3 and 4 for the Luna analysis.

Vegetation Structural Stage

With the no-action alternative the existing distribution of vegetation structural stages within the analysis area for ponderosa pine and woodland cover types would change as trees grow. Barring any natural disturbances, both stand density index (table 32) and canopy density (table 33 and

table 34) would continue to increase until site capacity is reached. Over a long period (more than 40 years), vegetation structural stage 1 and canopy density class A percentages may increase slowly as older trees die and deteriorate leaving large openings for regeneration. Also, openings may come from mortality from tree competition at high densities, or from abiotic and or biotic causes such as insect or disease infections, wildfire, or other damaging agents.

Table 33. Ponderosa pine percent of area by canopy density class under alternative A, no action, from existing to 20 and 40 years compared to desired condition; where Canopy Density Class A = Open (0-39%); B = Moderately closed (40-59%); and C = Closed (60% +).

Canopy Density Class	Desired Condition (Percent)	Existing Condition (Percent)	Condition at 20 Years (Percent)	Condition at 40 Years (Percent)
A	40%	36%	31%	25%
B	40%	51%	43%	27%
C	20%	12%	25%	48%

Table 34. Woodlands percent of area by canopy density class under alternative A, no action, from existing to 20 and 40 years compared to desired condition; where Canopy Density Class A = Open (0-39%); B = Moderately closed (40-59%); and C = Closed (60% +).

Canopy Density Class	Desired Condition (Percent)	Existing Condition (Percent)	Condition at 20 Years (Percent)	Condition at 40 Years (Percent)
A	55%	13%	3%	3%
B	30%	63%	43%	26%
C	15%	24%	55%	71%

Based on modeling the no-action alternative, canopy density for ponderosa pine and woodland cover types would become less open (class A) over 20 and 40 years (table 33 and table 34). Over the 40-year period, open and moderately closed classes will drop below desired conditions, with the open category displaying the greater departure. Canopy density for both cover types would greatly exceed desired conditions for the closed class (class C) over the 40 years (table 33 and table 34), following the trend of the stand density index (table 32).

Within the Luna planning area, the model for vegetation structural stages shows changes in percent acres in all diameter classes of ponderosa pine cover type from existing through 20 and 40 years (table 35). In year 20, diameter classes 1 and 5 for ponderosa pine decline and are deficient when compared to desired conditions; unlike vegetation structural stage diameter classes 2, 3, and 4, which are in surplus (table 35). In 40 years, vegetation structural stage classes 1 and 2 are both deficit compared desired conditions. As trees grow over the 20 to 40 years, the percent acres in vegetation structural stage classes 3, 4, and 5 increase, exceeding desired conditions. Vegetation structural stage 6 percent acres does not change over the 40-year modeling period.

Table 35. Vegetation structural stages (VSSs) by percent area for ponderosa pine cover type for existing, 20-year and 40-year conditions compared to desired conditions under alternative A, no action.

Vegetation Structural Stage (VSS) (Diameter class in inches)	Desired Condition (percent acres)	Existing Condition (percent acres)	Condition at 20 Years (percent acres)	Condition at 40 Years (percent acres)
VSS 1 (0.0-0.9")	10	22	<1	0
VSS 2 (1.0-4.9")	10	<1	20	<1
VSS 3 (5.0-11.9")	20	30	26	30
VSS 4 (12.0-17.9")	20	25	38	34
VSS 5 (18.0-23.9")	20	16	7	27
VSS 6 (24" +)	20	8	8	8

The existing condition of uneven-aged stand structure for both ponderosa pine and woodland cover types are deficit, 46 percent and 40 percent respectively, compared to desired conditions (90 percent and 100 percent). Over the 20 and 40 year period, the percent for each increase from the existing condition, 53 percent and 43 percent, respectively, at year 40. It is only a small increase and still far below desired conditions of 90 percent and 100 percent.

Habitat Features for Mexican Spotted Owl (Threshold Stands)

Under the no-action alternative, fuel loadings in Mexican spotted owl recovery habitat would not be reduced. Consequently, the risk of loss of habitat due to high severity wildfire, would increase over time.

In 20 years, there will be an increase to 33 percent mixed-conifer stands and 6 percent of ponderosa pine stands that meet all minimum habitat features (table 36). The remaining stands in the mixed conifer and ponderosa pine meet minimum habitat features to varying degrees.

Table 36. Percent of Mexican spotted owl threshold stands meeting minimum habitat characteristic(s) by cover type within 20 years under alternative A, no action.

Forest Cover Type	% Stands Meeting all Features	Basal Area Size Class of 12-18" DBH	Basal Area Size Class >18" DBH	Stand Avg. Basal Area	Stand Avg. Trees per Acre 18"+
Mixed-conifer	33%	58%	48%	76%	79%
Ponderosa Pine-Oak	6%	47%	45%	90%	73%

In 40 years, the modeling results suggest a reduction in the percent (6 percent) of mixed conifer stands that meet all minimum habitat features (table 37). The stand reduction is due to not meeting more than 30 percent basal area in the 12 to 18 inches diameter at breast height class, and more than 30 percent basal area in the 18 inches or larger tree class.

The number of ponderosa pine stands meeting minimum habitat features would increase to 20 percent of the stands in year 40 (table 37).

Table 37. Percent of Mexican spotted owl threshold stands meeting minimum habitat characteristic(s) by cover type within 40 years under alternative A, no action.

Forest Cover Type	% Stands Meeting all Features	Basal Area Size Class of 12-18" DBH	Basal Area Size Class >18" DBH	Stand Avg. Basal Area	Stand Avg. Trees per Acre 18"+
Mixed-conifer	6%	33%	39%	94%	94%
Ponderosa Pine-Oak	20%	47%	65%	96%	88%

Old Growth Stand Structural Attributes

Under the no-action alternative, the percentage of area simultaneously meeting the minimum old growth stand structural attributes (excluding down dead trees which is unknown) would begin to move toward the desired condition during the 40-year period (provided a large scale disturbance such as wildfire does not occur). Under this alternative, all minimum old growth variables would be simultaneously met in 20 years in 15 percent of the interior ponderosa pine group, 12 percent of the mixed-species group, and 96 percent of the woodland species group (table 38). Compared to the existing condition the percentage of the ponderosa pine group simultaneously meeting old growth conditions remains would remain unchanged, decreasing slightly for the mixed-species group by 7 percent and increasing for the woodland species group by 8 percent (table 38).

In 40 years, all minimum old growth variables would be simultaneously met over 31 percent of the interior ponderosa pine group, 12 percent of the mixed-species group, and 95 percent of the woodland species group. The degree to which the old growth groups meet various stand structural attributes fluctuates throughout the 40-year period, and tends to increase for all attributes except for meeting the standing dead tree requirements for a give old growth group. Although the minimum variable of down dead is unknown for the various groups, given the amount of standing dead in the area it is concluded that this variable would be met as the other variables are simultaneously met. There would be a high risk of loss of dead and down material, dead standing material, and live vegetation through wildfire occurrence due to the increasing tree densities over time.

Overall, table 38 shows the trend for old growth under the no-action alternative from existing to 20 and 40 years; with no treatments and no disturbances. All stands are moving towards desired conditions over the 40 year period, with the exception being the mixed species group. Model outputs suggest the degree to which the old growth groups meet various stand structural attributes, fluctuates throughout the 40-year period, and tends to increase for all attributes except for meeting the standing dead tree requirements.

Table 38. Percent of designated 20% (identified) old growth area meeting minimum criteria of structural attributes by group from existing through 20 and 40 years under alternative A, no action.

Old Growth Group	Minimum Criteria of Structural Attributes ¹	Percent of Identified Old Growth Area – Existing Condition	Percent of Identified Old Growth Area – 20 years	Percent of Identified Old Growth Area – 40 years
Ponderosa pine	20 live trees in main canopy at least 14 inches in diameter at breast height (DBH)	70	91	98
Ponderosa pine	1 standing dead tree per acre at least 14 inches in diameter at breast height and at least 15 feet	46	36	61
Ponderosa pine	70 to 90 square feet per acre total basal area	98	99	100
Ponderosa pine	40 to 50% total canopy cover	34	48	70
Ponderosa pine	Percent area simultaneously meeting all attributes ²	12	15	31
Mixed-species	12 to 16 live trees in main canopy at least 18 inches in diameter at breast height	45	61	75
Mixed-species	2.5 standing dead tree per acre at least 14 inches in diameter at breast height and at least 20 feet	85	40	19
Mixed-species	80 to 100 square feet per acre total basal area	100	100	100
Mixed-species	50 to 60% total canopy cover	43	51	65
Mixed-species	Percent area simultaneously meeting all attributes ²	19	12	12
Woodland	12 to 30 live trees in main canopy at least 9 inches in diameter at root crown	99	100	100
Woodland	1 standing dead tree per acre at least 9 inches in diameter at root crown and at least 8 feet	88	99	96
Woodland	6 to 24 square feet per acre total basal area	100	100	100
Woodland	20 to 35% total canopy cover	97	97	99
Woodland	Percent area simultaneously meeting all attributes ²	87	96	95

¹ Low site productivity values were used as threshold for each old-growth group for the Luna planning area.

² Age and down dead trees are unknown for the group.

Effects Common to Alternatives B, C, and D

Forest Cover Types

As in the no-action alternative, changes in tree growth, sprouting, regeneration of other species, and climatic variation, may cause a change in the forest cover type acreage within the Luna project area. Under all action alternatives, there would not be a decline in the grassland cover type, at 20 years, as woody vegetation is cut and burned through grassland maintenance treatment. Restoration of the grasslands currently regenerating into pinyon pine-juniper

woodlands and ponderosa pine forests would increase the grassland component in the Luna project area by 1 percent in the first 20 years. Continued grassland maintenance would retain the 1 percent increase in the grassland cover type forty years post-harvest (table 39).

The majority of the species would fall within the desired percent range for management over the 40-year period (table 39). There would be slight increases for several of the mixed-species cover types including Douglas-fir, white fir and southwest white pine for both the 20- and 40-year periods. These cover types fall within Mexican spotted owl recovery habitat in the Luna project area where it is desirable to have a variety of species present. Pinyon-juniper and oak woodlands would also increase in the 20-year period by approximately 0.9 and 0.8 percent, respectively. This increase would be sustained through the 40-year period. The ponderosa pine cover type would sustain the largest decline in cover type decreasing by 4 percent at 20 years, and 6.2 percent at 40 years. This is slightly outside of the desired range for management at 40 years post-harvest.

The decrease in the ponderosa pine cover type is predicted through modeling, but actual prescriptions would be implemented to favor ponderosa pine in the ponderosa pine cover type and where ponderosa pine has transitioned to woodlands. There might be a slight decrease in the ponderosa cover type in some areas due to favoring of other species in Mexican spotted owl recovery habitat, transition from ponderosa pine to Douglas-fir in no-treatment areas, and also in removing encroaching conifers in grassland and meadow restoration treatments. Therefore, while model outputs and professional experience show a net overall reduction in the ponderosa pine cover type under various thinning regimes, the actual amount is largely dependent on the individual stand conditions pre-treatment and how the treatment is applied.

Table 39. Percent change from existing forest cover type acres at 1 year, 20 years, and 40 years post harvest compared to range of desired percent for alternatives B, C, and D.

Forest Cover Type	Acres (Range of Desired Percent Change)	Percent Change (%) 1-year Post-harvest	Percent Change (%) 20 years Post-harvest	Percent Change (%) 40 years Post-harvest
Grassland/Meadow	21,941 (+0-2%)	+1%	+1%	+1%
Douglas fir	6,323 (+0-2%)	+0.4	+0.2%	+2.2%
Engelmann Spruce	109 (+0-2%)	0%	0%	0%
Oak Woodland	1,414 (+/-2%)	+0.2%	+0.9%	+0.9%
Pinyon-Juniper	41,713 (+/-5%)	+1.6%	+0.8%	+0.8%
Ponderosa pine	87,195 (+/-5%)	-3.9%	-4.0%	-6.2%
Riparian	784 (NA)	N/A	N/A	N/A
Southwestern White Pine	69 (+0-2%)	0%	+0.3%	+0.3%
White Fir	6,887 (+0-2%)	+0.7%	+0.8%	+0.9%
Reforestation Area	3,954 (NA)	N/A	N/A	N/A
Rocky Area	942 (NA)	N/A	N/A	N/A
	171,331 ¹			

¹ Acreage does not include private lands.

Note: The summarization of results includes all stands as part of the modified proposed action alternative including not no treatment stands and prescribed burn-only stands. Prescribed burn only stands were not directly modeled in FVS and were modeled as no action stands.

Results were given 1 year post-harvest since mortality was not modeled for the prescribed burning modeled post-thinning treatments.

Forest stands would be treated, following principles described in the Rocky Mountain Research Station general technical report GTR-310 (Reynolds et al. 2013) where applicable.

Implementation of principles provided in GTR-310, where appropriate, that restore the composition and structure of frequent-fire forests will result in a more open forest structure with a decreased potential for stand-replacing wildfire and epidemic outbreaks of insects and diseases (Fitzgerald 2005; Fulé et al 2002, 2004; Graham et al 2004; Roccaforte et al 2008; Strom and Fulé 2007 as cited in Reynolds et al. 2013).

Stand Density Index

Under all action alternatives, 1 year post-harvest, zones 1 and 2 would be above the desired range (table 40), while 23 percent of the landscape in zones 3 and 4 would be at full site occupancy, but are below the desired range.

Modeling for changes in stand density over 20 and 40-year periods show a transitioning of the landscape from zone to zone over time (table 40). The model does not include the possibility of re-entry into areas for treatment activities. Within 20-years, all zones would be within or very close to desired percent of the landscape. Zone 1 would be in surplus by roughly 1 percent, and zone 2 would be at the upper end of the desired range. In 40 years, the percent of the landscape at full site occupancy would increase to roughly 67 percent, with zone 3 still being with the desired range, but zone 4 would be 10 percent in surplus.

Table 40. Percent of maximum stand density index (SDI) 1 year, 20 years, and 40 years post-harvest for alternatives B, C, and D compared to desired percent of the landscape.

Zone	Maximum SDI (%)	Desired Percent of Landscape	Percent of Landscape 1 year Post-harvest	Percent of Landscape 20 years Post-harvest	Percent of Landscape 40 years Post-harvest
1	0 - 25	10-20	35	21	16
2	25 - 35	20-30	42	30	18
3	35 - 55	30-50	17	32	37
4	55 - 100	10-20	6	16	30

The decreases to the stand density indicator are in alignment with recommendations for the management of southwestern forests (Reynolds et al. 2013) because increased density levels create conditions for wildland fires or insects and disease outbreaks. Drought is also a significant stressor to vegetation communities in this area of the United States; the effects of drought are amplified by higher vegetation density levels, as the need for moisture is increased by greater numbers of plants.

Thinning would reduce tree competition, create openings, and release residual trees. The direct effects of thinning would be increased stand and landscape level resistance and resiliency to fire, insects, and disease. Additionally, decreased stand densities would maintain healthy forest conditions during drought cycles. These effects would be apparent immediately following thinning.

Grassland maintenance or meadow restoration treatments would result in a decrease in tree density which would allow for an increase in native grasses and forbs. There would also be an increase in grasses and forbs in forested areas as the canopy would be open allowing light and

moisture to reach the forest floor. The restoration of grass-forb-shrub interspaces and resultant separation of tree canopies and increase in herbaceous plant cover will provide fuels to carry frequent surface fires. Restoration of the characteristic fire regimes should sustain forest composition, structure, processes, and functions (Reynolds et al. 2013).

The direct effects to vegetation from thinning and subsequent fuels treatments would be a reduction to the stand density indicator. Active management, through forest thinning, maintains healthy trees that are less susceptible to high levels of mortality. Individual or small groups of trees may die, but the forest would be retained. Forests managed with appropriate residual density are able to withstand the effects of fire (Agee and Skinner 2005).

Additionally, aside from the changes to the indicator measures for vegetation, fuels reduction work would create landscapes with residual fuel loadings closer to desired conditions. Subsequent prescribed burning treatments post-thinning would result in less surface, ladder, and canopy fuels. This would change the fuel content within the stands and across the landscape, which would affect future wildland fires. These stand and landscape level changes in the thinned stands will result in a discontinuous canopy and decreased crown bulk densities. Research has shown that this along with a reduction in surface fuels and increase in canopy base height from prescribed fire will help create fire resilient landscapes (Agee and Skinner 2005). Maintenance treatments including prescribed fire and mechanical treatments would be needed to maintain or move towards desired conditions.

Vegetation Structural Stage

The action alternatives would result in more uneven-aged ponderosa pine and woodland stands through thinning, burning, and group selection silvicultural treatments. Thinning and prescribed burning stands would reduce competition and release trees to grow at faster rates, than stands that are left untreated. Increases in vegetation structural stage class from one structural stage to the next would occur at a slightly more rapid rate than with the no action alternative. Creating small openings (regeneration groups up to 4 acres in size outside northern goshawk post-fledging family areas and up to 2 acres in size within northern goshawk post-fledging family areas) by tree cutting and removal and burning would provide an opportunity for regeneration of small clumps of trees and increase the percentage of the landscape in vegetation structural stage 1. Treatments would be designed to promote structural heterogeneity leaving a mosaic of groups of trees providing areas of higher basal areas and canopy cover, in addition to scattered individual trees, and openings.

One year post harvest, canopy density within the ponderosa pine cover type would be more open (67 percent in class A) (table 41). Over time, canopy density would progress towards moderately closed and closed classes (table 41). Based on modeling, the ponderosa pine canopy density would near desired conditions over 40 years.

For the woodland cover type, the open (class A) and closed (class C) canopy density classes are deficit from desired conditions (table 42). Moderately closed density class (class B) is the condition over majority of the area. Over 20 to 40 years, post-harvest would progress towards more percent area of closed canopy density (class C), but would not near desired conditions (table 42).

Table 41. Ponderosa pine percent of area by canopy density class under alternatives B, C, and D, 1; 20; and 40 years post harvest compared to desired condition; where canopy density class A = Open (0-39%); B = Moderately closed (40-59%); and C = Closed (60%+).

Canopy Density Class	Desired Condition (Percent)	Condition at 1-year Post Harvest (Percent)	Condition at 20-Years Post Harvest (Percent)	Condition at 40-Years Post Harvest (Percent)
A	40%	67%	51%	43%
B	40%	31%	45%	45%
C	20%	1%	4%	11%

Table 42. Woodlands percent of area by canopy density class under alternatives B, C, and D, 1; 20; and 40 years post harvest compared to desired condition; where canopy density class A = Open (0-39%); B = Moderately closed (40-59%); and C = Closed (60%+).

Canopy Density Class	Desired Condition (Percent)	Condition at 1-year Post Harvest (Percent)	Condition at 20-Years Post Harvest (Percent)	Condition at 40-Years Post Harvest (Percent)
A	55%	2%	3%	2%
B	30%	93%	70%	50%
C	15%	5%	27%	47%

Structural stages for ponderosa cover type for 1 year, 20 years, and 40 years post-harvest are shown in table 43. In year one post-harvest, vegetation structural stages 1 and 5 are surplus of desired conditions. Immediately post-treatment, there would be an increase in vegetation structural stage 1 from established openings. Over time, this acreage would progress to vegetation structural stages 2 through 6. Prescribed burning in the surplus categories in vegetation structural stages 4 and 5 would reduce the amount of smaller trees and enhance the growth and vigor of residual trees promoting their ascendancy into larger size classes over time. This would facilitate stand structural development while also enhancing stand health and vigor through reducing tree density. Stand would become more resilient to disturbances, like insect and diseases. Post-harvest, there would be an increase in the percentage of acres in uneven-aged structure for ponderosa pine from 46 percent to 64 percent and only a slight increase for woodland 40 percent to 41 percent.

Table 43. Vegetation structural stages by percent area for ponderosa pine cover type for 1-year, 20-year and 40-year post harvest conditions for alternatives B, C, and D compared to desired conditions.

Vegetation Structural Stage (VSS) (Diameter class in inches)	Desired Condition (percent acres)	Condition at 1 year Post Harvest (percent acres)	Condition at 20 Years Post Harvest (percent acres)	Condition at 40 Years Post Harvest (percent acres)
VSS 1 (0.0-0.9")	10	34	10	3
VSS 2 (1.0-4.9")	10	<1	23	4
VSS 3 (5.0-11.9")	20	21	14	34
VSS 4 (12.0-17.9")	20	19	27	21
VSS 5 (18.0-23.9")	20	24	20	26
VSS 6 (24" +)	20	1	6	12

In 20 years post treatment, vegetation structural stages 1 and 5 would meet the desired condition, and classes 2 and 4 would be surplus of desired conditions. Vegetation structural stages 3 and 6 would be below desired conditions (table 43). For uneven and even aged stand structure, the ponderosa pine and woodland cover type remain relatively the same as one year post treatment, 67 percent and 40 percent respectively.

In 40 years post treatment, vegetation structural stages 1, 2 and 6 would be deficit; vegetation structural stages 3 and 5 would be surplus; and vegetation structural stage 4 would be almost at desired conditions (table 43). For uneven-aged structure ponderosa pine remains unchanged from 20 years at 67 percent and the woodland group would increase slightly to 44 percent.

Over the 40-year period, the landscape supports a forest composed of uneven aged stands with larger diameter trees. However, the amount of forest openings are reduced.

Habitat Features for Mexican Spotted Owl (Threshold Stands)

There are a variety of treatments proposed within some of the habitat being managed for Mexican spotted owl threshold stands including prescribed burning and small diameter thinning with follow up slash treatments. Treatments would reduce fuel loadings and the risk of loss of habitat from wildfires. Additional benefits of density reduction, diversity of forest composition and structure would also be realized with implementation of the action alternatives.

Under the action alternatives none of the target threshold stands would simultaneously meet all the minimum habitat parameters as outlined in the first revision of the Mexican spotted owl recovery plan (2012) 1-year post-harvest (table 44). One-year post harvest individual habitat parameters would be met to varying degrees for the two cover types.

Table 44. Percent of Mexican spotted owl threshold stands meeting minimum habitat features by cover type 1 year post-harvest under alternatives B, C, and D.

Forest Cover Type	% Stands Meeting all Features	Basal Area Size Class of 12-18" DBH	Basal Area Size Class >18" DBH	Stand Avg. Basal Area	Stand Avg. Trees per Acre 18"+
Mixed-conifer	0%	61%	15%	45%	33%
Ponderosa Pine-Oak	0%	49%	43%	27%	43%

In year 20 post-harvest, approximately 24 percent of the Mexican spotted owl threshold stands in the mixed-conifer and 6 percent of the stands in the ponderosa pine stands would simultaneously meet all the minimum habitat features (table 45). Individual stand variables would be met to varying degrees for the two cover types. Variables would improve from 1-year post-harvest values (table 44).

Table 45. Percent of Mexican spotted owl threshold stands meeting minimum habitat features by cover type 20 years post-harvest under alternatives B, C, and D.

Forest Cover Type	% Stands Meeting all Features	Basal Area Size Class of 12-18" DBH	Basal Area Size Class >18" DBH	Stand Avg. Basal Area	Stand Avg. Trees per Acre 18"+
Mixed-conifer	24%	58%	52%	67%	51%
Ponderosa Pine-Oak	6%	47%	49%	88%	73%

In year 40 post-harvest, approximately 18 percent of the Mexican spotted owl threshold stands in the mixed-conifer and 22 percent of the stands in the ponderosa pine would simultaneously meet all the minimum habitat features (table 46). Individual stand variables would also be met to varying degrees for the two cover types. Variables would improve from 20-years post-harvest (table 45) except for basal area for trees in the 12 to 18 inches in diameter at breast height class in the mixed-conifer stands (table 46).

Table 46. Percent of Mexican spotted owl threshold stands meeting minimum habitat features by cover type 40 years post-harvest under alternatives B, C, and D.

Forest Cover Type	% Stands Meeting all Features	Basal Area Size Class of 12-18" DBH	Basal Area Size Class >18" DBH	Stand Avg. Basal Area	Stand Avg. Trees per Acre 18"+
Mixed-conifer	18%	33%	55%	100%	94%
Ponderosa Pine-Oak	22%	47%	71%	96%	88%

Old Growth Stand Structural Attributes

Under the action alternatives, the percentage of area simultaneously meeting the minimum old growth variables (excluding down dead trees which is unknown) would begin to move toward the desired condition during the 40-year period (providing a disturbance doesn't occur e.g. stand replacing).

After the 1-year post treatment (table 47) there would be a slight decrease in stand densities and for some of the other structural attributes in comparison to the no-action alternative (table 38). However, the percentage of groups meeting all minimum old growth minimum criteria changed from none to the most 2 percent from no action alternative.

In 20 and 40 years post treatment, under the action alternatives, all minimum old growth variables would trend towards desired conditions for all vegetation groups. However, the mixed-species group stays relatively static. Individual structural attributes would increase for all old growth variables to varying degrees. Although the minimum variable of down and dead trees is unknown for the interior ponderosa pine group, the mixed-species group, and the woodland species group, given the amount of standing dead in the area it is concluded that this variable would also be met as the other variables are simultaneously met.

Although the area would be managed with low to moderate average basal areas across the landscape, project design would provide high basal areas and tree canopy cover retaining clumps of dense trees throughout the area. Openings would also be enhanced where feasible and would lower the average basal area and provide a reduction of fuels to reduce potential damage to old growth components in the event of a wildfire. There would be a low to moderate risk of loss of dead and down material, dead standing material, and live vegetation in treated areas through wildfire occurrence due to the low to moderate average tree densities.

Table 47. Percent of designated 20% (identified) old growth area meeting minimum criteria of structural attributes by group in 1; 20; and 40 years post-harvest under alternatives B, C, and D.

Old Growth Group	Minimum Criteria of Structural Attributes ¹	Percent of Identified Old Growth Area – 1 year post-harvest	Percent of Identified Old Growth Area – 20 years post-harvest	Percent of Identified Old Growth Area – 40 years post-harvest
Ponderosa pine	20 live trees in main canopy at least 14 inches in diameter at breast height (DBH)	68	89	95
Ponderosa pine	1 standing dead tree per acre at least 14 inches DBH and at least 15 feet	46	37	62
Ponderosa pine	70 to 90 square feet per acre total basal area	95	95	96
Ponderosa pine	40 to 50 percent total canopy cover	31	41	55
Ponderosa pine	Percent area simultaneously meeting all attributes ²	13	16	30
Mixed-species	12 to 16 live trees in main canopy at least 18 inches DBH	46	59	75
Mixed-species	2.5 standing dead tree per acre at least 14 inches DBH and at least 20 feet	45	48	55
Mixed-species	80 to 100 square feet per acre total basal area	53	100	100
Mixed-species	50 to 60 percent total canopy cover	22	52	64
Mixed-species	Percent area simultaneously meeting all attributes ²	10	12	12
Woodland	12 to 30 live trees in main canopy at least 9 inches diameter at root crown (DRC)	99	100	100
Woodland	1 standing dead tree per acre at least 9 inches DRC and at least 8 feet	88	95	97
Woodland	6 to 24 square feet per acre total basal area	100	100	100
Woodland	20 to 35 percent total canopy cover	97	93	99
Woodland	Percent area simultaneously meeting all attributes ²	87	89	96

¹ Low site productivity values were used as threshold for each old-growth group for the Luna planning area.

² Age and down dead trees are unknown for the group.

Alternative C – Herbicide Utilization

All other effects are the same as alternative B and D.

Under this alternative, the direct effect to vegetation would be a reduced amount of shrub and woodland tree species. Reducing the presence of these species would have the indirect effect of creating growing space for grass and forb species in grasslands, and also for conifer seedlings in forested areas. The objective of this treatment would be to remove competing species in grassland restoration treatments and to create ideal conditions for grass and forb species to regenerate. Herbicides would also be applied to sprouting alligator juniper in forested areas which would create growing space for conifer establishment and growth. By decreasing plant competition, the planted and naturally regenerated conifer species would have increased growth rates as they would have more available soil moisture, nutrients and sunlight.

Herbicide application would increase treatment effectiveness and help set back succession of competing shrub and juniper species which should help maintain grassland treatments for a longer period of time, and also help facilitate conifer establishment and growth in forested areas. Herbicide application would also be targeted within the wildland urban interface where sprouting of juniper post-thinning could create ladder fuels. In this case herbicide treatment would help increase the effectiveness of fuel reduction treatments to meet fuels objectives, with treatments lasting longer than with tree cutting alone.

Cumulative Effects

The 185,586-acre Luna planning area is part of the larger Escudilla Landscape, a 279,470-acre landscape planning area that extends across both the Apache-Sitgreaves and Gila National Forests. Twenty-five years was chosen as a benchmark for assessing cumulative effects as this allows adequate time for vegetation to respond to forest vegetation treatment activities such as timber harvest and pre-commercial thinning. There have been numerous vegetation management activities, including mechanical treatments and prescribed fire treatments, within the Luna Restoration Project area over the past 25 years.

Overall the number of treatments has decreased in the last 25 years compared to the amount of treatments occurring in the 1980s. This decline can be partially attributed to reduction in commercial timber activities across the Gila National Forest and throughout the Southwestern Region. Timber harvest activities across the Gila have declined by over 50 percent, going from an average of 25,000 CCF (100 cubic feet) per year in the early 1980s, to a current average of 10,000 CCF per year. This reduction in timber harvest has, in turn, reduced the number of roads constructed in support of these activities.

Current activities range from fuelwood collection, commercial thinning, salvage cutting, pre-commercial thinning for wildlife, watershed, vegetation and forest health improvement, pre-commercial thinning, overstory removal, road closures, and fuels reduction thinning. In recent years (2006 to current), timber sale activities have included the decommissioning of non-system roads following completion of harvest operations. Current and future planning projects also analyze the closure of non-system roads following completion of harvest activities. In addition, incorporation of best management practices and design features is required on all vegetation management projects. Best management practices address Gila National Forest staff responsibilities to implement the Clean Water Act, which is accomplished through implementation and monitoring of best management practices.

On the adjacent Apache-Sitgreaves National Forest, there are 35,105 acres of vegetation improvement, thinning, and prescribed burning projects planned. A recent decision was signed for the 68,000 acre West Escudilla Restoration Project which includes thinning trees and prescribed fire on the Alpine and Springerville Ranger Districts along the New Mexico-Arizona state line. In addition, it is likely there is “Fire Wise” hazardous fuels reduction work occurring on private lands within and adjacent to the project area. This project would be important to the success of future fire suppression efforts and complements past treatments and those currently occurring or being proposed on adjacent Federal, State, and private lands.

Cumulatively, the above activities in combination with prescribed fire would facilitate restoring and sustaining ecological processes in fire-dependent ecosystems and move vegetation and fuel conditions towards their historic fire regimes. Treatments would reduce density, creating more open forest conditions, with increased herbaceous, forb, and woody vegetation production. These treatments would also facilitate regeneration in openings and increase stand structural complexity and diversity at both the stand- and landscape-scale. Change in vegetation composition, stand density, and structure would help create more resilient ecosystems that are better suited to future disturbances. These combined treatments would complement the purpose and need goals for vegetation restoration and fire and fuels management by restoring departed vegetation communities, and reducing the impact of high-severity fire on private inholdings, communities, infrastructure, cultural resources, and livelihoods within the planning area. It should be noted there would be no effects to vegetation outside of the analysis area boundary as a result of this project.

Fire and Fuels

Assumptions and Limitations

Assumptions

A number of assumptions were made in this analysis and are listed below:

- Current forest plan and other management direction would continue in the future.
- No major disturbance, such as wildfire, blow down or insect epidemics would occur from the baseline year of 2016 until implementation is completed. This analysis discusses future risk and probable effects if a disturbance occurs, it is not a future projection of the occurrence.
- The project area is sufficient to analyze and discuss effects to fire and fuels.
 - ◆ The low-intensity prescribed burning treatments were not modeled in this analysis as they are not within a delineated unit or stand boundary, and due to the uncertainty of the exact location of where the prescribed burns would occur and the size of burn units.
 - ◆ Where appropriate, the vegetation characteristics (canopy base height, canopy cover, stand height, crown bulk density, and fuel model) were modified in treatment units to reflect the expected vegetation conditions after treatment.
 - ◆ Acres of private land and lands of other ownership that lie within the Luna Restoration project area boundary were included in the discussion.

Limitations of the Models

“It should be noted a model is a simplification or approximation of reality and hence will not reflect all of reality” (Stratton 2006). The use of models depends upon sample data, validity of the model itself, and assumptions made by the modeler. All three affect the results. The use of FlamMap 5 in this analysis is to generally characterize and display existing conditions and the nature and magnitude of treatment effects to inform decisions to be made. The modeling results are not to be taken as reality. Fire models are tools to help depict relative change in fire behavior and growth across the landscape. Although there are limitations to fire behavior modeling, the model outputs provide useful information for planning, assessing and prioritizing fuel treatments (Stratton 2004 and 2006). While we have a good general understanding of the factors that govern fire behavior, the interactions among these factors and the way in which fire behaves on the landscape are highly complex. As a result, fire behavior and severity can be understood and predicted in general terms, but exact predictions are not possible. Different models have been developed that are widely used and useful to assist in managing fires and developing fuel treatment plans. However, there are key uncertainties in how the simplifying assumptions of models affect their accuracy and as well as uncertainties that result from difficulties of providing adequate input data to operate the models (Graham et al. 2004). Given the uncertainty of any modeling exercise, the results are best used to compare the relative effects of the alternatives, rather than as an indicator of absolute effects (Graham et al. 2004).

Affected Environment

Fire regime groups and acres of each for the Luna planning area is displayed in table 48. A fire regime is the pattern, frequency, and intensity of the wildfires that prevail in an area over long periods of time. A fire regime describes the spatial and temporal patterns and ecosystem impacts of fire on the landscape.

LANDFIRE was used to conduct this assessment of fire regime groups within the project area. Approximately eighty-three percent of the project area is classified as Fire Regime Group I with a 0 to 35 year fire return interval with low/mixed fire severity. Approximately two percent is classified as Fire Regime Group II with 0-35 years fire frequency and replacement severity. Seven percent is classified as Fire Regime Group III with a 35 to 200 year fire frequency and mixed/low severity. Almost eight percent of the project area is classified as Fire Regime Group IV with a 35- to 200-year frequency and stand replacement severity and less than one percent is classified as Fire Regime Group V with 200+ year frequency and replacement to any type of severity.

Table 48. Summary of fire regime groups within the Luna planning area.

Fire Regime Group	Frequency	Severity	Severity Description	Acres of Project Area	Approximate percentage of Project Area
Group I	0 to 35 years	Low/mixed	Generally low-severity fires replacing less than 25% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the overstory.	153,800	83
Group II	0 to 35 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation.	3,592	2
Group III	35 to 200 years	Mixed/low	Generally mixed severity; can also include low-severity fires.	12,890	7
Group IV	35 to 200 years	Replacement	High-severity fires	14,292	8
Group V	200+ years	Replacement/ any severity	Generally replacement-severity; can include any severity type in this frequency range.	444	<1

Condition classes are used to categorize how much key ecosystem components such as species composition, structural stage, and stocking level, have changed in an area due to changing fire regimes. One or more activities, such as fire exclusion, insects and disease, and past management activities, can cause a change in fire regimes (Schmidt et al. 2002).

Vegetation condition class (VCC) distribution in the project area is shown below in table 49. Approximately 38 percent of the project area is within vegetation condition class Ia and Ib and has a low departure from the reference condition. Approximately 18 percent is classified as vegetation condition class IIa and IIb and is moderately departed from the reference condition; and approximately 43 percent is classified as vegetation condition class IIIa and is highly departed from the reference condition.

Table 49. Vegetation condition class distribution in the Luna planning area.

Vegetation Condition Class (VCC)	Acres*	Approximate Percentage of Project Area
VCC Ia, Very Low	1,034	<1
VCC, Ib Low	69,455	37
VCC IIa, Moderate-Low	20,408	11
VCC IIb, Moderate -High	12,835	7
VCC, IIIa, High	80,565	43
VCC IIIb, Very High	0	0

*Unburnable acres were not included; lands of other ownership within the Luna project area boundary are included.

Environmental Consequences

Alternative A

There would be no changes in current management and forest plan would continue to be implemented. There would be no direct effect to fuels under this alternative and no reduction of potential fire behavior. There are no foreseeable vegetation projects or prescribed fire projects proposed within the next five years. The no-action alternative would not move the project area towards desired conditions, nor would it meet the purpose and need; to reduce the impacts of high-severity fire and to implement vegetative treatments to restore departed landscapes at risk of fire.

In the absence of human-caused or natural disturbance such as vegetation treatment activities and wildfire, there would be an increased accumulation of surface and ladder fuels from insect and disease activity, storm damage, and the progression of forest succession, growth and change. Structural changes in vegetation may lead to increase departure from historic fire regimes and ecosystem function. Vegetation condition class departure would be expected to continue away from the desired condition. The result would be increased surface and ladder fuels that affect flame length, surface fuel loading levels (tons/acre) that affect fire intensity and severity, as well as increased tree crown density that make crown fire initiation more likely. Denser crown spacing and ladder fuels may contribute to uncharacteristic wildfire events. Increased fuel loading levels would continue to pose a threat to adjacent private land and ecosystems as fire suppression becomes more difficult. It is likely the ability of firefighters to safely and effectively suppress wildland fire would become more difficult as fire behavior characteristics intensify. Once wildfire transitions to the tree crowns, direct suppression tactics are not effective. Wildfires burning under these conditions would have greater potential to become large and have adverse effects.

Modeling results suggest the majority of the planning area is at risk to crown fire (table 8, MAP 1). In alternative A, the percent of the landscape susceptible to crown fire activity would increase over time.

Wildfires may impact private lands and other resources. Direct suppression tactics by firefighting forces may not be as effective in the project area under the no-action alternative. Tree mortality, as a result of insect and disease activity and natural forest succession, would continue into the future and would exacerbate the amount of standing and downed fuels in the project area.

Effects Common to Alternatives B, C, and D

Implementing Alternative B, C or D would result in a reduction in fuel loading and decrease fire behavior characteristics when compared to the existing condition. Treatments will help to maintain or shift areas towards the desired condition; reducing crown fire potential (table 50).

Crown fire potential refers to the conditions that allow fire to spread through the forest canopy. Modeling results suggest crown fire potential would be reduced to 16 percent of the project area compared to 67 percent under alternative A. Also, model results show 84 percent of the project would transition to surface fire, as compared to 24 percent under the no-action alternative (table 50).

Approximately 83 percent (153,800 acres) of the project area is classified as fire regime group I with a 0 to 35 year fire frequency (low-mixed fire severity) (table 48). With implementation of

alternatives B, C, or D, approximately 116,000 acres classified in fire regime group 1 would be treated, moving towards restoring the natural and historical fire regime (table 50). Additionally approximately 19,000 acres would be treated in areas classified as fire regime groups II through V. The project area would benefit from the proposed treatments with respect to ecosystem function, forest health, resiliency and reduction in potential fire behavior.

Table 50. Summary comparison of all alternatives for fire related concerns in the Luna planning area.

Concern	Indicator/Measure	Alt A	Alt B,C,D
Reduce impact of high severity fire	Percent of modeled crown fire (passive and active)	67%	16%
Reduce impact of high severity fire	Percent of modeled surface fire	24%	84%
Restore departed landscapes that are at risk of fire.	Approximate acres treated in fire regime group I	0	116,000

Implementation of low-severity prescribed fire in the Dry Blue and along the San Francisco Divide is expected to result in mortality of smaller diameter understory trees, brush (ladder fuels), and consumption of dead and down fuels. Single tree torching, isolated group tree torching, or both may occur. After multiple entries, it is anticipated there would be open interspaces of various sizes, groups of trees with interlocking crown, multi-storied canopies, and retention of larger-diameter over story trees. Overall, the treatments would move towards the ability to reintroduce fire into a fire-adapted ecosystem.

Mixed-severity prescribed burns are expected to create a mosaic of burned and unburned patches of vegetation. Prescribed burns would result in multi-storied canopies, and early seral grass/forb/shrub openings.

It is expected mechanical and prescribed fire treatments would reduce surface, ladder and crown fuels and change the fuel model profile. Raising canopy base heights and reducing tree density in mechanical thinning units would reduce ladder fuels and potential for crown fire initiation.

Cutting trees for vegetation health and reduction of canopy closure would initially result in increased surface fire intensity and spread rate due to residual activity fuels contributing to existing surface fuel loadings. Treatments would begin to restore ecological processes, including the frequent low- to mixed-severity fire regimes. Proposed treatments are expected to reduce fire behavior potential and the risk of wildfire impacting adjacent private lands, natural resources, and infrastructure.

The resulting treatments would allow the increased use of wildfires to maintain this landscape. The risk of wildfire impacting private lands, natural resources, and infrastructure would be reduced; the landscape would become more resilient.

National Forest System land and adjacent private land would be positively affected from the reduction of hazardous fuels and subsequent modification of potential fire behavior.

Forest Plan Amendment

Amending the forest plan to allow a one-time exceedance in the amount of activity fuels treated and prescribed burning implemented would beneficially benefit fire and fuels management.

Allowing a greater amount of acres to be treated is correlated to a larger reduction in potential fire behavior across the project area, and acres treated to facilitate restoration towards desired conditions and historic fire regimes.

Cumulative Effects

The cumulative effects analysis area was determined to be the area within the project analysis boundary, because it is of sufficient size to manage vegetation, fire behavior and effects on a landscape level. Past, current, and future activities include such things as use and maintenance of trails; developed and dispersed recreation; and administrative facilities, motorized vehicle use, all range management activities, rural and urban development, prescribe burning, fuelwood cutting, and mechanical vegetation management.

For analyzing cumulative impacts to fire and fuels management, only those activities including vegetation treatments, and prescribed burning will be used in the analysis. Within the Luna planning area approximately 25,000 acres have received mechanical or burning treatments in the past 25 years. Over 6,000 acres has been treated in the last 12 years (table 51).

Table 51. Vegetation project treatments acres, type, and implementation date within the last 12 years within the Luna planning area.

Name	Acres	Type of Treatment	Year(s) Treated
East Centerfire Prescribed Burn	5,420	Broadcast burn	2006, 2011, 2012
Wallow Site Preparation	181	Piles	2014
Tucson Electric Power Company Transmission Vegetation Project	192	Thinning	2014
Canovas Thinning	636	Thinning	2006

The Wallow Fire in 2011 burned approximately 15,000 acres within the Luna Restoration Project. In 2016, two wildfires totaling 2,394 acres burned within the planning area.

On the Apache-Sitgreaves National Forest, there are 35,105 acres of vegetation improvement, thinning, and prescribed burning projects planned. A recent decision was signed for the 68,000-acre West Escudilla Restoration Project which includes thinning trees and prescribed fire on the Alpine and Springerville Ranger Districts along the New Mexico-Arizona state line. In addition, hazardous fuels reduction work occurring on private lands within and adjacent to the project area.

Cumulatively, these activities result in reductions in fire behavior potential to a greater degree than described in the effects of the action alternatives. Activities discussed would cumulatively break up fuel continuity (surface, ladder, and crown fuels) across the landscape. These combined activities would greatly facilitate restoring and sustaining ecological processes in fire-dependent ecosystems and move vegetation and fuel conditions toward their historic frequent low- to mixed-severity fire regimes. These combined treatments would complement the purpose and need goals for fire and fuels management by reducing the impact of high-severity fire on private inholdings, communities, infrastructure, cultural resources and livelihoods within the planning area. It would also support the reintroduction of fire into fire-dependent ecosystems.

Past wildland fire events and management activities have affected the landscape and would continue into the future. The existing condition was influenced by events including; wildfires, fire suppression, fire exclusion, insects and disease, prescribed burning and past timber management activities.

The effects of future wildland fires in the analysis area was not analyzed in detail because it is impossible to predict when and where a wildfire may occur in the future, or the subsequent effects of that fire.

Wildlife

Species assessed for this project include:

- federally listed endangered, threatened, or proposed (Forest Service Manual 2672.4), and designated critical habitat for these species
- Region 3 regional forester sensitive species (Forest Service Manual 2670.5)
- Gila National Forest management indicator species as listed in the Gila forest plan as amended (1986)
- migratory bird species that occur within the planning area.

Federally Listed Species

The U.S. Fish and Wildlife Service county list of endangered and threatened species were reviewed to determine the federally listed species that would need to be considered in this evaluation. Table 52 lists the threatened and endangered species and their critical habit, if applicable, that may be within the planning area.

Table 52. Summary of federally listed species (endangered, threatened, and experimental) within Catron County and within the Luna planning area.

Scientific Name	Common Name	Status	Critical Habitat
<i>Canis lupus baileyi</i>	Mexican gray wolf	Endangered Experimental	N/A
<i>Strix occidentalis lucida</i>	Mexican spotted owl	Threatened	Yes
<i>Empidonax traillii extrimus</i>	Southwestern willow flycatcher	Threatened	Yes
<i>Thamnophis rufipunctatus</i>	Narrow-headed gartersnake	Threatened	Proposed
<i>Thamnophis eques megalops</i>	Northern Mexican gartersnake	Threatened	N/A ¹
<i>Tiaroga cobitis</i>	Loach minnow	Threatened	Yes
<i>Meda fulgida</i>	Spikedace	Threatened	Yes

¹There is proposed critical habitat for northern Mexican gartersnake, but none is located within or adjacent to the planning area.

Mexican Gray Wolf

The Mexican gray wolf is in the process of being reintroduced on the Gila National Forest in New Mexico and on the Apache-Sitgreaves National Forest in Arizona. These wolves have been designated as a non-essential experimental population, pursuant to section 10(j) of the Endangered Species Act as amended.

Re-introduced wolves have been located periodically in the planning area. Multiple wolf packs have used the area for denning and single wolves have been detected moving through the area. The planning area has suitable habitat for hunting and reproducing for the Mexican gray wolf. Key prey species, elk and deer, for the wolf are present in the planning area.

Environmental Consequences

Alternative A

Under alternative A, no project activities would be implemented; therefore, there would be no effect to the Mexican gray wolf.

Effects Common to Alternatives B, C, and D

As defined in the Endangered Species Act section 10 (j) rule for the Mexican gray wolf, “disturbance causing land use activity” means any land use activity that the U.S. Fish and Wildlife Service determines could adversely affect reproductive success, natural behavior, or survival of Mexican gray wolves. The following activities are specifically excluded from this definition under the Endangered Species Act section 10 (j) rule for the Mexican gray wolf:

- legally permitted livestock grazing and use of water sources by livestock
- livestock trailing or drives (only if no reasonable alternative route exists)
- vehicle access over established roads to private property and to areas on public land where legally permitted (only if no reasonable alternative route exists)
- use of lands within the national park or national wildlife refuge systems as safety buffer zones for military activities
- prescribed fire and associated management actions (except in the vicinity of wolf release pens)
- any authorized, specific land use that was active and ongoing at the time wolves chose to locate a den or rendezvous site nearby

Project activities would not preclude occupancy of the area by the Mexican gray wolf. Human disturbance to the Mexican gray wolf as a result of the proposed activities at this time seems unlikely. However, there have been documented wolf dens in the project area. If wolves are found denning during implementations of projects, the Quemado Ranger District staff will coordinate with the Mexican gray wolf field team to minimize or eliminate adverse effects to denning activities.

The decommissioning of roads across the planning area will decrease habitat fragmentation for both the wolf and native ungulates. Implementation of the alternatives may indirectly affect wolves through disturbance to their primary prey base, native ungulates like elk and deer. Activities may cause native ungulates to temporarily move to other locations or further from denning locations, therefore resulting in greater distances to forage.

One of the goals of this project is to improve wildlife habitat conditions through improving browse components for wild ungulates. In the short term, while vegetation is responding to treatments, the change to native ungulates may be relatively undetectable. Compared to the potential long-term benefits to native ungulates and the wolf prey base.

Rationale for determination: Under all action alternatives, disturbance to potential denning sites are minimized through avoidance or other features developed in coordination with the field team in relation to the activity being implemented. There are beneficial effects to the species and its habitat through reduction of habitat fragmentation through road decommissioning and improvement of native ungulate (prey species) habitat. A determination of “not likely to jeopardize” is made for all action alternatives.

Mexican Spotted Owl

The Luna Restoration Project is located in the Upper Gila Mountains Recovery Unit/Ecological Management Unit. Primary constituent elements of Mexican spotted owl critical habitat are high basal area (square footage of trunk) of large-diameter trees; moderate to high canopy closure; wide range of tree sizes (uneven-age stands); multi-layered canopy with large overstory trees of various species; high snag basal area; high volumes of fallen trees and other debris; high plant species richness, including hardwoods; adequate levels of plant cover to maintain fruits, seeds, and regeneration to provide for the needs of Mexican spotted owl prey species within mixed conifer, pine-oak, and riparian forest types.

Currently, Mexican spotted owl habitat on the Gila National Forest is managed according to the direction in the Gila forest plan, which was amended by elements of the 1995 recovery plan for the Mexican spotted owl. With 2 exceptions, current forest plan direction will be followed. Mexican spotted owl habitat discussed in this report are analyzed using the current forest plan and two project-specific amendments to the forest plan from the 2012 Mexican spotted recovery plan. These 2 amendments will be as follows:

- 1995 Mexican spotted owl recovery plan precludes cutting conifers in the protected activity centers. This amendment will follow the 2012 Mexican spotted owl recovery plan and allow cutting conifers in protected activity centers, while leaving a 100-acre core area untreated in the protected activity center. A fire risk analysis was done showing the potential for high-intensity wildfire that could severely affect protected activity centers.
- 1995 Mexican spotted owl recovery plan, as incorporated and amended into the forest plan allows for treating up to 10 percent of protected activity centers in a recovery unit. This amendment will follow the 2012 Mexican spotted owl recovery plan to allow for more treatments in protected activity centers.

Within the Luna Restoration Project boundaries, there are 64,293 acres of designated Mexican spotted owl critical habitat. Approximately 17,003 acres are within protected activity centers. Outside protected activity centers, 6,984 acres have been identified as protected habitat under the 1995 recovery plan consisting of mixed conifer (4,725 acres of slopes greater than 40 percent) and ponderosa pine-Gambel oak (2,259 acres of slopes greater than 40 percent). There is approximately 21,816 acres of restricted habitat consisting of mixed conifer (3,018 acres); riparian (784 acres); and ponderosa pine-Gambel oak (18,014).

For the Mexican spotted owl, reducing risk of high-intensity wildfire and reintroducing a fire regime into the ecosystem to maintain fuel loadings at a low level is desirable. The desired future conditions in areas identified as habitat for Mexican spotted owl include reduction of risk of high intensity wildfire while maintaining key habitat components.

Within the acres of protected activity centers, "prescribed burning only" treatment is proposed on approximately 8,399 acres and an additional 1,319 acres treated with a combination of

prescribed burning, thinning, and associated slash treatments to reduce fire risk. Approximately 31 percent (1,489 acres) of mixed conifer protected (potential recovery) habitat and 19 percent (428 acres) of ponderosa pine- Gambel oak protected habitat would be managed toward threshold habitat conditions within the Luna Restoration Project area. Twenty-nine percent (1,212 acres) of mixed conifer restricted (potential recovery) habitat, and 5 percent (1,033 acres) of ponderosa-Gambel oak restricted (potential recovery) habitat will be designated to be managed toward threshold habitat conditions.

Outside protected activity centers, of the 25,058 acres of restricted (potential recovery) habitat associated with the project, 923 acres have prescribed burning proposed. Within the restricted or recovery habitat associated with the Luna Restoration Project area, treatment of these areas will be managed to promote the primary constituent elements for nesting, roosting, foraging, and dispersing. The remaining 24,135 acres of Mexican spotted owl restricted or recovery habitat will be managed according to the Mexican spotted owl recovery plan recommendations which call for management of the landscape to maintain and create replacement owl habitat, while providing a diversity of stand conditions and stand sizes across the landscape.

Other activities associated with the Luna Restoration Project in Mexican spotted owl protected activity centers include 6.2 miles of road decommissioning, 0.9 miles of fence construction, 1.2 miles of pipeline, 0.1 miles of a trail reroute (with culvert) to eliminate 2 stream crossings, and 1 well with storage and drinkers. In Mexican spotted owl designated critical habitat, other activities would include 47.2 miles of road decommissioning, 2.0 miles of temporary roads for thinning activity access, 4.5 miles of pipeline, 1.1 miles of fence, 0.1 miles of a trail reroute (with culvert) to eliminate 2 stream crossings, 5 wells with storage and drinkers, hardening of 2 stream crossings, 1 French drain sediment structure, and 1 trail barrier to prevent motorized use.

Environmental Consequences

Alternative A

Taking no action would have no effect to Mexican spotted owls, but the habitat would continue to be at risk of being impacted by wildfires.

Effects Common to Alternatives B, C, and D

All activities in Mexican spotted owl protected activity centers will be performed outside of the breeding season (March 1 to August 31). If activities are needed to be done during the breeding season, survey protocols would be implemented to determine if there are owls present or are not breeding before work is allowed to proceed. All activities in Mexican spotted owl habitat, are subject to the forest plan amendment in regards to not treating more than 25 percent of a 6th code watershed in a 3-year period which may be adjusted as monitoring dictates.

Mechanical and hand thinning are proposed in Mexican spotted owl habitat. Thinning trees less than 9 inches in diameter at breast height would reduce basal area in protected activity centers, which in turn would reduce thermal properties. Thinning in protected activity centers would not go below threshold levels of 150 basal area in ponderosa pine/Gamble oak, and 170 basal area in mixed conifer. Thinning less than 9-inch trees in protected activity centers would allow the remaining trees to grow at a more rapid pace, increasing the percentage of basal area in the larger trees. Proposed treatments in protected and restricted habitats, would help restore the forest to a fire adapted ecosystem, lessening the probability of a damaging wildfire. The treatments in protected and restricted habitats would leave appropriate percentages for meeting primary

constituent elements in the future. Thinning would allow herbaceous plants to establish, providing a food source for prey species. Human activity and noise associated with chainsaws or other mechanized equipment could disturb nesting owls. Performing these actions outside the breeding season will prevent disturbing nesting owls. The potential for vehicles to collide with owls has a very low possibility. This would be minimized due to motorized activity would be occurring during daylight hours when owls are less likely foraging.

Prescribed fire in Mexican spotted owl protected activity centers and designated critical habitat is proposed to be low intensity. This low intensity would remove excess fuels from the forest floor, raise the low-live limb on remaining trees, thus reducing the threat of devastating wildfire to Mexican spotted owl habitat. Some snags might burn up during implementation, while others may be created to take their place. Removing some of the fuels from the forest floor, would allow herbaceous plants to establish, providing additional food sources for prey species. Smoke from prescribed burning might cause owls to leave the nest, possibly putting nestlings at risk. Human activity and noise associated with chainsaws or other mechanized equipment could disturb nesting owls. Implementing these actions outside the breeding season will prevent disturbances to the owls.

Long-term effects would include a reduction of fuel loading which would lessen wildfire intensities, and thinning and prescribed fire would allow for healthier habitat.

For all other proposed treatments, noise and human presence may disturb individual owls, movement of prey species, or modify habitat components for either the owl or their prey species within critical habitat. Activities such as maintenance of sediment control features, road decommissioning, stream and riparian projects within critical habitat would improve and restore habitat conditions and improve watershed conditions. These activities would cause short-term impacts, but there would be long-term benefits to habitat for both Mexican spotted owl and its prey species as areas stabilize and recover.

Alternative C – Herbicide Utilization

Herbicide treatments are proposed on approximately 1,270 acres of designated critical habitat for the Mexican spotted owl in conjunction with thinning of juniper. Treating juniper with herbicide would reduce competition with ponderosa pine and mixed conifer species, which in turn would allow for more rapid growth. Reducing juniper would reduce feed for prey species. Herbicide manufactures produce label processes on application to prevent effects to Mexican spotted owl, wildlife, and Mexican spotted owl prey species. Human activity and noise associated with mechanized equipment could disturb nesting owls. Performing these actions outside the breeding season will prevent disturbing nesting owls.

Cumulative Effect:

Short-term cumulative impacts are anticipated to come from reduced basal area in protected activity centers and a reduction in snags, with ongoing activities coupled with proposed projects. Projects that will decrease basal area short term include thinning conifers (less than 9 inches diameter) in protected activity centers and prescribed fire. Prescribed fire would also reduce snags. Over time, the cumulative impacts from lowered basal area and fewer snags would improve. This improvement would occur because the implementation of these projects are projected to accelerate growth in remaining trees, and prescribed fire would create new snags.

Rationale for determination: Thinning and burning activities associated with the Luna Restoration Project will reduce basal area in protected activity centers during the short term (but not drop below threshold values) and will adjust the structure and thermal characteristics. Reducing fuel loading in designated critical habitat could impact prey species in the short term. Reducing juniper could reduce food sources for prey species. Performing actions outside the breeding season or after confirming non-breeding status will prevent disturbing nesting owls. Core areas of 100 acres have been identified, and will not receive mechanical treatment and will not have prescribed fires ignited within them. Modeling has shown thinning treatments in protected activity centers would increase the growth in larger-diameter trees, which in turn would increase the basal area in the larger size classes over the long term.

The Luna Restoration Project would reduce habitat needs in protected activity centers in the short term, but improve conditions in the long term; therefore, the Luna Restoration Project may affect, likely to adversely affect the Mexican spotted owl.

Treatments in designated critical habitat would align with the forest plan, which complements the 1995 Mexican spotted owl recovery plan, therefore the Luna Restoration Project may affect, not likely to adversely affect the designated critical habitat for the Mexican spotted owl.

Southwestern Willow Flycatcher

The southwestern willow flycatcher is federally listed and a migratory bird species.

Environmental Consequences

Alternatives A, B, C, and D

There will be no effect to the species due to southwestern willow flycatchers not being observed within the project area for the last 10 years. Also, the designated critical habitat within the planning area does not contain the primary constituent elements to support the birds.

Designated Critical Habitat

There are 208 acres of designated southwestern willow flycatcher critical habitat within the planning area, located along the San Francisco River. The designated critical habitat does not contain the primary constituent elements to support southwestern willow flycatchers. Willow species are in small quantities and not densely grouped. Tree canopy does not fall within the density range of 50 percent to 100 percent. Also, the area does not have open water or marsh openings meeting the 0.25-acre minimum size.

Alternative A

There will be no effect to southwestern willow flycatcher critical habitat due to no activities being implemented under this alternative.

Effects Common to Alternatives B, C, and D

No impacts would occur to critical habitat with the implementation of vegetation and prescribed burning treatments and herbicide utilization under alternative C. By applying the design feature of buffering the critical habitat from project implementation activities, no treatments would occur within critical habitat. Therefore no changes to the habitat constituents or vegetation would be altered.

The following activities would occur within critical habitat: construction of new road crossing in Head of Ditch campground, applying rock to roads within Head of Ditch campground, irrigation ditch diversion construction, road decommissioning, and stream restoration activities within San Francisco River and Stone Creek.

The irrigation ditch construction and campground new road stream crossing would remove riparian vegetation during implementation altering the vegetative components in the critical habitat at those specific locations. Those areas would be permanently void of vegetation. The placement of a permanent diversion structure compared to the multiple disturbances to the stream channel from maintenance of the earthen diversion berm; provides an opportunity for the banks to stabilize and over the long-term allow recruitment and establishment of vegetation.

Approximately 0.2 miles of road that run along and cross the San Francisco River would be decommissioned under the action alternatives. Road decommissioning and other stream restoration activities within critical habitat would cause short-term disturbances but in the long term would have improved stream habitat components and an increase in riparian through planting and natural recruitment.

The removal of riparian vegetation and short-term disturbances from other stream restoration activities and decommissioning within designated critical habitat would be insignificant and discountable. These sites are small and localized but have the potential to provide long-term benefits, although the benefits would not greatly improve or change the primary constituent elements of the critical habitat. Project activities may affect, not likely adversely affect the designated critical habitat.

Narrow-Headed and Northern Mexican Gartersnakes

The narrow-headed and northern Mexican gartersnakes are federally listed as a threatened species. Critical habitat for the narrow-headed and northern Mexican gartersnakes is proposed. Only proposed critical habitat for the narrow-headed gartersnake is found within the Luna planning area. There are approximately 2,781 acres of proposed critical habitat in the Luna planning area located on the San Francisco River and Dry Blue Creek.

For this analysis, it is assumed the northern Mexican gartersnake occupies the same area and within the proposed critical habitat for the narrow-headed gartersnake.

Surveys for narrow-headed and northern Mexican gartersnakes were conducted at the Head of the Ditch campground along the San Francisco River (July 25 through 28, 2016). None of these species were caught or observed during the survey. Also, very few prey fish were caught. During the surveys, other terrestrial and checkered gartersnakes were found.

Environmental Consequences

Alternative A

There will be no effect to the northern Mexican gartersnake or the narrow-headed gartersnake and its proposed critical habitat due to no activities being implemented under this alternative.

Effects Common to Alternatives B, C, and D

The risk of impacts would be minimized to the northern Mexican gartersnake and the narrow-headed gartersnake and its proposed critical habitat with the implementation of vegetation and

prescribed burning treatments and herbicide utilization under alternative C. By applying the design feature of buffering the proposed critical habitat from project implementation activities, no treatments would occur within proposed critical habitat, therefore no disturbance to the stream or shoreline habitat would be altered.

The following activities would occur within proposed critical habitat: construction of new road crossing in Head of Ditch campground, applying rock to roads within Head of Ditch campground, irrigation ditch diversion construction, road decommissioning, hardening of motorized trail crossings in Dry Blue Creek, and variety of stream restoration activities within San Francisco River and Dry Blue Creek.

During the implementation of these activities, the potential risk to gartersnakes is being harassed by human presence and various machinery sounds or vibrations or crushed between rocks as material is moved or run over by vehicles. Implementation could generate fine sediment impacting proposed critical habitat and also prey species habitat. This is expected to be a short-term impact.

The placement of the irrigation ditch diversion would continue to alter natural flows during periods of irrigation water usage but reduces fine sediment input and habitat disturbances that resulted from the multiple entries to maintain the earthen diversion berm. Some fine sediment would still be produced during periodic clean-out of the sediment trap but to a lesser degree than previous activities.

The irrigation ditch construction and the new road-stream crossing in the campground would remove riparian vegetation during implementation, altering the vegetative components along the shoreline of the proposed critical habitat at those specific locations. Those areas would be permanently void of vegetation.

Approximately 0.2 miles of road that run along and cross the San Francisco River would be decommissioned under the action alternatives. Road decommissioning and other stream restoration activities within proposed critical habitat would cause short-term disturbances but in the long term would have improved stream habitat components and an increase in riparian through planting and natural recruitment.

The removal of riparian vegetation and short-term disturbances from other stream restoration activities and decommissioning within proposed critical habitat would be insignificant and discountable. These sites are small and localized, but have the potential to provide long-term benefits. Surveying for the two gartersnake species prior to implementation and applying buffer around habitat will reduce the risk of disturbance and harm. Project activities may affect, not likely adversely affect the northern Mexican gartersnake and narrow-headed gartersnake and its proposed critical habitat.

Spikedace

Spikedace is federally listed as a threatened species. Critical habitat has been designated and designation included both spikedace and loachminnow.

The Luna Restoration Project will have no effect to spikedace. Spikedace have not been found occupying streams within the planning area and closest they have been detected on the San Francisco River is near Alma, New Mexico. Effects to designated critical habitat will be discussed with loachminnow.

Loachminnow

Loachminnow is federally listed as a threatened species. Critical habitat has been designated and designation included both spikedace and loachminnow.

Loachminnow have been found within Dry Blue Creek but have not been found in the since the Wallow Fire in 2011. It is thought that after the fire; ash, debris, and sediment entering the system impacted the fish and its habitat (personal communication Gila National Forest: Dustin Myers, fish biologist and Jerry Monzingo, wildlife program manager). Loachminnow are located approximately 2 miles downstream of the planning boundary on the San Francisco River.

Environmental Consequences

Alternative A

Under the no-action alternative, there would no effect from project activities to loachminnow or to designated critical habitat for spikedace and loachminnow. The risk of the loachminnow and the designated critical habitat being impacted by wildfires would continue.

Effects Common to Alternatives B, C, and D

On the San Francisco River, loachminnow and the spikedace and loachminnow designated critical habitat would be indirectly impacted from project activities related to vegetation treatments, prescribed fire, road decommissioning, and stream and riparian treatments. Impacts would primarily relate to runoff of sediment or ash from upland sources or sedimentation directly related to activities within the stream channels. Implementation of design features and best management practices will reduce the amounts of material entering the system and flowing downstream. Compared to alternative A, the amount of sediment, ash, and debris would be much less than the potential impacts after a wildfire.

Within Dry Blue Creek, loachminnow and the designated critical habitat would be directly and indirectly impacted from project activities. As in the San Francisco River, vegetation treatments, prescribed fire, and some stream and riparian treatments may introduce sediment, ash, or debris causing indirect impacts to loachminnow and the critical habitat. Hardening of motorized crossings and stream and riparian projects will have direct impacts. If fish are present, there is a risk of being crushed while rocks are being moved or by equipment driving across the channel. Fine sediment would be suspended for a short while during work; the sediment could impact fish and fill or cover habitat niches for the fish or its prey species.

The impacts would be minimized with the application of the design feature to survey prior to implementing instream activities. If fish are found, they would be captured and held upstream or off-site until work is completed. Also if fish are detected, block nets would be set-up to keep fish from entering the active work site.

Project activities will cause short-term negative impacts to loachminnow and spikedace and loachminnow critical habitat. Stream, riparian, and hardening crossings activities, and reducing the risk sedimentation, ash, and debris from uncharacteristic wildfires through vegetation and prescribed fire, will provide long-term benefits to the species and habitat. The project will result in a may affect, likely to adversely affect to the loachminnow and to designated critical habitat for spikedace and loachminnow.

Region 3 Sensitive Species

Sensitive species are defined as “those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: (a) significant current or predicted downward trends in population numbers or density, or (b) significant current or predicted downward trends in habitat capability that would reduce a species’ existing distribution (Forest Service Manual 2670.5(19)).”

Environmental Consequences

Alternative A

Under alternative A, there would be no activities implemented; therefore, there would be no risk of disturbance and therefore no impact to any Region 3 sensitive species. Risk of disturbance from ongoing activities and risk of wildfire would continue.

Effects Common to Alternatives B, C, and D

The following Region 3 sensitive species occur or may occur within the Luna planning area:

- northern goshawk
- burrowing owl
- common blackhawk
- American peregrine falcon
- bald eagle
- gray vireo
- desert sucker
- Rio Grande sucker
- pale Townsend’s big-eared bat
- Gunnison’s prairie dog
- Allen’s lappet-browed bat
- Arizona montane vole
- Arizona gray squirrel
- Goodding’s onion
- villous groundcover milkvetch
- Mogollon clover

Implementation of the Luna Restoration Project activities results in a determination for each of these species: may impact individuals or habitat, but will not likely contribute to trend toward federal listing or loss of viability.

In general, the fauna species may be impacted from the increase in human presence and equipment use and noise. This may cause a change in the species behavior and if applicable, its prey base. Prey species may move away from areas of work causing increased forage distances or times. If species forage on vegetation or seeds, these sources may be reduced from vegetation and prescribed fire treatments. Noise effects will be of short duration, but vegetation and prescribed fire effects may be longer. But overall in the long-term vegetation conditions would improve.

Currently northern goshawk habitat within ponderosa pine cover type is departed from desired conditions. Modeling of the treatments within the ponderosa cover type shows that the vegetation structural stages after 1 year post harvest begin to move toward desired conditions over 20 years (see *Vegetation* section of this chapter), displaying the potential for treatments to improve habitat conditions for the goshawk.

If any of the sensitive plants species are found during project implementation, they will be avoided, removing the risk of any disturbance. The risk of disturbance to these plant species include such things as being crushed, pulled from the ground, or habitat changes from vegetation or prescribed fire treatments resulting in unfavorable conditions for survival. In the long-term restoration activities would improve conditions and depending on the species has the potential of increasing preferred habitat types.

Management Indicator Species

Management indicator species are identified in the Gila National Forest Plan as amended (USDA 1986). Management indicator species are addressed in order to implement National Forest Management Act regulations. They are selected because their population changes are believed to indicate the effects of management activities (36 CFR 219.19(a) (1). The management indicator species approach is designed to function as a means to provide insight into effects of forest management on plant and animal communities. Species are selected to represent several categories, such as commonly hunted or fished species, non-game species, and threatened and endangered species. They may be used as a tool for assessing changes in specialized habitats, formulating habitat objectives, and establishing standards and guidelines to provide for a diversity of wildlife, fish, and plant habitats.

The Gila forest plan amendment #10 for management indicator species amended the management indicator species list for the Gila National Forest to represent the major vegetation types potentially affected by management actions. Table 53 identifies the management indicator species for the Gila National Forest and rationale for including or eliminating them from the Luna Restoration Project analysis.

Mule Deer

The mule deer is a management indicator species for desert shrub, pinyon-juniper shrub, and shrub oak woodland communities. However, there can be other limiting factors to deer population levels other than vegetative conditions. New Mexico's climate and weather patterns are extremely important to deer survival. Periods of significant rainfall produce ample forage and vegetative cover, which improves fawn survival. However, harsh winters or prolonged periods of drought can have devastating effects on fawn survival and overall deer numbers. Other limiting factors such as lack of water, predation, and competition with other species also contribute to the decreasing trend in the mule deer population. The New Mexico Department of Game and Fish manages mule deer populations through annual hunting permits, which also affects population levels. The department is currently striving to achieve increased deer survival, and higher population numbers.

The Luna Restoration Project proposes to treat pinyon/juniper, ponderosa pine, and associated grasslands within the project area utilizing a variety of methods. Primary objectives of this project are to improve watershed condition, wildlife habitat, and to reduce accumulated fuels. The desired condition is restored grasslands and more open and healthier forests having a mix of tree species and tree sizes. Uneven aged structural characteristics having low to moderate tree densities are desirable throughout the area. These structural characteristics are important to mule deer because they provide forage that are readily available, critical winter range, and travel corridors.

Table 53. Gila National Forest management indicator species with associated habitat type and rationale for including or excluding from analysis.

Management Indicator Specie	Vegetation Type	Analysis (Yes/No)	Rationale for Elimination or Inclusion
Mule deer (<i>Odocoileus hemionus</i>)	Desert shrub, pinyon/juniper, shrub oak woodland communities	Yes	Habitat exists for this species
Mearn's quail (<i>Cyrtonyx montezumae mearnsi</i>)	Plains and mountain grassland communities	Yes	Habitat exists for this species
Long-tailed vole (<i>Microtus longicaudus</i>)	Wet meadows and wetlands	Yes	Habitat exists for this species
Beaver (<i>Castor canadensis</i>)	Low and mid elevation riparian areas	Yes	Habitat exists for this species
Plain [Juniper] titmouse (<i>Baeolophus ridgwayi</i>)	Pinyon/juniper and shrub oak woodlands	Yes	Habitat exists for this species
Hairy woodpecker (<i>Picoides villosus</i>)	Ponderosa pine and mixed conifer snag component	Yes	Habitat exists for this species
Mexican spotted owl (<i>Strix occidentalis lucida</i>)	Mixed conifer community	Yes ¹	Habitat exists for this species
Black hawk (<i>Buteogallus anthracinus anthracinus</i>)	Riparian habitat at low and mid elevations	Yes ²	Habitat exists for this species
Northern goshawk (<i>Accipiter gentiles</i>)	Ponderosa pine community	Yes ²	Habitat exists for this species
Gila trout (<i>Oncorhynchus gilae</i>)	Riparian habitat at high elevations	No	Habitat for this species does not exist in the planning area. San Francisco River and its tributaries are not considered for recovery areas for Gila Trout. Currently there is no plan to re-establish Gila Trout in perennial streams within the planning area.
Rio Grande cutthroat (<i>Oncorhynchus clarki virginalis</i>)	Riparian habitat at high elevations	No	Habitat for this species does not exist in the planning area. Also, the planning area is not within the historical range of the species.

¹ Analysis for Mexican spotted owl is located under the "Federally Listed Species" section of this document.

² Analysis for black hawk and goshawk are located under "Region 3 Sensitive Species" section of this document.

Alternative A

Under alternative A, no treatments would be implemented within associated vegetation types; therefore, there would be no impact to mule deer population from this project.

Effects Common to Alternatives B, C, and D

For all treatment activities, the presence of human activity and mechanized equipment use and noise could disturb mule deer foraging, distribution patterns, and rearing of young. These disturbances would be over short periods. Treatments would not occur within the various mule

deer habitat at the same time, therefore providing the opportunity to utilize other areas without disturbances to the species or its habitat. Disturbances to mule deer from each treatment activity would be short-term.

Mechanical Thinning and Hand Thinning: The result of the mechanical treatments, such as slash on the ground, ground disturbance, and piles, could disrupt the available forbs for deer for a short period of time.

Prescribed Burning: The project will have fire take place on all units but not at the same time. This could result in a short term disturbance to the mule deer. Fire can effectively alter vegetation structure and composition thereby affecting foraging habitat. The short-term effects of fire are likely to be unfavorable as plant foraging species are initially being reduced; however, mule deer have long evolved with fire and the long-term effects of prescribed fire will help reduce devastating wildfire and would improve foraging habitat.

Sediment Control: Installing and maintaining sediment control features would create a short term disturbance to foraging mule deer through noise and human presence. These activities are spaced out across the project area, and would not all occur at the same time, giving mule deer opportunities to utilize other areas in the project.

Road and All-terrain Vehicle Trail: Installing user-proposed routes, and decommissioning roads would create a short term disturbance to foraging mule deer through noise and human presence. These activities are spaced out across the project area, and would not all occur at the same time, giving mule deer opportunities to utilize other areas in the project. Decommissioning roads would reduce habitat fragmentation, and increase forage where bare dirt currently exists.

Fences and Water Improvement: Installing fences, and water improvements would create a short term disturbance to foraging mule deer through noise and human presence. These activities are spaced out across the project area, and would not all occur at the same time, giving mule deer opportunities to utilize other areas in the project. Water improvements would improve habitat for deer, allowing them to forage in previously un-watered areas.

Summary of Effects: Short-term disturbances will occur during implementation through human presence and reduction of forage. Long term habitat conditions will improve.

Alternative C – Herbicide Utilization

Herbicide application would cause short term disturbances to foraging mule deer through human presence. These activities are spaced out across the project area, and would not all occur at the same time, giving mule deer opportunities to utilize other areas in the project. Forage would increase in the long term, due to decreased canopy closure. Manufacturer labels would be followed to prevent impacts to wildlife.

Alternative D

Not implementing the user-proposed routes would result in less habitat fragmentation to mule deer.

Cumulative Effect:

This project and the Escudilla West Project located in Arizona would increase short-term disturbances to foraging mule deer through thinning and prescribed burning. Both projects would

lead to improved habitat conditions for mule deer in the long term. Livestock grazing activities, fuelwood collection, road maintenance, and recreation activities could increase disturbance to foraging mule deer.

Determination of Impact to the Species

Foraging would be disrupted in the short term, but there would be long term improvement of habitat conditions for this species. For alternatives B, C, and D, individuals may be affected, but at the forest level, the activities proposed under these alternatives would not adversely affect population trends on the Gila National Forest.

Mearn's (Montezuma) Quail

The Mearn's quail was picked as a management indicator species for plains and mountain grassland communities because good Mearn's habitat reflects the herbaceous conditions in these communities that the Forest is striving to attain/maintain; based on the types of management that is occurring today under the direction of the forest plan.

There can be other limiting factors to Mearn's population other than vegetative conditions. Quail populations fluctuate from year to year for a number of reasons, primarily local weather conditions and predators. Limiting factors for quail populations include predation, habitat modification and annual precipitation. Annual population fluctuations are positively correlated with the amount of summer precipitation in any given year. The New Mexico Department of Game and Fish manages quail through annual small game hunting licenses. The species is hunted in New Mexico from November through February, which is another factor affecting Mearn's quail population levels.

Spatial arrangement of both grassland and woodland cover types is very important for this species due to its survival strategy, small home range, dispersal distances, and food habits. Adequate horizontal and vertical grass cover must be well distributed across the landscape to meet the cover needs of this species. Excessive cover removal can affect the species by limiting nest building habitat and escape cover.

Alternative A

Implementing the no-action alternative would have no impact to Mearn's quail.

Effects Common to Alternatives B, C, and D

Mechanical Thinning and Hand Thinning: Thinning would increase herbaceous plants in the long term, providing additional food sources for Mearn's quail. Some hiding and nesting cover could be removed, displacing Mearn's quail. Thinning activities would not occur across the entire project area at the same time. This gives Mearn's quail the opportunity to utilize other areas until treatments are done.

Prescribed Burning: The prescribed burn vegetative treatments would decrease forage and nesting and hiding cover in the short term. The project will have fire take place on the majority of the project area, but not at the same time. This would allow Mearn's quail to utilize other areas during implementation. Mearn's quail has long evolved with fire and the long-term effects of prescribed fire will help reduce devastating stand replacing wildfire and would overall improve foraging and nesting and hiding cover.

Irrigation Ditch Diversion: The diversion structure and associated road re-route do not occur in Mearn's quail habitat.

Sediment Control: Installing and maintaining sediment control features could reduce forage and nesting and hiding cover in the short term but would lead to better habitat conditions in the long term due to improved watershed conditions.

Road and All-terrain Vehicle Trail: Installing user-proposed routes could create habitat fragmentation, and a slight reduction in forage and nesting and hiding cover. Decommissioning roads would decrease habitat fragmentation, and lead to more forage and nesting and hiding cover in the long term. These activities are spaced out across the project area, and would not all occur at the same time, giving Mearn's quail opportunities to utilize other areas in the project.

Fences and Water Improvement: Installing fences, and water improvements would not impact Mearn's quail and its habitat.

Summary of Effects: Forage and nesting and hiding cover will decrease over the short term. Forage and nesting/hiding cover will increase over the long term.

Alternative C – Herbicide Utilization

Utilizing herbicide on alligator juniper and rabbit brush will create conditions that will allow herbaceous plants to establish, providing additional forage for Mearn's quail. Manufacturer labels will be followed in applying herbicide.

Alternative D

Not implementing the user-proposed routes would not increase habitat fragmentation, nor remove forage and nesting and hiding cover.

Cumulative Effect:

This project and the Escudilla West project located in Arizona would remove forage and nesting and hiding cover in the short term, but both are expected to improve habitat conditions in the long term. Livestock grazing activities, fuelwood collection, road maintenance, and recreation activities could decrease available forage and nesting/hiding cover for Mearn's quail.

Determination of Impact to the Species

Forage and nesting and hiding cover would be reduced in the short term but would increase in the long term. For alternatives B, C, and D, individuals may be affected, but at the forest level, the activities proposed under these alternatives would not adversely affect population trends on the Gila National Forest.

Long-tailed Vole

The long-tailed vole is an indicator of wet meadows and wetlands. Within the Gila National Forest, there are estimated 1,710 acres of wet meadows and wetlands. Distribution of the long-tailed vole across the Gila is likely to be larger than delineated wet meadow and wetland vegetation types because the species is also found in moist habitats and along the edges of spruce/fir vegetation and some mixed conifer habitats. On the Gila National Forest, the long-tailed vole has previously been found near Willow Creek in the Mogollon Mountains and in the Mimbres. More recently, surveys conducted by Frey (2005) included a number of additional observations. Long-tailed voles have a very small home range, generally less than 100 meters.

Devastating fire also has the potential to be a major impact on the long-tailed vole since fire within the spruce-fir/mixed-conifer landscape is often stand replacing and thus has dramatic and moderate duration effects to surrounding ecosystem.

Alternative A

Implementing the no-action alternative would have no impact to the long-tailed vole.

Effects Common to Alternatives B, C, and D

Mechanical Thinning and Hand Thinning: Limited thinning activities are anticipated to occur in long-tailed vole habitat. Long-tailed voles could be inadvertently crushed by humans or equipment during implementation. Thinning would reduce the threat for devastating wildfire surrounding long-tailed vole habitat, which could lead to habitat losing moisture. Loss of moisture could occur through increased sunlight and increased sediment.

Prescribed Burning: Prescribed burning would trend current vegetative conditions towards desired conditions. Moving towards desired conditions would improve watershed conditions, which in turn should allow moist conditions in long-tailed vole habitat.

Irrigation Ditch Diversion: The diversion structure and associated road re-route do not occur in long-tailed vole habitat.

Sediment Control: Sediment control structures do not occur in long-tailed vole habitat.

Road and All-terrain Vehicle Trail: Decommissioning roads could result in Long-tail voles being inadvertently crushed. Decommissioning roads would allow the areas to heal naturally and increase habitat. User-proposed routes do not occur in long-tailed vole habitat.

Fences and Water Improvement: Fences and water improvements do not occur in long-tailed vole habitat.

Summary of Effects: Long-tailed voles may be crushed during implementation. Long-tailed vole habitat would have a lower chance of being impacted by devastating wildfire.

Alternative C – Herbicide Utilization

Herbicide is proposed to be used to treat alligator juniper. Wet meadows will be buffered 300 feet, and no herbicide will be used in the buffer zone. Manufacturer labels will be followed to prevent impacts to wildlife.

Alternative D

Not implementing the user-proposed routes would have no impact to the long-tailed vole.

Cumulative Effect

This project and the Escudilla West project located in Arizona could inadvertently run over long-tailed voles. Both projects would lead to improved watershed conditions. Livestock grazing activities, fuelwood collection, road maintenance, and recreation activities could increase disturbance to long-tailed voles.

Determination of Impact to the Species

Some long-tailed voles may be inadvertently crushed during implementation, but proposed activities will improve conditions in and surrounding habitat in the long term for this species. For alternatives B, C, and D, individuals may be affected, but at the forest level, the activities proposed under these alternatives would not adversely affect population trends on the Gila National Forest.

Beaver

The beaver was selected as a management indicator species for the mid elevation riparian areas that occur in the project area.

Beaver are semi-aquatic. They prefer streams and small lakes having nearby growths of willow, aspen, cottonwood, birch or alder. They often are thought of as the “engineers” of the animal kingdom, because they build dams, lodges, and canals. A dam provides an area of still, deep water where a lodge can be conveniently constructed and protected from terrestrial predators, and where building materials and food supplies can be easily floated and kept from being washed away. The impounded water may form ponds many hectares in area.

Beavers are active throughout the year. They feed on the bark, cambium, twigs, leaves, and roots of deciduous trees and shrubs, such as willow, alder, birch, and aspen, and on various parts of aquatic plants, especially the young shoots of water lilies. Beavers anchor sticks and logs underwater to feed on during winter.

North American beavers were among the most widely distributed of mammalian species. Beavers declined drastically in recent centuries, mainly because of excessive human hunting for their valuable pelts. By the early 1900s, only scattered and greatly reduced populations remained. Subsequent programs of regulated harvesting and transplantation have resulted in large-scale reestablishment of the beaver in many parts of the United States and Canada, though not always of the subspecies native to the areas involved.

Observations by Quemado District personnel and New Mexico Department of Game and Fish personnel indicate a drop in beaver population with fewer occupied sites. This may, in part, be due to drought conditions that have reduced stream flow and pond retention below levels that are comfortable for beaver security. In addition, many watershed gradient control structures, when first built, provided habitat for beaver have now silted in. Silt catches in these structures decreased the potential reservoir below levels acceptable to beaver. Beaver continue to be trapped and relocated from private land and irrigation ditches to locations on Gila. Few of these relocations have resulted in permanent occupancy of new sites, probably due to the lower potential of the habitat present in these relocation sites.

Alternative A

Implementing the no-action alternative would have no impact to the beaver.

Effects Common to Alternatives B, C, and D

Mechanical Thinning and Hand Thinning: Thinning would increase the occurrence of human presence and could cause a disturbance to the beaver. The disturbances will be short term and will not occur across the entire project area at the same time.

Prescribed Burning: Prescribed burn vegetative treatments would increase the occurrence of human presence and could cause a disturbance to the beaver. The disturbances will be short term and will not occur across the entire project area at the same time. The short-term effects of fire are likely to be unfavorable as fire could potentially impact the riparian vegetation. The beaver has long evolved with fire and the long-term effects of prescribed fire will help reduce devastating stand replacing wildfire and would overall improve the riparian habitat.

Irrigation Ditch Diversion: The diversion structure and associated road re-route would remove some riparian vegetation and increase human presence which could disturb beaver. The vegetation removal is anticipated to be minimal and not have a noticeable impact to the beaver.

Sediment Control: Installing and maintaining sediment control features such as hardening stream crossings would create a short term disturbance to beavers through human presence.

Road and All-terrain Vehicle Trail: Installing user-proposed routes and decommissioning roads would create a short term disturbance to beavers through noise and human presence. These activities are spaced out across the project area and would not all occur at the same time.

Fences and Water Improvement: Installing fences, and water improvements would not occur in beaver habitat.

Summary of Effects: Beavers will be disturbed from human presence and have a loss of some riparian vegetation in the short term during project implementation. Risk of devastating wildfire would be lowered in and around beaver habitat.

Alternative C - Herbicide Utilization

Herbicide is proposed to be used to treat alligator juniper. Human presence may disturb beavers. No live waters will be sprayed. Manufacturer labels will be followed to prevent impacts to wildlife.

Alternative D

Not implementing the user-proposed routes would have no impact to beaver.

Cumulative Effect:

This project and the Escudilla West Project located in Arizona would increase disturbance to beaver, and would result in loss of riparian vegetation in the short term. Both projects would lead to improved habitat conditions for beaver in the long term. Livestock grazing activities, fuelwood collection, road maintenance, and recreation activities could increase disturbance to beaver and result in loss of riparian vegetation.

Determination of Impact to the Species

Some disturbance and loss of riparian vegetation in the short term, but will have improved habitat conditions in the long term for this species. For alternatives B, C, and D, individuals may be affected, but at the forest level, the activities proposed under these alternatives would not adversely affect population trends on the Gila National Forest.

Plain [Juniper] Titmouse

The plain [Juniper] titmouse was selected as management indicator species for the pinyon/juniper and shrub oak woodlands habitat found on the Gila National Forest.

Plain titmouse, also known as juniper titmouse, is a resident of deciduous or mixed woodlands, favoring oak and pinyon/juniper. The plain titmouse inhabits evergreen trees in dry woodlands of the Southwest. It usually builds nests in natural cavities or old woodpecker holes, primarily in oak trees, but it is capable of excavating its own cavity in rotted wood. Current estimates of habitat indicate approximately 1,630,930 acres of pinyon-juniper/shrub oak woodland on the Gila National Forest.

The juniper titmouse is omnivorous preferring insects, but uses fruits and seeds in the fall and winter. The species mates for life and defends territories year-round.

Alternative A

Implementing the no-action alternative would have no impact to the juniper titmouse.

Effects Common to Alternatives B, C, and D

Mechanical Thinning and Hand Thinning: Thinning would increase the occurrence of human activity, trucks and chainsaws for example, could cause a disturbance in the nesting and roosting of the juniper titmouse. Each of the disturbances will be short term and will not occur in all of the project area at once. This gives the juniper titmouse the opportunity to nest and roost in other areas until treatments are done. The removal of snags that pose a hazard during implementation may also cause the temporary loss of some nesting habitat.

Prescribed Burning: The prescribed burn vegetative treatments would increase the occurrence of human activity and could cause a disturbance in the nesting and roosting of the juniper titmouse. The project will have fire take place on the majority of the project area but not at the same time. This could result in disturbance to the juniper titmouse. The short-term effects of fire are likely to be unfavorable as nesting and roosting species can initially being reduced. Fire activity has the potential to reduce the amount of snags in which the titmouse nests but prescribed burning could promote the hardening of other snags suitable for nesting and create new snags. The juniper titmouse has long evolved with fire and the long-term effects of prescribed fire will help reduce devastating stand-replacing wildfire and would overall improve nesting and roosting habitat.

Irrigation Ditch Diversion: The diversion structure and associated road re-route do not occur in juniper titmouse habitat.

Sediment Control: Installing and maintaining sediment control features would create a short term disturbance to nesting and roosting for the juniper titmouse through noise and human presence. These activities are spaced out across the project area, and would not all occur at the same time, giving the titmouse opportunities to utilize other areas in the project.

Road and All-terrain Vehicle Trail: Installing user-proposed routes, and decommissioning roads would create a short term disturbance to nesting and roosting for the juniper titmouse through noise and human presence. These activities are spaced out across the project area and would not all occur at the same time, giving the titmouse opportunities to utilize other areas in the project.

Fences and Water Improvement: Installing fences, and water improvements would create a short term disturbance to nesting and roosting for the juniper titmouse through noise and human

presence. These activities are spaced out across the project area, and would not all occur at the same time, giving the titmouse opportunities to utilize other areas in the project.

Summary of Effects: Snags will be removed, reducing habitat for the juniper titmouse. Short term disturbances will occur during implementation. New snags are expected to be created through prescribed burning activities.

Alternative C – Herbicide Utilization

Herbicide would not affect snags utilized by the juniper titmouse, but may temporarily affect some food sources in the short term. Manufacturer labels would be followed to prevent impacts to wildlife.

Alternative D

Not implementing the user-proposed routes would have no impact to the juniper titmouse.

Cumulative Effect

This project and the Escudilla West Project located in Arizona would remove snags, but both are expected to create new snags in prescribed burning. Both projects would lead to improved habitat conditions for the juniper titmouse. Fuelwood collection and road maintenance could lead to more snag removal.

This project and the Escudilla West Project located in Arizona could impact the juniper titmouse through noise or human presence. Livestock grazing activities, fuelwood collection, road maintenance, and recreation activities could increase disturbance to the juniper titmouse, and result in more snag removal.

Determination of Impact to the Species

Since fire has the potential to increase the number of snags, there would be long term improvement of habitat conditions for this species. For alternatives B, C, and D, individuals may be affected, but at the forest level, the activities proposed under these alternatives would not adversely affect population trends on the Gila National Forest.

Hairy Woodpecker

The hairy woodpecker was selected as management indicator species for the ponderosa pine and mixed conifer forest snag component habitat found on the Gila National Forest.

It nests in holes dug mostly by the male in live or dead trees or shrubs, at an average height of 30 above ground. In most areas, it favors dying parts of live trees, especially where fungal heart rot has softened the heartwood. Limiting factors for the hairy woodpecker include predation and habitat modification. Snags (10 inches or more in diameter at breast height) and an average of five snags per hectare are assumed optimal for woodpecker reproduction, but may not be adequate for foraging. With over 1,341,662 acres of ponderosa pine and mixed conifer vegetation on the Gila National Forest, snag habitat is abundant for this species.

The hairy woodpecker is omnivorous, preferring insects but using fruits and seeds in fall and winter.

Alternative A

Implementing the no-action alternative would have no impact to the hairy woodpecker.

Effects Common to Alternatives B, C, and D

Mechanical Thinning and Hand Thinning: Thinning would increase the occurrence of human activity, trucks and chainsaws for example, could cause a disturbance in the nesting and roosting of the hairy woodpecker. Each of the disturbances will be short term and will not occur in all of the project area at once. This gives the hairy woodpecker the opportunity to nest and roost in other areas until treatments are done. The removal of snags that pose a hazard during implementation may also cause the temporary loss of some nesting habitat.

Prescribed Burning: The prescribed burn vegetative treatments would increase the occurrence of human activity and could cause a disturbance in the nesting and roosting of the hairy woodpecker. The project will have fire take place on the majority of the project area, but not at the same time. This could result in disturbance to the hairy woodpecker. The short-term effects of fire are likely to be unfavorable as nesting and roosting species can initially be reduced. Fire activity has the potential to reduce the amount of snags in which the woodpecker nests, but prescribed burning could promote the hardening of other snags suitable for nesting and create new snags. The hairy woodpecker has long evolved with fire, and the long-term effects of prescribed fire will help reduce devastating stand replacing wildfire and would overall improve nesting and roosting habitat.

Irrigation Ditch Diversion: The diversion structure and associated road re-route do not occur in hairy woodpecker habitat.

Sediment Control: Installing and maintaining sediment control features would create a short term disturbance to nesting and roosting hairy woodpeckers through noise and human presence. These activities are spaced out across the project area, and would not all occur at the same time, giving the woodpecker opportunities to utilize other areas in the project.

Road and All-terrain Vehicle Trail: Installing user-proposed routes, and decommissioning roads would create a short term disturbance to nesting and roosting hairy woodpeckers through noise and human presence. These activities are spaced out across the project area, and would not all occur at the same time, giving the woodpecker opportunities to utilize other areas in the project.

Fences and Water Improvement: Installing fences, and water improvements would create a short term disturbance to nesting and roosting hairy woodpeckers through noise and human presence. These activities are spaced out across the project area, and would not all occur at the same time, giving the woodpecker opportunities to utilize other areas in the project.

Summary of Effects: Snags will be removed, reducing habitat for hairy woodpeckers. Short term disturbances will occur during implementation. New snags are expected to be created through prescribed burning activities.

Alternative C - Herbicide Utilization

Herbicide would not affect snags utilized by hairy woodpeckers, but may temporarily affect some food sources in the short term. Manufacturer labels would be followed to prevent impacts to wildlife.

Alternative D

Not implementing the user-proposed routes would have no impact to hairy woodpeckers.

Cumulative Effect:

This project and the Escudilla West Project located in Arizona would remove snags, but both are expected to create new snags in prescribed burning. Both projects would lead to improved habitat conditions for hairy woodpeckers. Fuelwood collection and road maintenance could lead to more snag removal.

Determination of Impact to the Species

Since snags will primarily be retained and fire has the potential to increase the number of snags there would be long term improvement of habitat conditions for this species. For alternatives B, C, and D, individuals may be affected, but at the forest level, the activities proposed under these alternatives would not adversely affect population trends on the Gila National Forest.

Migratory Bird Species

This assessment identified migratory bird species that occur or have the potential to occur within the Luna planning area. The Forest Service Memorandum of understanding with the U.S. Fish and Wildlife Service (December 8, 2008) identifies specific activities for bird conservation, pursuant to Executive Order 13186, signed January 10, 2001, including striving to protect, restore, enhance, and manage habitat of migratory birds, and prevent the further loss or degradation of remaining habitats on National Forest System lands. This includes identifying management practices that impact populations of high priority migratory bird species on National Forest System lands. Agencies shall identify potential impacts to migratory birds and their habitats, avoid or minimize adverse impacts, restore and enhance habitats, and evaluate the effects of actions on migratory birds. Table 54 identifies the species considered in this analysis.

The analysis for following migratory birds:

- Mexican spotted owl and southwestern willow flycatcher are located under the “Federally Listed Species” section of this document
- Gray vireo, burrowing owl, peregrine falcon, bald eagle, and black hawk are located under the “Region 3 Sensitive Species” section of this document

Table 54. List of migratory bird species occur or have the potential to occur within the Luna planning area and associated habitat types.

Species	Habitat Association
Bendire's thrasher	Inhabits sparse desert shrubland and degraded grassland vegetation. It may also occur in open woodland with scattered shrubs
Black-chinned sparrow	Moderately dense shrubs from 3-7 ft. tall mixed with rocky outcroppings, a large grass component, and scattered large shrubs or trees.
Black-throated gray warbler	Primarily pinyon-juniper and, in the far southwest, pine-oak woodland. Prefers large, closed canopy woodland stands, but it often uses edge habitat
Cassin's finch	Associated with mature coniferous forests and woodlands
Chestnut-collared longspur	Uses level to rolling mixed-grass and shortgrass uplands, and, in drier habitats, moist lowlands. Prefers open prairie and avoids excessively shrubby areas
Clark's nutcracker	Inhabits montane forests where preferred, large-seeded pines are locally abundant
Common nighthawk	Associated with open woodlands, clearings, and fields.
Evening grosbeak	Occupies mature and second-growth coniferous forests including spruce-fir, pine-oak, pinyon-juniper, and aspen forests
Flammulated owl	Associated with open ponderosa pine forest. At higher elevations, the species may be found in mixed conifer habitat, in association with Douglas-fir, white fir, or blue spruce.
Grace's warbler	Prefers park-like stands of mature tall pines
Juniper titmouse	Open, mixed woodland areas at mid-elevations, and is most common where juniper is dominant. may be present where pinyon-juniper is interspersed with oaks, and occurs in largely pine-oak habitat
Lewis's woodpecker	Requires open canopy forests with large dead or decaying trees for nesting. It breeds in both lowland riparian and montane forest habitats. In New Mexico, breeding occurs most commonly in riparian woodland with large, mature cottonwoods. At higher elevations, Lewis's Woodpecker occurs in ponderosa pine forests with large trees and an open canopy.
Loggerhead shrike	Associated with open country and with short vegetation, including desert grasslands and shrublands and open woodlands or juniper savannahs
Mexican whip-poor-will	Pinon/juniper woodlands, ponderosa/oak forests, and mixed conifer forests
Mountain bluebird	Pinyon-juniper woodlands, mountain meadows, and sagebrush shrublands. Associated with high open habitats with a scattered tree or shrub component, including savannahs, prairie-forest ecotones, and meadow and alpine tundra edges, and cool desert shrublands.
Mountain plover	Prefers large, flat grassland expanses with sparse, short vegetation, and bare ground
Olive-sided flycatcher	Associated with openings and edges in coniferous forest habitat. it is generally more abundant in mixed conifer, late-successional forest with less than 40% canopy cover
Painted redstart	Middle- and upper-elevation riparian woodlands, and adjacent pine-oak woodlands, generally prefers areas with rugged slopes and deeply-shaded canyon bottoms.
Pinyon jay	Associated with pinyon-juniper habitat

Species	Habitat Association
Pygmy nuthatch	Occurs in forests of pine mixed with oak, quaking aspen, maple, Douglas-fir, or white fir
Red-faced warbler	Mixed conifer and ponderosa pine forests, typically with a Gambel oak or other deciduous tree component
Red-headed woodpecker	Associated with both deciduous woodlands and open areas with surrounding trees or isolated woodlots. prefer woodlands and areas with tall trees with large circumferences, high basal area, and low density of stems in understory
Vesper sparrow	Found in open habitats, including old fields, shrub-steppe, grasslands, and cultivated crop fields. Generally prefers short, sparse, and patchy herbaceous vegetation with some bare ground, and low to moderate shrub or tall forb cover
Virginia's warbler	Occurs at middle elevations, where coniferous woodland or forest mixes with deciduous shrubs or trees.
Whiskered screech-owl	Occupies canyon areas in montane forests
Williamson's sapsucker	Inhabits open, mixed coniferous and deciduous forests in mountain areas up to 10,000 feet in elevation.

Environmental Consequences

Alternative A

For all migratory bird species listed in table 54, there would be no change to the habitat or disturbance to the species, but there is still exists the risk of wildfire impacts to forested and woodland cover types. A determination of “no impact” is made for alternative A.

Effects Common to Alternative B, C, and D

For all migratory bird species listed in table 54, individuals may be disturbed by project equipment noise and human presence in the short term. Proposed treatments would improve habitat and reduce wildfire threat in long term. Some habitat elements may decline such as the amount of bare ground, juniper cover types or increase such as amount of larger and mature tree stands, grasslands. Depending on the bird species and their habitat preference, this may either be a positive or a negative impact. During implementation, not all associated habitat types will be treated at the same time, providing opportunity for birds to utilize adjacent or nearby habitat, therefore reducing disturbance and impacts to individuals from activities and habitat treatments. There may be short-term impacts to individual migratory birds, but alteration to their habitats or being disturbed during treatments, will not negatively affect population levels.

Alternative C – Herbicide Utilization

All other effects are the same as alternative B.

Herbicide application may disturb individuals by noise and human presence in the short term. Rabbitbrush and alligator juniper would be reduced, providing opportunity for growth and increase of herbaceous plants in treatment areas. During implementation, not all associated habitat types will be treated at the same time, providing opportunity for birds to utilize adjacent or nearby habitat, therefore reducing disturbance and impacts to individuals from activities and habitat treatments. To further reduce impacts manufacturer labels will be followed during application. There may be short-term impacts to individual migratory birds, but alteration to their habitats or being disturbed during treatments, will not negatively affect population levels.

Alternative D

All other effects are the same as alternative B.

Not adding user-proposed routes would not impact habitat nor disturb the species. There would be beneficial effects by not having routes crossing through habitats causing fragmentation. Although routes are not added under this alternative, other activities are still being implemented, therefore there may be short-term impacts to individual migratory birds, but alteration to their habitats or being disturbed during treatments, will not negatively affect population levels.

Air Quality

Incomplete or Unavailable Information

The following discusses where information is incomplete or unavailable and its relevance to environmental effects analysis.

Air Quality: Smoke analysis was unavailable for prescribed burning treatments.

Gila National Forest personnel did not attempt any smoke modeling related to prescribed burning treatments. A review was done of smoke monitoring information during past prescribed fires to ascertain length of smoke disturbance. Gila National Forest personnel would also follow the New Mexico smoke management program guidelines to determine burning windows that allow for proper ventilation and dispersion of smoke to protect air quality and human health. This existing information and mitigation is adequate to determine the effects of the action alternatives.

Alternative A – No Action

This alternative has no direct effect on air quality because no treatment activities are proposed.

Under this alternative, no treatments would occur and there would be no anthropogenic emission contribution to degrade air quality. However, this alternative could lead to increased accumulation of ground fuel due to insect and disease activity and continuous natural forest succession. This accumulation of ladder and ground fuels may lead to an increased probability of high intensity wildfire in the future which could result in air quality degradation. Air quality can be degraded by smoke from wildfires to the point of human illness in some instances. Hardy et al. (2001) noted emissions from wildfire are typically greater than emissions from a prescribed fire on the same acreage due to greater emission factor, fuel consumption, and fire intensity. Wildfires are also known to result in high levels of emissions, and associated violations of national ambient air quality standards. Smoke from wildfire can cause visual impacts to the surrounding area and create hazardous driving conditions on adjacent state, county, and Forest Service roads for extended periods of time. Should a wildfire occur, dust emissions from fire suppression equipment could also increase. In the short-term air quality impacts from alternative A would be less because prescribed burning treatments and project activities would not occur. In the long term, the no-action alternative would not meet the purpose and need of this project. Previous wildfire activity, natural forest succession and increasing conifer mortality due to insect and disease can influence the amount of material available for consumption in the event of a future wildfire.

Emissions sources contributing to particulate matter and other pollutants would continue to be present. These sources include wood burning stoves, vehicle exhaust, emissions from

recreational campfires, emissions associated with prescribed fire, fugitive dust, and wildfires within or near the project area. Wildfire frequency is expected to continue as it has been observed in the past. A wildfire could lead to negative cumulative effects and would be dependent upon the size and intensity of the wildfire. Visibility impairment and human health impacts due to sudden and dramatic pollutant release are likely with a large wildfire event. Cumulative effects of smoke are unknown because the intensity and size of a wildfire is unknown. Research indicates wildfires can produce nearly twice the amount of smoke as prescribed fire (Huff et al. 1995).

Alternatives B, C, and D

A small amount of fugitive dust is likely to be generated from project activities. This dust is expected to settle quickly and result in minimal short-term impacts to air quality.

Prescribed burning treatments would have direct, short-term impacts on air quality in the project area. All proposed prescribed burning would occur when weather conditions and dispersion forecasts are favorable. Transitory smoke as a result of implementing alternative B, C, or D could produce some smoky days in the local area, and nuisance smoke (smell, see, or haze). Smoke would also be expected to settle into the lower draws and drainages during the evening hours following ignition.

The project is 24 air miles northeast of the Gila Wilderness Class I airshed and is not within a recognized area of nonattainment for particulate matter 10, carbon monoxide, sulfur dioxide, ozone or total suspended particulates. Therefore, no analysis is necessary or provided to determine conformity with the State implementation plan for air quality.

Smoke generated from prescribed fire is likely to impact human populations towards the northeast and east; due to predominant wind direction. Some wind variability would occur due to the surrounding topography. If the winds follow the prevailing direction during burning, smoke would drift and disperse over mostly unsettled portions of the Gila National Forest.

The communities of Luna, Cruzville, Apache Creek, Aragon, Reserve, Rancho Grande Estates, and Alpine, Arizona are all within approximately 8 to 15 miles of the Luna Restoration Project and would likely experience the greatest impact from prescribed burning and pile burns. There are other communities greater than 15 miles in any direction in which residents could see, smell, and experience smoke and haze.

In contrast to wildfire, prescribed fires follow a written prescription which allows managers to minimize smoke impacts. Emission reduction techniques, can reduce the impacts to air quality while meeting fire-related objectives. These techniques are outlined in New Mexico's smoke management plan (NM 2005). The Gila National Forest personnel are responsible for following the state's smoke management requirements.

Overall, there are no measurable differences in regards to air quality between the alternatives. One aspect of the purpose and need for this project is to reduce the impacts of high-severity fire. Smoke from wildfires can present a risk to public health. Wildfires often result in high levels of emissions, poor visibility, and associated violations of national ambient air quality standards. Vegetation management treatments provide the opportunity on a long-term basis to reduce the magnitude of wildfire air quality concerns. According to Wiedinmyer and Hurteau (2010) wide-scale prescribed fire application can reduce carbon dioxide fire emissions for the western U.S. by

18 to 25 percent. The total amount of pollutants released by prescribed burning under alternative B, C or D would be spread out over several years and would occur when emissions would be unlikely to have adverse effects on human health and visibility. After implementation, it is estimated that subsequent wildfires in the project area would produce less pollutants due to less fuel available to burn.

Fugitive dust may be generated in areas where mechanical operations are occurring and with associated vehicle travel. These impacts are expected to stay within the analysis area as dust from roads settles out relatively quickly. There is no measurable difference expected between alternatives as related to dust generated from restoration activities. Best management practices should be effective in retaining protective ground cover, reducing exposed soil susceptible to wind erosion and creation of dust in all action alternatives. This project is not within a State-designated nonattainment area; therefore, no conformity assessment was necessary or completed. Compliance with Clean Air Act would continue.

Air quality as a result of implementing alternatives B, C, or D would result in a short-term increase in pollutants from prescribed fire smoke emissions and fugitive dust. When considering past, present, and reasonably future activities, the activities proposed in the alternatives are not anticipated to result in cumulative effects to air quality.

Watershed and Soils

General Assumptions

- No more than 25 percent of a 6th code watershed within a 3-year period would be treated. This percentage may be adjusted up or down based on monitoring and assessment of watershed conditions, after treatments.
- The reduction or elimination of vehicle traffic on a road or trail near a stream will result in less sediment delivered from the road to the stream over time. This relates to the reduction of the amount of loose material on the road surface and also the increase in the amount of vegetative litter and other cover on the road surface. Erosion rates from a closed road may decrease to near background levels as the density of vegetation on the surface of the road increase (Dissmeyer, 2000).
- Closed routes without fixed barriers are expected to revegetate minimally. These routes will not disappear from the landscape until decommissioned, and will continue to be a source of sediment and erosion to some degree. They will still be included in road density calculations.
- Best management practices would be properly implemented to aid in mitigating negative impacts to water quality and quantity, soil resources, riparian and wetland resources, and air resources.
- Existing road system has already committed soil resources to loss of productivity.
- Routes that are connected to the drainage network provide some level of sediment transport, regardless of whether drainage is perennial, intermittent, or ephemeral. These sediment inputs vary based on duration and frequency of flow events. During short duration, high intensity storm events, ephemeral drainages can carry a considerable amount of sediment, some of which is generated by roads.

- The 2015 watershed condition classification incorporated management activities and watershed events that occurred in the past or that are on-going. The final assessment of watershed condition in 2015 constituted a culmination of these activities, events, or both leading to current watershed condition. The condition classification of each 6th code watershed is considered a result of cumulative watershed effects up to 2015.

Incomplete or Unavailable Information

The following discusses where information is incomplete or unavailable and its relevance to environmental effects analysis.

Soils: The general ecosystem survey map and associated soil interpretations were partially used to evaluate soils within the Luna Restoration Project.

The general ecosystem survey is mapped at a scale of 1:250,000 and was designed for general assessments and evaluation of projects at the landscape or forestwide level similar to the scope of the proposed action. It is key to acknowledge the general ecosystem survey is a very broad scale survey (1 inch equals approximately 4 miles) and many differences in soils, geology and topography can occur within very short distances. The draft forest terrestrial ecosystem survey map was used to identify erosive soils formed from volcanic sediments. Currently no soil map unit interpretations have been developed to accompany the draft terrestrial ecosystem survey map.

Gila National Forest personnel did not attempt any sedimentation modeling by alternative due to incomplete data. Although complete data was unavailable, ongoing survey information and past ecosystem survey data were evaluated. Best professional judgment was applied to determine the likelihood of soil disturbance from treatments as well as review of best available science and current literature related to vegetation treatments. Best management practices were developed by the interdisciplinary team to mitigate any expected impacts to soils. Therefore, the existing information is adequate to determine the effects of the action alternatives.

Riparian: Some riparian systems within the project area did not have a recent or completed proper functioning condition assessments.

These include Romero Creek, Centerfire Creek, and some reaches of the San Francisco River. Design for stream stabilization treatments will occur following completion of environmental analysis. Site-specific disturbance related to design implementation is unavailable.

Field inspections, photographic documentation, or both for all riparian systems within the project area had been made within the past three years by members of the project's interdisciplinary team. Best professional judgment was applied to determine resource conditions, trends, proposed treatments, and effects from proposed treatments. The existing information is adequate to determine the effects of the action alternatives.

Affected Environment

Watershed Condition

This analysis will address effects at the sixth code watershed level, which range in size from approximately 7,000 acres to 38,000 acres within the project area.

Watershed condition encompasses both aquatic and terrestrial processes and functions as the quality of water and aquatic habitat are inseparably linked to the integrity of uplands and riparian areas within a watershed. Aspects of a watershed related to geomorphic integrity can be defined in terms of attributes such as slope stability, soil productivity, channel morphology and other upslope, riparian and aquatic habitat characteristics. Hydrologic integrity of a watershed is related primarily to flow, sediment and water quality attributes. Biological integrity can be defined by the aquatic characteristics that influence the diversity and abundance of species. In each case, integrity must be evaluated in the context of the natural disturbance regime, geoclimatic setting and other important factors. The geomorphic, hydrologic, and biologic components are then combined and evaluated as a whole to assess watershed integrity and health.

Three classes are used to describe watershed condition (USDA Forest Service 2004, Forest Service Manual 2521.1):

- Class 1 watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.
- Class 2 watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.
- Class 3 watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.

In March 2011, watershed condition classification was initially completed across the Gila National Forest at the subwatershed level (6th code). A review and reclassification of all Gila National Forest watersheds was completed in December 2015. The watersheds were classified as being in one of the three condition classes noted above, as translated to functionality.

- Class 1 = Functioning properly,
- Class 2 = Functioning at risk, and
- Class 3 = Impaired function.

The Luna Restoration Project occupies a portion of nineteen 6th code watersheds, however the majority (98 percent) of the project area falls within 11 of the following 6th code watersheds: Canovas Creek – Coyote Creek, Trout Creek, Stone Creek – San Francisco River, Dry Blue Creek, Spur Draw, SA Creek, Headwaters Centerfire Creek, Outlet Centerfire Creek, Big Canyon – San Francisco River, Hay Vega, Cow Springs Draw. Table 55 provides the percentage of the project area found in all of the 6th code watersheds along with the 2015 watershed condition classification rating.

Watersheds with less than 2 percent of the area in the project will not be evaluated further. Activities in the Luna Restoration Project will not affect all of the indicators used to derive the watershed condition rating.

Current watershed conditions are the culmination of historic activities since the late 1800s and early 1900s, ongoing management activities, climate fluctuations, roads, and recent wildfire.

Table 55. Summary of watersheds and condition ratings that overlap the Luna planning area. Watershed condition ratings are Class 1 = Functioning Properly; Class 2 = Functioning at Risk; and Class 3 = Impaired Function.

6 th Code Watershed / Hydrologic Unit Code	Acres in Watershed	Project Acres in Watershed (includes private land acres)	% of Project within Watershed	% of Watershed Occupied by Project	Watershed Condition Rating
Hay Vega 150200010301	7,091	3,236	2%	46%	Class 1
Canovas Creek – Coyote Creek	32,466	10,834	6%	33%	Class 2
Cow Springs Draw 150200030703	31,273	6,568	4%	21%	Class 1
Mangitas Creek 150200030505	23,062	2,235	1%	10%	Class 1
Campbell Blue Creek 150400040503	34,218	617	<1%	2%	Class 3
Trout Creek 150400040302	20,934	13,174	7%	63%	Class 2
Stone Creek-San Francisco River 150400040303	35,769	24,276	13%	68%	Class 2
Spur Draw 150400040304	26,179	26,179	14%	100%	Class 2
SA Creek 150400040305	22,560	22,560	12%	100%	Class 2
Headwaters Centerfire Creek 150400040306	18,536	18,536	10%	100%	Class 2
Outlet Centerfire Creek 150400040307	20,591	20,591	11%	100%	Class 3
Big Canyon-San Francisco River 150400040308	16,418	16,418	9%	100%	Class 2
Dry Blue Creek 150400040502	25,048	19,104	10%	76%	Class 2
Starkweather Canyon 150400040309	25,279	636	<1%	3%	Class 2
Cienega Canyon-San Francisco River 150400040311	36,089	188	<1%	1%	Class 2
Centerfire Creek – Blue River 150400040504	17,311	329	<1%	2%	Class 1

6 th Code Watershed / Hydrologic Unit Code	Acres in Watershed	Project Acres in Watershed (includes private land acres)	% of Project within Watershed	% of Watershed Occupied by Project	Watershed Condition Rating
Headwaters Saliz Canyon 150400040401	26,228	98	<1%	<1%	Class 1
Steeple Canyon-Blue River 150400040506	37,760	5	<1%	<1%	Class 2
Upper Pueblo Creek 150400040601	21,554	3	<1%	<1%	Class 2

In 2011, the Wallow Fire burned across acres of the Gila National Forest, within the Luna Restoration Project boundary. This fire originated on the adjacent Apache-Sitgreaves National Forests, and burned during drought conditions, resulted in severe negative impacts to watershed conditions on both national forests along the state line.

Watershed conditions have improved over the last century across the project area, and within the last several years within the Wallow Fire burn scar. However, there are still many localized areas throughout the project area where restoration of ecosystem health and watershed functionality is necessary. Headcuts and gullies are still active in many of the streams, ephemeral drainages, and low-lying swales. A great effort was placed on restoration of these sites in the 1980s. More than 150 erosion control structures were constructed, however little maintenance has occurred on these sites to date. Additional areas have since been identified for erosion control measures and other restoration treatments. The Escudilla Landscape watershed restoration action plan has been developed concurrently with this analysis that details many specifics related to the watershed condition rating for eight of these watersheds and four on the adjacent Apache-Sitgreaves National Forests (USDA Forest Service, 2017).

Soils

Soils within the Luna Restoration Project can be characterized as highly variable. They have been formed primarily from volcanic sediments, basalt, rhyolite, sandstone, and recent alluvium. The soils range from shallow to deep and stable to unstable in nature, with varying amounts of surface and subsurface rock fragments. The topography within the project area ranges from gently sloping elevated plains, valley bottoms, and hills to steep mountains and scarp slopes.

The project area has many acres of soils that were formed from volcanic sediments which are oftentimes referred to as Datil soils. These soils are highly erosive and are typically not very productive.

Table 56 and table 57 display acres and percent of project area by soil condition and erosion hazard rating.

Table 56. Summary of general ecosystem survey soil condition within the Luna planning area.

Soil Condition	Satisfactory	Unsatisfactory	Unsuited
Acres	155,550	27,560	3,927
Percent	83%	15%	2%

Table 57. Summary of general ecosystem survey erosion hazard within the Luna planning area.

Erosion Hazard	Slight	Moderate	Severe
Acres	78,422	79,502	27,113
Percent	42%	43%	15%

Aquatic Resources

Water resources within the project area include streams, wetlands, riparian areas, ponds, and numerous stock ponds and tanks. There are approximately 75 miles of perennial streams and 39 miles of intermittent streams in the project area. The remaining drainages are considered ephemeral, of which there are approximately 634 miles of these systems. There are approximately 205 surface acres of open water within the project area. These acres are mainly associated with stock ponds, and other larger storage reservoirs, when filled to capacity.

The major drainages within the project area are San Francisco River, Stone Creek, Jenkins Creek, Romero Creek, SA Creek, Trout Creek, Canovas Creek, Spur Draw, Centerfire Creek, and Dry Blue Creek. The San Francisco River, Dry Blue Creek, and Stone Creek have experienced, direct or indirect effects from the 2011 Wallow Fire. These effects included increased stream flow volumes and peak flow magnitudes, with accompanying excess channel erosion and sedimentation. Spring discharge, a source of perennial water for a number of streams, has increased from the decreased transpiration associated with the loss of over story vegetation. Recovery of the hydrologic regime following wildfire generally occurs within a 5 to 10 year period, however it can take longer.

Riparian, Wetlands, and Upland Wet Meadows

Riparian areas found within the Luna Restoration Project were evaluated using site visits by members of the interdisciplinary team, proper functioning condition surveys (USDI 1993), or both to determine both riparian potential and functionality. Areas evaluated within the project area are Jenkins Creek, Trout Creek, San Francisco River, Stone Creek, Centerfire Creek, SA Creek, Pace Creek, Dillman Creek, Adair Canyon, Spur Basin Draw, Romero Creek, Dry Blue Creek, and Canovas Creek. Most of the drainages within the planning area are ephemeral in nature, and only flow in response to precipitation or runoff events.

Water Quality

The potential adverse effects from most forest management activities are non-point sources, as opposed to point sources of water pollution. To ensure compliance with the Clean Water Act, water quality standards are set by the New Mexico Water Quality Control Commission. New Mexico's surface water quality standards define water quality goals by designating uses for waterbodies, setting criteria to protect those uses, and establishing provisions to preserve water quality. These water quality standards are examined for changes on a 3-year rotating basis. The current standards are documented in the New Mexico Administrative Code (NMAC) Title 20, Chapter 6, Part 4 "New Mexico Standards for Interstate and Intrastate Surface Waters" ([New Mexico Water Quality Standards](#)). Under section 303(d)(1) of the Clean Water Act, States are

required to develop a list of waters within a state that are not in compliance with water quality standards and to establish a total maximum daily load for each pollutant. Reaches of streams that are in some state of nonattainment are documented in "2016-2018 State of New Mexico Clean Water Act Section 303(d)/Section 305(b) Integrated Report Appendix B - Integrated List" (State of New Mexico 2016). Currently there are two waterbodies within the project area that are included in this report.

Headwaters Centerfire Creek and Outlet Centerfire Creek 6th code watersheds

Centerfire Creek (San Francisco River upstream to headwaters) is in non-support of its designated use of "high quality coldwater aquatic life" and "primary contact".

- Probable causes of impairment are identified as nutrient/eutrophication, sedimentation/siltation, specific conductance, water temperature, turbidity, and *E. coli*.
- Probable sources of impairment include low water crossings, channelization, recreational pollution sources, source unknown, drought-related impacts, silviculture, fire suppression, silviculture activities, road and bridge runoff, rangeland grazing, natural sources, and streambank modifications and destabilization.
- Total maximum daily loads for plant nutrients and conductivity were completed in 2002. Total maximum daily loads for turbidity and *E. coli* were scheduled in 2014. Water temperature standards are currently under review.

Stone Creek – San Francisco River and Big Canyon – San Francisco River 6th code watersheds

San Francisco River (Centerfire Creek upstream to Arizona State Line) is in non-support of its designated use of coldwater aquatic life.

- Probable cause of impairment is identified as water temperature and benthic macro-invertebrate community.
- Probable sources of impairment are silviculture, fire suppression, rangeland grazing, and source unknown.
- Total maximum daily loads for temperature and plant nutrients were completed in 2002. The reach was delisted for nutrients during the 2010 listing cycle. Water temperature standards are currently under review.

Water quality related to stream temperature is of major concern in the perennial and intermittent streams located in the Luna Restoration area. Often related to riparian health, temperature is important because it governs the kinds and types of aquatic life that can be present in the stream, regulates the maximum dissolved oxygen concentration of the water, and influences the rate of chemical and biological reactions. Seasonal variations in stream temperature may be caused by changing air temperature, solar angle, meteorological events, and a number of physical aspects related to the stream and watershed. These physical features include upland watershed condition, velocity, vegetation types and canopy cover, stream configuration, and land use.

Summary of Resource Conditions

Existing stream crossings – Negative impacts to riparian areas is occurring as current stream crossings go directly through riparian areas and wetlands. Negative impacts to vegetation in

these areas include rutting of wetlands, damage to riparian woody and herbaceous vegetation, and increased sedimentation downstream of crossings.

Encroaching conifers in riparian areas and upland wet meadows – Conifers are currently encroaching into floodplains, riparian areas, and fringes of the wet meadows, taking available water, nutrients, and energy that would otherwise be available to riparian and wetland species. Continuation of this encroachment will eventually lead to an ecological conversion of the site to more upland vegetation species, thus reducing wetland and riparian habitat within the project area. This would limit water quantity, in particular, from being available for valuable wetland and riparian habitats.

Ungulate utilization in degraded riparian and uplands – Several degraded riparian areas and upland sites have been identified for restoration needs. Water quality impairments have been identified by the State as a result of rangeland grazing with some of the probable causes of impairment notes as sedimentation or siltation and temperature. These causes can be both a direct and indirect result of inadequate woody and herbaceous vegetation, both in uplands and on streambanks.

Stream and wet meadow stabilization structures – Stream reaches throughout the project area that have been experiencing increased water flows and sediment delivery due to wildfire and flood events would not receive any treatments. These streams would have to continue to recover at a natural rate. In some of these streams, such as Stone Creek and Centerfire Creek, slow to no recovery is currently occurring. It would take decades for these systems to move towards upward trends without multiple treatments.

Riparian tree planting – There are riparian areas and stream systems that currently have excessive sedimentation, unstable banks, lack of vegetation, and high temperatures. Areas that are currently not functioning or in downward trends would maintain this condition and in areas where there are temperature and siltation impairments, these would not improve without improvement to riparian vegetation.

Head of Ditch irrigation diversion reconstruction – The current diversion has negative impacts on the adjacent riparian area as heavy equipment is in the channel several times every year, constructing and deconstructing the push-up dam. This disturbance does not allow long-term recovery of riparian woody species, and results in excessive sedimentation at the site and downstream.

Wet meadows – Currently there are locations in wet meadows that receive motorized traffic several times throughout the year, even though the routes are closed. Motorized use in wet meadows poses a threat to soil productivity and vegetation. Repeated motorized use can cause soil compaction in these areas, which may result in long-term adverse effects to riparian and wet meadow conditions.

Erosion stabilization structures – Currently, the effectiveness of a majority of the existing erosion control structures has diminished over the years or they are no longer functional. Several of these structures have breached, and new headcuts have formed. This has caused excessive sediment that ultimately moves downstream and into riparian areas and wet meadows. Some of the structures are located in upland wet meadows and resultant new headcuts are proceeding to dewater these areas.

Degraded uplands – Downstream negative impacts to riparian areas are occurring with excessive sedimentation being generated from degraded uplands. These areas will continue to produce sediment and higher overland flows if herbaceous vegetation is not restored.

Campgrounds – Existing road and campsite drainage leads directly to the adjacent waterways of San Francisco River and Trout Creek, thus providing a direct input of sediment. This influx of sediment will continue to hamper improvement of riparian conditions in these areas as it impacts bank stability and riparian vegetation growth.

Range Management – Livestock would continue to provide the same pressure at existing water sources including where water source is spring-fed with associated riparian vegetation.

Motorized Transportation – There are negative impacts occurring where motorized routes coincide with riparian areas and wetlands/wet meadows. Closed routes continue to discharge runoff and sediment to adjacent waterways. Some closed roads are located in the drainage bottoms of perennial streams, with associated riparian vegetation, where unauthorized use is occurring. Other closed roads cross or are adjacent to wet meadow areas. These routes still receive some amount of unauthorized use and cross-country travel, although unauthorized.

Environmental Consequences

Soil Resources

Alternative A

Mechanical Vegetation Treatments

The existing condition of soils and soil loss rates will continue under the no-action alternative. Trends would remain stable in vegetation types where there is adequate vegetative ground cover and canopy cover. Organic soil carbon will accumulate at potential rates and soil fertility will slowly improve if accumulation of organic matter continues at its present rate. Existing amounts of coarse woody material would remain constant, with an increasing amount likely within the Wallow Fire scar as dead trees begin to topple. There would be no disturbance to soils from vegetation treatments as vegetative ground cover would remain intact, with no disturbance from landings, skid trails, heavy equipment, or other treatment related impacts. No mowing of rabbitbrush would occur, thus canopy cover in these areas would remain high with very little herbaceous understory in impacted rangelands. No herbicide treatment would occur on either rabbitbrush or alligator juniper, there would be no risk to the soil resource or soil crusts from potential chemical interactions. Infiltration rates would remain the same as there would be no increase in surface runoff from soil disturbing activities.

Tree encroachment will continue in grasslands and meadows. A study on the Cibola National Forest concluded competition for limited site resources (nutrient stock, water, sunlight, etc.) from a relatively dense juniper overstory was the principal cause for decline in understory productivity and deterioration of soil quality at their study site (Brockway et al 2001). As woody species encroachment occurs, grass biomass and cover decrease as woody species biomass and cover increase. Additionally, herbaceous species richness and diversity tends to decline as woody species density increases (Van Auken 2009). If site conditions such as this persist, infiltration rates may gradually decrease as water-compacted, bare soil increases and organic matter accumulation decreases.

Ponderosa pine and mixed conifer vegetation types will remain at risk for future soil loss as high tree density and heavy fuel loading in forested stands increases the risk of uncharacteristic high-intensity wildfire. High-severity fire can result in large areal extents of high soil burn severity which can pose negative impacts to soil productivity and site stability. High tree densities can also create conditions where herbaceous ground cover is out-competed for sunlight, precipitation, and nutrients. A reduction in grass under these thick canopies could result in less favorable site conditions over the long term.

Overall in the no-action alternative there would be no long-term benefit to soil resources, resulting in a potential downward trend in soil condition.

Prescribed Fire Treatments

Ponderosa pine and mixed conifer vegetation types which have high tree densities and canopy cover tend to exhibit heavy fuel loading in the understory. As surface and ladder fuels increase, and tree density increases, the probability of high-intensity uncharacteristic wildfire increases resulting in the potential for high soil burn severity. The loss of canopy cover, ground cover, and organic debris on the soil surface, together with the possible occurrence of hydrophobic soil layers in these areas, would likely lead to considerable increases in soil erosion, loss of soil organic matter, and reduction in long-term soil productivity. This would result in a greater risk of negative impacts to the soil resource under alternative A compared to all action alternatives.

Soils under dense, closed canopy, stands pinyon-juniper and in heavily encroached meadows would not realize any increase in herbaceous ground cover or site productivity. Soil condition in these areas would likely stay the same or experience a downward trend. Similar to ponderosa pine and mixed conifer vegetation, if heavy surface fuel loading are present, these areas would be at a higher risk to high soil burn severity in the event of a wildfire.

Soils in grassland and meadow vegetation types would not be affected under alternative A since surface fuel loading is relatively low in these areas. Soils would remain in their existing conditions with the same trends.

Stream, Riparian, and Erosion Control Treatments

Restoration activities would not occur in alternative A. Degraded soil conditions, including excessive erosion and destabilization would continue at their current rate.

In areas where conifers are beginning to encroach into upland wet meadows and riparian areas, soil conditions would likely remain stable for a period of time. However, conifer encroachment would continue to compete with riparian, wetland, and wet meadow species for sunlight, water and nutrients.

In areas where degraded soils are negatively impacting riparian areas, streams, wetlands, and wet meadows, these conditions would continue and cause further detriment to water quality. Sediment control structures would not be cleaned or maintained, and those that are breached would continue to headcut upstream. Soil stability would lessen, stream bank stability would decrease, and erosion rates would continue or worsen.

At the Head of Ditch diversion site, ground disturbance would persist multiple times per year as native soil push-up dams would be installed and removed repeatedly to accommodate irrigation season and in response to flooding events.

The potential for a downward trend in areas currently having negative soil resource issues would occur with implementation of alternative A.

Range Management Treatments

New range improvements consisting of storage tanks, wells, drinkers, pipeline, and pasture division fences would not occur under the no-action alternative. Currently, isolated areas around existing water points receive heavier use from livestock and wildlife, resulting in less herbaceous vegetation and soil compaction. These areas would remain the same as there would be no improvement in distribution of livestock and wildlife. However, the acres associated with these areas are minimal across the project area. No soil disturbance would occur under this alternative. Soil conditions and trend would remain the same.

Motorized Transportation Treatments

There would be no change to the motorized vehicle transportation system.

This alternative results in the least amount of soil disturbance related to motorized transportation system. However, the absence of road improvements, decommissioning, or reroutes under this alternative would result in negative soil impacts to occur in many locations across the project area. With no road decommissioning, closed routes would still continue provide a pathway for erosion to occur and for sediment to enter the waterway.

Negative impacts to the soil resource would continue at locations where current road conditions are poor and where motorized stream crossings are creating both erosion and water quality issues. Some locations currently have impaired site conditions due to instability / erosion problems resulting from structural crossing issues, heavy ground disturbance from motorized traffic, or both. If these conditions persist in these locations, a downward trend in soil conditions is likely.

Effects Common to Alternatives B, C, and D

In the development of these alternatives, sensitive soils were identified and considered. Vegetation treatments were excluded from these areas. Prescribed fire was excluded from most areas with sensitive soils; with the exceptions being the north aspect of the San Francisco Divide, and southwest of the community of Luna in Dry Blue Creek and Frieborn Canyon, extending south to the planning boundary. In these areas, low-severity fire may be introduced when fuel conditions, weather conditions, or both lessen fire spread across the landscape.

Mechanical Vegetation Treatments

In these alternatives, where soils are in satisfactory condition, they would continue to be maintained or improved with implementation of best management practices. Vegetation with dense canopies and heavy coarse woody debris fuel loading would see enhancement from vegetation treatments. Vegetative ground cover would be reduced and/or spatially rearranged by proposed vegetation treatments.

Restoration thinning would reduce the risk of forests and woodlands to intense, high-intensity uncharacteristic wildfire behavior which would increase the potential for high soil burn severity. Thinning would also help reduce competition for light, nutrients and water by creating gaps in canopies and reducing woody vegetation basal area. This would aid in restoring an herbaceous component to the understory which would help carry low-intensity fires.

Heavy equipment used in vegetation treatments will cause varying degrees of soil compaction which can temporarily increase water runoff and delay, reduce, or both the establishment and growth of desired herbaceous vegetation. Short-term increases in soil loss related to ground cover and soil disturbance are expected from mechanical thinning and skidding operations, as well as from the use of existing roads by logging equipment.

Long-term negative impacts to the soil resource from compaction or soil loss are not expected. Site stability and long-term soil productivity are expected to be maintained. Skid trails, staging areas, and landing sites will be scarified and seeded as necessary to reestablish vegetative cover. This should reduce the potential for erosion and sedimentation that could originate from these areas. Roads that are currently adding sediment to the stream system could receive additional erosion control treatments during project implementation. Activity slash can help mitigate some impacts from ground disturbance on site stability and productivity and activity slash would provide long term soil nutrient cycling.

Mowing of rabbitbrush under this alternative is not expected to have any adverse impacts to the soil resource. This activity will be done with rubber-tired equipment, with organic matter generated from mowing left largely in place, serving as organic matter and mulch across the soil surface. These areas of treatment are fairly flat, thus little soil movement is expected to be generated.

It is anticipated that overall soil condition and trends across the project area will be maintained, and over the long term, the trend will improve.

Prescribed Fire Treatments

Proposed prescribed fire treatments within ponderosa pine, mixed conifer, and pinyon-juniper vegetation types across the project have the potential to help maintain and/or improve soil conditions. Prescribed fire treatments would reduce surface and ladder fuels. These treatments would reduce the severity of future wildfires that could impact soils.

Pile burning will likely result in localized, negative effects including soil sterilization and total consumption of fine organic materials which can result in loss of litter layer, oxidation of soils, hydrophobic soils, loss of soil structure, minimal return of native grasses, and an increase in forbs. These effects could also cause a localized decrease in infiltration and an increase in runoff.

Soil conditions in riparian areas, wetlands, and wet meadows would be maintained as these areas would be buffered. Buffer distances are designed to provide adequate distance for ash and mobilized sediment to drop out prior to reaching riparian and water resources.

Designed low-intensity wildfire in the areas of Dry Blue Creek, Frieborn Canyon, and the San Francisco Divide will limit the severity of impacts to soil resources. Soil conditions are expected to remain the same, with a lessening of risk to high severity wildfire. High-severity wildfire often results in negative effects to the soil resource. Upward trends would occur over the long-term if canopy covers are reduced and more herbaceous ground cover can be restored in these areas.

Prescribed fire can also stimulate more vigorous growth of grass and forb vegetation as well as reduce fuel loading. This can lead to overall improvements in herbaceous cover and maintenance of coarse woody debris into the future. These benefits would not occur under alternative A.

The prescribed fire activities proposed under these action alternatives would help reduce fuel loading and ladder fuels and reduce the risk of future high-severity wildfire; providing for long-term soil protection and soil productivity.

Stream, Riparian, and Erosion Control Treatments

Proposed riparian, stream, and erosion control treatments would maintain satisfactory soils and have the potential to improve impaired soils and reduce current soil loss rates.

These treatments are designed to restore areas where site conditions are currently degraded. The treatments described in chapter 2 of this document would result in improving infiltration rates, bank stabilization, increase residence time of water in the system, control erosion, reduce sediment movement into the stream, vegetation diversity along stream channels, increase herbaceous ground cover in the uplands, reduce direct motorized impacts on riparian and stream channels, and reduce sediment movement into stream channels from motorized crossings.

The action alternatives provide for the improvement of impaired soil conditions as well as help in maintaining satisfactory soil conditions in riparian areas, wetlands, upland wet meadows, and degraded uplands. Upward trends are expected in all of these restoration areas.

Range Management Treatments

Additional watering sites in selected grazing allotments within the project area, are anticipated to improve livestock and wildlife distribution. Improvements would not completely eliminate concentrated use at existing watering locations. At new sites, some soil compaction and loss of herbaceous vegetation is likely to occur.

Motorized Transportation Treatments

Road improvements, reroutes, and decommissioning activities proposed under the action alternatives are designed to improve the soil resource over the long term. Road improvements are planned in areas where current routes are leading to erosion and contributing to movement of sediment into the stream system.

Reroutes have been planned in areas where the current route crosses live streams, riparian areas, or both. Reroutes would be in a more stable locations with less water and soil resource impacts.

Approximately 116 miles of decommissioning is planned where currently closed routes are no longer necessary for forest management activities. In the short term, approximately 104 miles would be available for decommissioning, while an additional 12 miles could be decommissioned following vegetation and prescribed fire treatments.

Currently, these closed routes continue to provide a pathway for sediment delivery into the stream system and remain a source of ongoing erosion. Decommissioning would provide a barrier thus allowing the roaded area to return to its natural state. In these areas, there would be an increase in vegetation, infiltration rates, soil stability, and a reduction in overland flow and soil loss. Soil conditions that are currently unsatisfactory within the road bed would improve, with upward trends over the long term.

These alternatives provide for several other motorized transportation treatments, for which the following direct and indirect effects would be realized.

Construction of 3 to 5 miles of temporary roads which would be obliterated following vegetation treatments. Short-term this temporary road construction would have negative impacts to the soil resource with removal of herbaceous vegetation and compaction during use. Subsequent obliteration should return the temporary road scar to its natural state. Construction and decommissioning of these temporary roads would result in 3.6 to 6.1 acres of new soil disturbance.

Approximately 4.2 miles of trail tread (3 feet wide) would remain on roads that are scheduled for decommissioning. This motorized treatment would have short-term impacts to the soil resource during decommissioning, long term impacts would remain from the trail tread. This would result in approximately 1.4 acres of long-term disturbance with possible connectivity to waterways.

Reopening of 13.8 miles of motorized routes to all vehicle types would result in long-term continued negative impacts to the soil resource. These closed routes are not currently decommissioned, with only a signed closure in place. Compaction, lack of infiltration, loss of soil productivity, and lack of vegetative ground cover would persist in the long-term. This results in approximately 20.1 acres of continued commitment of the soil resource.

Addition of 4.2 miles of user-created routes to the motorized system would result in long-term impacts to the soil resource, similar to the above-mentioned reopening of motorized routes. This results in approximately 6.1 acres of continued commitment of the soil resource.

Reopen then close and/or decommission 34.5 miles of currently closed routes for vegetation and/or prescribe fire treatments (22.5 miles would be reclosed and 12 miles would be decommissioned) – this motorized treatment would have short-term negative impacts to the soil resource. Reopening a currently closed route would subject it to renewed compaction and removal of any vegetation gains it might have seen during its closure. Follow-up closure would negate these impacts, however it may be a few years before this occurs. The roadbed scar would continue to result in some level of soil disturbance in the long term. Roads that would be decommissioned following treatments would see more benefit to the soil resource as they would be returned to their natural state, with an increase in vegetation, infiltration, and some restoration of soil fertility and productivity over the long term. This would affect approximately 51.6 total acres. Approximately 32.7 acres would realize benefits of being reclosed while 17.5 acres would realize benefits of decommissioning.

Construction of 0.3 miles of all-terrain vehicle routes would have both positive and negative impacts to the soil resource. The new routes are being constructed to avoid riparian areas, stream crossings, and perennial water. The reroutes would improve the soil and water resources in these areas over the long-term. However, there would be 0.3 miles of new construction and commitment of 0.2 acres of the soil resource to the all-terrain vehicle routes. Overall, the positive outweighs the negative for soil and water resources as the soil, riparian, and water quality benefits are greater than the 0.2 acres of new disturbance across the landscape.

Reopening of 3.5 miles of previously closed routes for administrative use or single purpose use (Tucson Electric Power line access) would have negative impacts on soil resources over the long-term as these roads would not be decommissioned in the future. Compaction, lack of vegetation, reduce infiltration, and loss of soil productivity would persist on these routes. This amounts to 5.1 acres of continued commitment of the soil resource.

Alternative B would have negative impacts between 87.5 to 90 acres to the soil resource, some of which may be mitigated by decommissioning. The same amount of acres would be impacted in alternative C. The 87.5 to 90 acres is more than alternative A and 27.2 acres more than alternative D.

Alternative C – Herbicide Utilization

Mechanical Vegetation Treatments

Alternative C vegetation treatments are similar to alternative B, with the exception of the following treatments:

- Herbicide may be used on 30 acres of meadow treatment that is currently proposed under alternative B for mechanical treatment.
- Herbicide may be used in lieu of, or in addition to, all 20,283 acres of rabbitbrush treatment areas proposed under alternative B, dependent on the site.
- Herbicide may be used on up to 8,000 acres of juniper that is currently proposed under alternative B for mechanical treatment.

Herbicide use is proposed in grasslands with rabbitbrush and woodlands with alligator juniper. Herbicides can persist in soils from a few months up to three years depending on soil type and environmental conditions such as soil moisture and temperature. The mobility of herbicides in the soil is determined by the adsorption capacity of the soil, soil moisture, and post application rainfall. Residence time in soils is also dependent soil texture and on the amount of microbial activity occurring in the soil. Soils associated with the rabbitbrush treatments have relatively high clay contents which will limit the mobility of the herbicide in the soil profile. Herbicide labels and application rates will be strictly adhered to. No negative effects to the soil condition or trend is anticipated with herbicide use in this alternative.

Direct and indirect effects are the same as described in the common to all alternative section, above for prescribed fire, stream, riparian, and erosion control, range management, and motorized transportation.

Alternative D

Direct and indirect effects are the same as described in the common to all alternative section, above for mechanical vegetation; prescribed fire; stream, riparian, and erosion control; and range management treatments.

Motorized Transportation Treatments

Alternative D motorized transportation treatments are similar to alternative B, with the exception of the following treatments:

- There would be no reopening of 13.6 miles (19.8 acres) of motorized routes to all vehicle types under this alternative (0.2 miles would be reopened). Instead, these 13.6 miles would be added to road decommissioning miles, bringing the total decommissioned miles to approximately 130 (189 acres) in alternative D. One hundred and eighteen miles would be immediately available for decommissioning, while 12 miles would be ready for decommissioning following vegetation and prescribed fire treatments. There would be an

increased benefit to the soil resource under alternative D, compared to alternatives B and C, with almost 14 more miles of road or approximately 20 acres returned to a natural state.

- There would be no addition of 4.2 miles of user-created routes to the motorized system. There would no long-term impacts to the soil resource from continued use of these routes. Currently, all user-created routes are planned to be returned to their natural state. Alternative D has more positive benefits to the soil resource under this activity, then do alternatives B and C.
- There would be no construction of 0.3 miles of all-terrain vehicle routes. There would be continued negative impacts to the soil resource at the crossing locations of Dillman Creek. However, no construction of a reroute would occur that would negatively impact soil resources in a new road bed. This area would remain undisturbed and soil productivity, stability, and fertility would remain the same. The current location of the route would continue to have negative impacts over the long-term to soil resources. Overall, the negative impacts of leaving this route in the same location would be greater than the negative impacts that 0.3 miles of new motorized trail would have, as the small disturbance of the landscape in uplands would not cause as lasting and continued harm as motorized stream crossings have to multiple resources.

Alternative D provides close to 30 more acres of positive benefit to the soil resource than alternatives B or C, but allows from between 60.6 to 63.1 more acres soil disturbance than alternative A.

Table 58 provides a comparison of acres of disturbance from motorized transportation treatments by alternative. These acres were derived from miles of road and assumed road widths (table 25).

Table 58. Acres of disturbance by alternative from motorized transportation treatments.

Alternative	Total Acres of Disturbance Related to Motorized Transportation Treatments
Alternative A	0
Alternative B	86.7 – 89.2
Alternative C	86.7 – 89.2
Alternative D	60.6 – 63.1

Riparian Areas and Wetlands/Wet Meadows

Alternative A

Mechanical Vegetation Treatments

This alternative would not provide for any mechanical vegetation treatments to reduce heavy fuel loadings and promote conditions that reduce risk of uncharacteristic high-intensity wildfire. High soil burn severities are often a result of uncharacteristic wildfire, leading to severe negative effects to downstream water resources, including riparian areas, wetlands, and wet meadows. Increased overland flow as a result of hydrophobic soils and high soil burn severities can produce excessive flood flows in channels, from even minor precipitation events. Increased runoff volumes and velocities in streams lead to damaged streambanks and riparian areas, often changing channel geometry. Riparian vegetation can be severely damaged during these flood events and often take years to recover. Repeated flooding until watershed stabilization occurs in

burned areas will continually set back riparian recovery. This was evident during field review of several streams on the western boundary of the Luna Restoration Project. These streams are currently experiencing increased water flows and sediment delivery from the effects of the 2011 Wallow Fire. The increased flows are causing both vertical and lateral stream instabilities, which have led to tremendous losses of riparian vegetation and have compromised floodplain access. These channels have experienced losses to much of their riparian habitat, with full recovery not expected for decades without restoration efforts. Without vegetation treatments, riparian areas will be placed at high risk for loss and associated downward trends in functionality in the event of an uncharacteristic wildfire.

The existing condition of riparian areas, wetlands, and wet meadows would continue and potentially decline under the no action alternative. In areas where overstory densities are high, little long-term improvement in hydrologic flow regime will occur without mechanical treatment or other vegetation treatment methods. Wildfires in untreated areas pose a greater risk of negative impacts to riparian areas, wetlands, and wet meadows than wildfire occurring after implementation of vegetation treatments in alternatives B, C, and D.

Prescribed Fire Treatments

Lack of prescribed fire treatments would result in effects similar to those noted above in the “Mechanical Vegetation Treatments” section. Not implementing prescribed fire treatments will continue to allow heavy fuel loading in the understory. As understory fuels build up and tree density and cover increases, the risk of higher intensity, uncharacteristic wildfire increases as well as the potential for high soil burn severity. The resultant loss of canopy cover, ground cover, and organic debris on the soil surface, together with the possible occurrence of hydrophobic soil layers in these areas, would likely lead to considerable increases in soil erosion, storm runoff response, and sediment movement into waterways. This would result in a greater risk of negative impacts to riparian areas, wetlands, and wet meadows under alternative A compared to all action alternatives.

Stream, Riparian, and Erosion Control Treatments

Restoration activities to address ongoing negative impacts to streams and riparian areas would not be implemented under alternative A.

Effects Common to Alternatives B, C, and D

Mechanical Vegetation Treatments

Current conditions of riparian areas, wetlands, and wet meadows would be maintained or improved with the proper implementation of best management practices.

Similar to the “Soils” and “Water Quality and Quantity” sections, areas across the project area with dense canopies and heavy coarse woody debris loading in the understory would see enhancement from vegetation treatments. Restoration thinning would reduce the risk of uncharacteristic wildfire that harms riparian function. Meadow thinning treatments are planned in upland meadows and terraces adjacent to riparian areas. These treatments are designed to thin out conifers that are encroaching upon riparian systems and not for commercial purposes. Limited equipment would be used in these area with no conifers removed that provide for bank stability. Piles would be located outside floodplains.

Heavy equipment used in vegetation treatments is not expected to be used near riparian areas or within wetlands or wet meadows. There may be some temporary increases in runoff and soil movement related to ground cover and soil disturbance from mechanical thinning and skidding operations, as well as from the use of existing roads by logging equipment. Skid trails, staging areas and landing sites will be scarified and seeded as necessary to reestablish vegetative cover. This should reduce the potential for erosion and sedimentation that could originate from these areas and move downstream. Buffer strips have been incorporated into the Best Management Practices and design features to provide protection of waterways and riparian areas. Mowing of rabbitbrush under this alternative is not expected to have any adverse impacts to riparian or wetland resources. These activities are not proposed near these sensitive resources. With proper implementation of best management practices and design features, riparian and wetland resources would be protected from both short-term and long-term negative impacts.

It is anticipated that current conditions of riparian areas, wetlands, and wet meadows would be maintained with implementation of mechanical vegetation treatment, with a lowered risk for long-term negative impacts as a result of uncharacteristic wildfire and encroachment of tree species.

Prescribed Fire Treatments

Prescribed fire treatments would result in effects similar to those noted in the “Mechanical Vegetation Treatments” section. Heavy fuel loading would be reduced in the understory, lowering the risk of uncharacteristic wildfire, and reducing the possibility for high soil burn severity.

Best management practices and design features restrict the location of pile sites from waterways, riparian areas, and wetlands. Pile burning would not impact these resources. This treatment would not impact riparian areas or wet meadows. Buffer distances are designed for landings and staging areas to provide adequate distance for ash and mobilized sediment to drop out prior to reaching stream courses.

Designed low-intensity wildfire in the areas of Dry Blue Creek, Frieborn Canyon, and the San Francisco Divide will limit the severity of impacts to soil resources in these locations. There are not expected to be negative impacts to downstream riparian resources, with a lessening of risk to high-severity, uncharacteristic wildfire in these areas.

The prescribed fire activities would help reduce fuel loading in the understory, thus reducing the risk from uncharacteristic wildfire, providing for long-term protection for riparian and wetland resources.

Stream, Riparian, and Erosion Control Treatments

Under all action alternatives, a suite of restoration activities to improve water quality and quantity are planned in streams, riparian areas, and uplands to improve degraded conditions. The following would be the effects to riparian areas, wetlands, and wet meadows with implementation of proposed projects:

- Upgrading, relocating, or hardening of existing stream crossings – Implementation of these action will provide positive benefits to riparian areas, wetlands, and wet meadows. Similar to positive benefit to water quality and quantity, hardening of crossings will help to alleviate impacts to native vegetation growing on the approaches. Less sediment and

gravels will be transported downstream of the crossing, which impacts vigor of different types of vegetation. While riparian woody plants may prefer coarser substrate, herbaceous vegetation may not. Several of the proposed crossings include small bridge designs and French drains that will enhance wet meadow habitats or avoid them altogether. This activity poses a positive benefit to riparian areas, wetlands, and wet meadows.

- Removal of encroaching conifers in riparian areas and upland wet meadows – Removal of conifers that are currently encroaching into floodplains, riparian areas, and fringes of the wet meadows would free up available water, nutrients, and energy that could be used by riparian and wetland species. This would also lower the risk these sites currently have for ecological conversion to upland vegetation species, which would reduce wetland and riparian habitat within the project area. This activity protects riparian areas, wetlands, and wet meadows.
- Construction of ungulate exclosures in riparian areas and degraded uplands – This activity will have positive benefits to riparian areas and wetland/wet meadows in the degraded riparian areas and upland sites that have been identified for restoration needs. Effects are similar to those under “Water Quality and Quantity”. The areas proposed for exclusion have a suite of additional restoration activities (riparian planting, stream stabilization, seeding) that will be implemented to improve resource conditions. By alleviated grazing pressure within this areas, it will provide a needed period of rest and recovery for riparian woody and herbaceous vegetation to grow, upland vegetation to recover, and stream banks to stabilize. These restoration efforts, combined, will aid in reversing erosion, lack of ground cover, and destabilized channels. Riparian areas, wetlands, and wet meadows will benefit over the long term. It will likely take several years for these improvements to be realized.
- Construction of stream and wet meadow stabilization structures – This activity would allow stabilization techniques to be employed on several degraded stream reaches and meadows throughout the project area. These activities will aid in restoring stream banks, and channel shape, form, and function back to proper functioning conditions. Sediment input from eroding banks would be reduced, channels would narrow, and flows would be reduced, allowing for an increase in productivity and vigor of riparian and wetland vegetation.
- Riparian tree planting – Riparian tree planting is proposed in locations where there is currently lack of riparian woody vegetation and streambank instability, leading to higher water temperatures and movement of sediment into the stream. By restoring riparian vegetation to these areas, the increased shade would help to reduce stream temperatures. The increased deep root system provided by these types of plants would aid in bank stability, helping to improve channel shape, form, and function, thus providing for stream stabilization and moving these systems in an upward trend and closer to proper functioning condition.
- Reconstruction of Head of Ditch irrigation diversion – A permanent diversion is planned at the current location for Head of Ditch to eliminate the need for repeated implementation of a native soil push-up dam that diverts all of the water from the San Francisco River (spring to fall). The new facility design would minimize activity in the active channel once it is constructed, thus reducing impacts to riparian vegetation in the immediate vicinity. The current diversion takes all of the stream flow for much of the summer months, with exception of flooding events. The new diversion would provide an opportunity for water

right owners to leave their share of water in the river if they do not need it for irrigation. While this may not occur immediately, the new design provides the opportunity for some water to remain in the channel year long, thereby increasing water availability for riparian species yearlong.

- Construction of all-terrain vehicle barriers to protect wet meadows – This activity is planned to deter motorized traffic into sensitive resource locations where the road is currently closed but unauthorized traffic persists. The barriers would help protect wet meadows which are currently receiving subject to rutting and disturbance of associated hydric soils. Wet meadow conditions would improve fairly quickly with elimination of unauthorized use, as compaction and rutting would be eliminated, infiltration and percolation would be improved, and movement of sediment would be reduced. This activity would move these systems quickly in an upward trend towards proper functioning condition.
- Maintenance and implementation of new erosion stabilization structures – There are currently more than 160 erosion control structures that were constructed within the Luna Restoration Project area over the last several decades. Many of these are in upland areas, away from riparian areas, wetlands, and wet meadows, however there are several located in upland wet meadows. Maintenance, reconstruction, or both of these upland wet meadow structures would ensure the longevity of the structures and lower the risk of them breaching which could result in headcutting and subsequent dewatering of the meadow. This activity will be a benefit to these fragile ecosystems and maintain functional conditions, improve functional conditions, or both.
- Native grass seeding in degraded uplands – These activities are planned primarily in uplands that would be adjacent to riparian systems. Improvement in these upland areas would benefit the downstream riparian areas by restoring herbaceous vegetation which will slow down overland flows and filter water. A reduction in flow velocities and dropping out of sediment prior to reaching the channels will aid in improving riparian condition and moving these areas in an upward trend towards proper functioning condition.
- Water quality improvements in campgrounds – Existing road and campsite drainage that leads directly to the adjacent waterways of San Francisco River and Trout Creek would be improved, thus reducing or eliminating a direct input of sediment. This would also provide a buffer for riparian vegetation from excessive flows off roads and campsites, thus providing riparian protection. This activity would provide improvement to riparian conditions.

Range Management Treatments

The action alternatives propose 14 additional watering sites within the project area. While this activity is expected to improve livestock distribution in allotments within the project areas, there are not expected to be any impacts to riparian areas, wetlands, and wet meadows. New water sites are planned in upland locations and no streamside watering sites are being eliminated.

Motorized Transportation Treatments

Road improvements, reroutes, and decommissioning activities proposed under the action alternatives are designed to protect and improve riparian areas, wetlands, and wet meadows. Road improvements are planned in areas where current routes are leading to erosion and

contributing to movement of sediment into the stream system. Reroutes have been planned in areas where the current route crosses live streams and/or riparian areas. Reroutes would be in more stable locations with less water and soil resource impacts. Decommissioning is planned where currently closed routes are no longer necessary for forest management activities. Currently, these closed routes continue to provide a pathway for sediment delivery into the stream system and remain a source of ongoing erosion. Local traffic continues to use these closed routes as they lack an effective closure barrier. Decommissioning would provide the necessary barrier and serve as a deterrent for continued use, thus allowing the roaded area to return to its natural state. In these areas, there would be an increase in vegetation on these former routes, an increase in infiltration rates, and increase in soil stability, and a reduction in overland flow and soil loss. Soil conditions that are currently unsatisfactory within the road bed would improve, with upward trends over the long term.

There are several other motorized transportation treatments, for which the following direct and indirect effects would be realized for riparian areas, wetlands, and wet meadows.

- Construction of 3-5 miles of temporary roads which would be obliterated following vegetation treatments – these motorized treatments are not planned to occur in riparian areas, wetlands, and wet meadows. Best management practices and design features are incorporated into the project that would prevent indirect impacts from these temporary roads from impacting downstream riparian areas and wetlands. There would be no change to riparian functional condition as a result of this treatment.
- Approximately 4.2 miles of trail head would be left on roads that are scheduled for decommissioning, with a trail tread of approximately 3 feet in width remaining– this motorized treatment would not have detrimental impacts to riparian areas, and wetland/wet meadows. Decommissioning of a majority of the road bed would lessen direct connections to riparian areas. The remaining tread would be designed with best management practices and design features that would mitigate water flow from the trail. This treatment is not anticipated to have any measurable impact to the functionality of riparian areas, wetlands, or wet meadows.
- Reopening of 13.8 miles of motorized routes to all vehicle types – this motorized treatment would result in little negative impact to riparian resources. One of the routes proposed crosses a small wetland area of Dillman Creek. This crossing is proposed for hardening, with uninhibited water passage through the crossing. These two treatments, implemented in tandem will minimize negative impacts to this riparian area. The crossing is currently receiving unauthorized use so this treatment will be an improvement over alternative A. The other routes included in the 13.8 miles do not cross riparian areas, wetlands, or wet meadows, thus would have no negative impacts to this resource area.
- Addition of 4.2 miles of user-created routes to the motorized system – The user-created routes proposed for addition in this alternative were all evaluated in the field by Gila National Forest watershed personnel for resource concerns. None of these routes cross riparian areas, wetlands, or wet meadows. The addition of these miles is not anticipated to impact these resources.
- Reopen then close and/or decommission 34.5 miles of currently closed routes for vegetation and/or prescribe fire treatments (22.5 miles would be reclosed and 12 miles would be decommissioned) – this motorized treatment may have short-term minor impacts to riparian resources, where the current road bed and riparian resources coincide.

Reopening a currently closed route would subject it to renewed compaction and removal of any vegetation gains it might have seen during its closure, thus increasing flow velocities down the roadbed and possibly into downstream waterways. Follow-up closure would negate these impacts, however it may be a few years before this occurs. The roadbed scar would continue to result in some level of disturbance in the long term. Roads that would be decommissioned following treatments would see more benefit to the soil resource as they would be returned to their natural state, with an increase in vegetation, increase in infiltration, and some restoration of soil fertility and productivity over the long term. While long-term impacts are not expected with this treatment, until the roads are decommissioned, benefits to riparian areas, wetlands and wet meadows would not occur.

- Construction of 0.3 miles of all-terrain vehicle routes – this motorized treatment would have positive impacts to riparian resources. The locations of these miles are in Dillman Creek where the current route path crosses several times. The reroute will avoid several stream crossings, thus eliminating direct effects to the riparian resource. A reduction in stream crossings will help improve riparian resource functionality. The new reroute is being constructed to avoid riparian areas, stream crossings, and perennial water.
- Reopening of 3.5 miles of previously closed routes for administrative use (Tucson Electric Power line access) – this motorized treatment is not anticipated to have negative impacts to riparian areas, wetlands, and wet meadows as the locations do not coincide.

Alternative C - Herbicide Utilization

Mechanical Vegetation Treatments

This alternative's vegetation treatments are common to all action alternatives with the exception applying herbicide treatments on 30 acres of meadow; appropriate areas of 20,283 acres of rabbitbrush; and up to 8,000 acres of juniper.

Herbicide use is proposed in upland rangelands and woodlands. Riparian areas, wetlands and wet meadow areas are not expected to be impacted by use of herbicide as their locations will not coincide. Application of best management practices will avoid negative effects to waterways. These include mitigation measures such as buffering waterways, avoiding precipitation events, limit use to low winds, and identification and avoidance of any drinking water supplies and sensitive aquatic species locations. No negative impacts to riparian areas and wetlands/wet meadows are anticipated with implementation of alternative C.

Alternative D

Motorized Transportation Treatments

This alternative's motorized transportation treatments are similar to all action alternatives with the exception of the following treatments:

- There would be no re-opening of 13.6 miles of motorized routes under this alternative. Only 0.2 miles would be reopened. Instead, these 13.6 miles would be added to road decommissioning miles, bringing the total decommissioned miles to approximately 130 in alternative D. Approximately 118 miles would be immediately available for decommissioning, while 12 miles would be ready for decommissioning following vegetation and prescribed fire treatments. There would be an increased benefit, although minor, to the riparian areas, wetlands, and wet meadows under alternative D, compared to

alternatives B and C. Although almost 14 more miles of road would be returned to a natural state, very few of these miles currently are within or adjacent to riparian areas or wet meadows.

- There would be no addition of 4.2 miles of user-created routes to the motorized system. There would no long-term impacts to the riparian areas, wetlands, and wet meadows from continued use of these routes. Currently, all user-created routes are planned to be returned to their natural state. Some short-term impacts may occur during obliteration of these routes where they are within or adjacent to riparian areas or wet meadows. Alternative D has more positive benefits to these resources under this activity, then do alternatives B and C; however, only approximately ¼ mile of these proposed additions are within a riparian area in Dillman Creek.
- There would be no construction of 0.3 miles of all-terrain vehicle routes. There would be continued negative impacts to the riparian areas, wetlands, and wet meadows crossing locations of Dillman Creek. The proposed reroute is outside of drainages with no impacts to riparian areas, wetlands, and wet meadows. Leaving this route in the same place would continue to provide long-term negative impacts to these resources.

Water Quality and Quantity

Alternative A

Mechanical Vegetation Treatments

This alternative would not provide for any mechanical vegetation treatments to reduce heavy fuel loadings and promote conditions that reduce risk of uncharacteristic high-intensity wildfire. High soil burn severities are often a result of uncharacteristic wildfire, leading to severe negative effects to water quality and quantity.

Post fire effects would result in increased runoff volumes and velocities in streams leading to damaged streambanks and riparian areas, and pose risks to downstream values such as in-channel structures and infrastructure adjacent to and/or within floodplains. Several streams on the western boundary of the Luna Restoration Project area are currently experiencing increased water flows and sediment delivery from the effects of the 2011 Wallow Fire. The increased flows are causing both vertical and lateral stream instabilities, which contribute negatively to water quality, in particular, temperature and turbidity. Stream flows are not able to dissipate effectively, thus runoff rates and velocities are high. Stabilizing riparian vegetation has been scoured away causing detachment and movement of channel and bank material.

In addition, within the project area, Centerfire Creek and the San Francisco River do not meet New Mexico State water quality standards. Any future high-intensity wildfires would hamper any water quality improvement to these streams.

The existing condition of water quality and quantity would continue and potentially decline under the no-action alternative. In areas where overstory densities are high, little long-term improvement in hydrologic flow regime will occur without mechanical treatment or other vegetation treatment methods. Wildfires in untreated areas pose a greater risk of negative impacts to water quality, channel stability, and changes to hydrologic regimes than wildfire occurring after implementation of vegetation treatments in alternatives B, C, and D.

Prescribed Fire Treatments

Lack of prescribed fire treatments would result in effects similar to those noted above under “Mechanical Vegetation Treatments”. Not implementing prescribed fire treatments will continue to allow heavy fuel loading in the understory. As understory fuels build up and tree density and cover increases, the risk of higher intensity, uncharacteristic wildfire increases as well as the potential for high soil burn severity. The resultant loss of canopy cover, ground cover, and organic debris on the soil surface, together with the possible occurrence of hydrophobic soil layers in these areas, would likely lead to considerable increases in soil erosion, storm runoff response, and sediment movement into waterways. This would result in a greater risk of negative impacts to water quality under alternative A compared to all action alternatives, with potential for destabilized hydrologic regime.

Stream, Riparian, and Erosion Control Treatments

Restoration activities to address ongoing negative impacts to streams and riparian areas would not be implemented under alternative A.

Motorized Transportation Treatments

This alternative results in the least amount of new disturbance related to motorized transportation as equipment would not be used for road-related ground-disturbing activities. However, the absence of road improvements, road decommissioning, or reroutes under this alternative would continue to allow negative impacts to water quality and water quantity to occur in many locations across the project area over the long term

The lack of road decommissioning would continue to allow currently closed routes to remain on the landscape. Current road closures do not immediately eliminate hydrologic impacts, especially when unauthorized use continues to occur. Rather, the disturbed surface takes years to stabilize, which depends on the level of success in the closure, underlying soils, vegetative regrowth, and other factors. Roads, including those behind gates and dropped from inventories, continue to produce sediment until they are totally revegetated. The primary effect to water quality related to roads is sedimentation originating from road erosion. Roads are a major source of sediment and contribute more off-site sediment than any other land management activity (Gibbons and Salo 1973; Meehan 1991). Numerous researchers have established that roads are a major source of sediment delivered to streams in otherwise relatively undisturbed watersheds, such as forests and rangelands. Because routes intercept and concentrate water the closer they are to a drainage channel, the quicker water is delivered to the stream channel, potentially increasing runoff response. Roads can also disrupt a watershed’s natural hydrologic flow by capturing surface and subsurface runoff on hillslopes. Unmitigated, the captured runoff can be delivered to stream systems more rapidly, at higher rates of flow, and can impact the timing and magnitude of natural stream flows. Stream channels will respond to increases in flow rates by widening or deepening in order to carry these greater flow rates. Roads directly alter natural sediment and hydrologic regimes by changing streamflow patterns and amounts, sediment loading, transport, and deposition, channel morphology and stability, water quality and riparian conditions within a watershed (Gibbons and Salo 1973, Dunne and Leopold 1978, Copstead et al. 1997). This can lead to higher peak flows, which may then lead to a higher risk of channel erosion.

The closed routes that are proposed for decommissioning in all action alternatives would continue to discharge runoff and sediment to adjacent waterways in this alternative, in particular

where the road bed is within 300 feet of a stream, or has inadequate drainage features, or is hydrologically connected to the stream network. Road densities would not be decreased thereby reducing potential for improved hydrologic flow regimes. This alternative provides the least benefit to water quality and quantity than any of the action alternatives due to lack of decommissioning alone.

Effects Common to Alternatives B, C, and D

Mechanical Vegetation Treatments

For all action alternatives, where water quality and quantity are currently meeting State water quality standards and display a stable flow regime, these indicators would continue to be maintained or improved with the proper implementation of best management practices and design features.

Similar to the “Soils” discussion for all action alternatives, areas across the project area with dense canopies and heavy coarse woody debris loading in the understory would see enhancement from vegetation treatments. Vegetative ground cover would be reduced, spatially rearranged, or both by proposed vegetation treatments. Restoration thinning would reduce the risk of high-severity wildfire that can have severe impacts to water quality as described in alternative A.

Heavy equipment used in vegetation treatments will cause varying degrees of soil compaction which can temporarily increase water runoff and delay, reduce, or both the establishment and growth of desired herbaceous vegetation. Short-term increases in soil loss related to ground cover and soil disturbance are expected from mechanical thinning and skidding operations, as well as from the use of existing roads by logging equipment, which can pose a threat to water quality. Project-specific best management practices and design features are designed to mitigate negative impacts from these activities. There is not expected to be long-term negative impacts to water quality or quantity as a result of mechanized vegetation treatments.

Mowing of rabbitbrush is not expected to have any adverse impacts to water quality and quantity. This activity will be done with rubber-tired equipment, with organic matter generated from mowing left largely in place, serving as organic matter and mulch across the land surface. These areas of treatment are fairly flat, thus there is not expected to be increases in runoff generated from these treatments.

It is anticipated that overall water quality condition and trends and hydrologic regimes across the project area will be maintained and the risk lowered for long-term negative impacts as a result of uncharacteristic wildfire.

Prescribed Fire Treatments

Prescribed fire treatments would result in effects similar to those noted above under “Mechanical Vegetation Treatments”. Heavy fuel loading would be reduced in the understory, lowering the risk of uncharacteristic wildfire, and reducing the possibility for high soil burn severity. Prescribed fire would initially reduce the level of organic debris and mobilize some sediment and nutrients. However careful attention to burning conditions during a prescribed fire is designed to limit the potential of short-term loss of soils and nutrients.

Pile burning will likely result in localized, negative effects to soil resources as described under the “Soils” section. Some effects of pile burning could also cause a localized decrease in

infiltration and an increase in runoff. Buffer distances are designed for landings and staging areas to provide adequate distance for ash and mobilized sediment to drop out prior to reaching stream courses.

Designed low-intensity wildfire in the areas of Dry Blue Creek, Frieborn Canyon, and the San Francisco Divide will limit the severity of impacts to soil resources in these locations. There are not expected to be negative impacts to water quality and quantity, with a lessening of risk to high-severity, uncharacteristic wildfire in these areas.

The prescribed fire activities would help reduce fuel loading in the understory, thus reducing the risk from uncharacteristic wildfire, providing for long-term protection for water quality and hydrologic regimes.

Stream, Riparian, and Erosion Control Treatments

A suite of restoration activities to improve water quality and quantity are planned to improve currently degraded conditions in streams, riparian areas, and uplands. The following would be the effects to water quality and quantity with implementation of proposed projects:

- Upgrading, relocating, or hardening existing stream crossings – Implementation of these actions will provide positive benefits to water quality and quantity. Hardening of crossing will help to alleviate the short-term negative impacts of vehicle tires disturbing and mobilizing stream bottom sediments. Improvement at these crossings will also aid hindering the direct flow path of water into the stream by either filtering out some of the sediment or relocating the crossing to a more stable location. Crossings will not be eliminated thus there will still be a hydrologic connection of water and sediment into the stream systems, at a reduced rate. This will be an improvement to water quality and water quantity from alternative A.
- Removal of encroaching conifers in riparian areas and upland wet meadows – Removal of conifers that are currently encroaching into floodplains, riparian areas, and fringes of the wet meadows would free up available water, nutrients, and energy that could be used by riparian and wetland species. This would also lower the risk these sites currently have for ecological conversion to upland vegetation species, which would reduce wetland and riparian habitat within the project area. This activity protects hydrologic regimes in these areas.
- Construction of ungulate exclosures in riparian areas and degraded uplands – This activity will be a positive benefit to water quality and quantity in the degraded riparian areas and upland sites that have been identified for restoration needs. The areas proposed for exclusion have a suite of additional restoration activities (riparian planting, stream stabilization, seeding) that will be implemented to improve resource conditions. By alleviating grazing pressure within these areas, it would provide a needed period of rest and recovery for riparian woody and herbaceous vegetation to grow, upland vegetation to recover, and stream banks to stabilize. All of these restoration efforts, combined, will aid in reversing erosion, lack of ground cover, and destabilized channels. Water quality and quantity will benefit over the long term. Streams currently not meeting New Mexico's State water quality standards would improve over the long-term, in particular where the probably causes for listing have been identified as sedimentation, siltation, and temperature. Increased vegetation within these areas will also reduce runoff rates, allowing

more subsurface water to remain in place, improving water quantity and stabilizing hydrologic regimes. It will likely take several years for these improvements to be realized.

- Construction of stream and wet meadow stabilization structures – This activity would allow stabilization techniques to be employed on several degraded stream reaches and meadows throughout the project area. These activities will aid in restoring stream banks, and channel shape, form, and function back to proper functioning conditions. Sediment input from eroding banks would be reduced, channels would narrow, and flows would be reduced, allowing for improvement in water quality (decreased temperature and sedimentation) and water quantity (reduction in flow velocities).
- Riparian tree planting – Riparian tree planting is proposed in locations where there is currently lack of riparian woody vegetation and streambank instability, leading to higher water temperatures and movement of sediment into the stream. By restoring riparian vegetation to these areas, the increased shade would help to reduce stream temperatures. The increased deep root system provided by these types of plants would aid in bank stability, helping to improve channel shape, form, and function, thus providing for stream stabilization. Water quality and quantity under this alternative would improve with this activity.
- Reconstruction of Head of Ditch irrigation diversion – A permanent diversion is planned at the current location for Head of Ditch to eliminate the need for repeated implementation of a native soil push-up dam that diverts all of the water from the San Francisco River (spring to fall). The new facility is planned to minimize maintenance, provide an easy way to switch flows from the main channel to the diversion, minimize effects on the stream and aquatic biota, and to eliminate water ponding behind the facility. The current diversion takes all of the stream flow for much of the summer months, with exception of flooding events. The new diversion would provide an opportunity for water right owners to leave their share of water in the river if they do not need it for irrigation. While this may not occur immediately, the new design provides the opportunity for some water to remain in the channel year long, thereby improving water quality and water quantity. In addition, the improvement to the diversion structure will improve stream channel geometry and reduce negative impacts to the site caused by repeated rebuilding of the push-up dam.
- Construction of all-terrain vehicle barriers to protect wet meadows – This activity is planned to deter motorized traffic into sensitive resource locations where the road is currently closed but unauthorized traffic persists. The barriers would help protect wet meadows which are currently receiving loss of soil productivity and soil compaction due to this unauthorized use. Water quality and water quantity would benefit from these barriers, as compaction and rutting would be eliminated, infiltration and percolation would be improved, and movement of sediment would be reduced. This ongoing threat to the identified wet meadows would be removed.
- Maintenance and implementation of new erosion stabilization structures – There are currently more than 160 erosion control structures that were constructed within the Luna Restoration Project area over the last several decades. Lack of maintenance on these structures has led them to reach storage capacity, breach, new headcuts and gullies, or a combination of these things. Maintenance of existing structures and construction of new structures will reduce erosion, control headcutting and gullying, and stabilize uplands where lack of stability and excessive flows have led to severe erosion issues. This activity

will reduce sedimentation and siltation downstream into waterways and provide for favorable conditions of flow, thereby improving both water quality and water quantity

- Native grass seeding in degraded uplands – Negative impacts to water quality and quantity in currently degraded uplands would be reversed if herbaceous ground cover increases on these sites. Herbaceous cover would slow down overland flow, thereby improving infiltration and reducing erosive processes. Some of these sites are severely denuded of vegetation so this would be a slow process, with improvement over the long term to water quality and quantity.
- Water quality improvements in campgrounds – Existing road and campsite drainage that currently leads directly to the adjacent waterways of San Francisco River and Trout Creek, would be improved, thus reducing or eliminating a direct input of sediment. This interrupted connection to the drainage would slow down storm-generated runoff to these streams, providing for a stable hydrologic flow regime and reducing the opportunity for runoff related erosion. This activity would provide improvement to water quality and hydrologic regimes under this alternative.

Range Management Treatments

There are 14 additional watering sites proposed within the project area. In watering locations where the water source is spring fed, less pressure on these springs may occur. The proposed treatments, however, do not provide fencing any of these areas, but rather provide alternate water sources to reduce pressure. This may relieve some water quality and quantity impacts; however, they may not be measurable. Effects to water quality and quantity are expected to improve slightly or not at all under all action alternatives.

Motorized Transportation Treatments

Road improvements, reroutes, and decommissioning activities are designed to improve water quality and quantity over the long term. Road improvements are planned in areas where current routes are leading to erosion and contributing to movement of sediment into the stream system. Reroutes have been planned in areas where the current route crosses live streams, riparian areas, or both. Reroutes would be in more stable locations with less water and soil resource impacts. Approximately 116 miles of decommissioning is planned where currently closed routes are no longer necessary for forest management activities, with 104 miles being immediately available for decommissioning. The additional 12 miles would be ready for decommissioning following vegetation and prescribed fire treatments. Currently, these closed routes continue to provide a pathway for sediment delivery into the stream system and remain a source of ongoing erosion. Local traffic continues to use these closed routes as they lack an effective closure barrier. Decommissioning would provide the necessary barrier and serve as a deterrent for continued use, thus allowing the roaded area to return to its natural state. Proper road obliteration or decommissioning, which returns the road bed and fill slope to the contours of the land and replaces culverts with natural stream channels, offers the best opportunity to restore health to heavily roaded watersheds and to aquatic habitat downstream. In these areas, there would be an increase in vegetation on these former routes, an increase in infiltration rates, and increase in soil stability, and a reduction in overland flow and soil loss. Long-term sediment reduction would benefit from these activities. Sediment production from roads diminishes over time after proper closure and non-use. Water quality would see improvements and hydrologic regimes would no longer be influenced by water flow from the road beds' unnatural flow paths.

There are several other motorized transportation treatments, for which the following direct and indirect effects would be realized:

- Construction of 3 to 5 miles of temporary roads which would be obliterated following vegetation treatments – this motorized treatment would have negative short-term impacts to water quality and water quantity with removal of herbaceous vegetation and compaction during use. These temporary roads can provide a conduit for surface flows to be directed down the road bed rather than dissipated across the land surface. Subsequent obliteration should return the temporary road scar to its natural state within a short period of time with proper implementation of best management practices and design features.
- Approximately 4.2 miles of trail head would be left on roads that are scheduled for decommissioning, with a trail tread of approximately 3 feet in width remaining– this motorized treatment would have benefits to water quality and quantity with decommissioning of a majority of the road bed. Some impacts to water quality and quantity may occur as flows may be directed down the remaining trail bed. However, proper implementation of trail tread and drainage should alleviate these impacts. There would be minimal long-term disturbance related to the trail tread that may have possible connectivity to waterways.
- Reopening of 13.8 miles of motorized routes to all vehicle types – this motorized treatment would result in some long-term negative impacts to water quality and quantity, somewhat similar to what is occurring under alternative A. These closed routes are not currently decommissioned, with only a signed closure in place. Unauthorized use continues on closed routes, albeit less than an open route receives. The current condition of these routes still provides a conduit for surface water to travel down these routes into waterways. Field review in 2015 determined that most of these routes were in upland areas, with little impacts to water quality and quantity. One route, however, does cross Dillman Creek in a perennial location. This crossing is proposed for hardening under alternatives B and C, which would mitigate concerns to water quality and quantity. Soil compaction and a lack of vegetation would still be present on all of these routes. None of these routes would realize the improvements to water quality and quantity that decommissioning would offer. Compaction, lack of infiltration, loss of soil productivity, and lack of vegetative ground cover would persist in the long term.
- Addition of 4.2 miles of user-created routes to the motorized system – this motorized treatment would result in some long-term impacts to water quality and water quantity. A field review of these roads determined that little water resource issues were currently occurring on these routes. They were located in upland locations, and would have effects similar to those in the above-mentioned reopening of motorized routes.
- Reopen then close and/or decommission 34.5 miles of currently closed routes for vegetation and/or prescribe fire treatments (22.5 miles would be reclosed and 12 miles would be decommissioned) – this motorized treatment would have some short-term and long-term negative impacts to water quality and quantity. Reopening a currently closed route would subject it to renewed compaction and removal of any vegetation gains it might have seen during its closure. Follow-up closure would negate these impacts however, it may be a few years before this occurs. The roadbed scar would continue to result in some level of water transport down its surface over the long-term if it is not decommissioned. Roads that would be decommissioned following treatments would see long-term benefits

to water quality and quantity as they would be returned to their natural state, with an increase in vegetation, increase in infiltration, and disconnected paths to waterways over the long-term. Unauthorized use remains a concern on closed roads that would not be decommissioned.

- Construction of 0.3 miles of all-terrain vehicle routes – this motorized treatment would have positive impacts to water quality and quantity. The new route is being constructed to avoid riparian areas, stream crossings, and perennial water of Dillman Creek. Local riding groups have expressed support in using an alternative route if available rather than continuing unauthorized use of Dillman Creek. The reroute provides alternate access to desirable locations without negative resource effects to the stream.
- Reopening of 3.5 miles of previously closed routes for administrative use (Tucson Electric Power line access) – this motorized treatment would have minor negative impacts to water quality and water quantity over the long-term as these roads would not be decommissioned in the future. Compaction, lack of vegetation, reduced infiltration, and loss of soil productivity would persist on these routes.

Alternative C – Herbicide Utilization

Mechanical Vegetation Treatments

This alternative's vegetation treatments are common to all action alternatives with the exception applying herbicide treatments on 30 acres of meadow; appropriate areas of 20,283 acres of rabbitbrush; and up to 8,000 acres of juniper.

Herbicide use is proposed in upland rangelands and woodlands. Best management practices and design features have been incorporated into the Luna Restoration Project to protect water quality. These include mitigation measures such as buffering waterways, avoiding precipitation events, limit use to low winds, and identification and avoidance of any drinking water supplies and sensitive aquatic species locations. No negative impacts to water quality are anticipated with implementation of alternative C.

No changes are anticipated to water quantity with the implementation of herbicide. Water use by rabbitbrush and juniper would be replaced with water use by herbaceous plants, if the herbicide treatment is effective. There would be no measurable change to water quantity; hydrologic regimes would remain unchanged.

Alternative D

Motorized Transportation Treatments

This alternative's motorized transportation treatments are similar all action alternatives with the exception of the following treatments:

- There would be no reopening of 13.6 miles of motorized routes to all vehicle types under this alternative (0.2 miles would be reopened). Instead, these 13.6 miles would be added to road decommissioning miles, bringing the total decommissioned miles to approximately 130 in alternative D. One hundred and eighteen miles would be immediately available for decommissioning, while 12 miles would be ready for decommissioning following vegetation and prescribed fire treatments. There would be an increased benefit to the water

quality and quantity under alternative D, compared to alternatives B and C, with almost 14 more miles of road returned to a natural state.

- There would be no addition of 4.2 miles of user-created routes to the motorized system – There would be no possible long-term impacts to water quality and quantity from continued use of these routes. Impacts currently are minor on these routes, with the exception of one crossing of Dillman Creek. This route would be obliterated as all user-created routes are planned to be returned to their natural state. Alternative D has more positive benefits to water quality and quantity under this activity, then do alternatives B and C.
- There would be no construction of 0.3 miles of all-terrain vehicle routes – There would be continued negative impacts to water quality and water quantity at the crossing locations in Dillman Creek, similar to alternative A. The Dillman Creek route is currently closed however, unauthorized use continues to occur.

Watershed Cumulative Effects

Watershed cumulative effects analyses are focused on the 6th code watersheds of Canovas Creek – Coyote Creek, Trout Creek, Stone Creek – San Francisco River, Dry Blue Creek, Spur Draw, SA Creek, Headwaters Centerfire Creek, Outlet Centerfire Creek, Big Canyon – San Francisco River, Hay Vega, and Cow Springs Draw as more than 2 percent of the project area was within these watersheds.

The existing conditions related to water quality, water quantity, aquatic habitats and biota, riparian areas, roads and trails, soils, range vegetation, forest cover, forest health, fire regime condition class, and invasive species within the Luna Restoration Project area contribute, in whole or part, to cumulative impacts on watershed condition. In 2015, 6th code watershed condition classifications incorporated information related to twelve watershed indicators. This recent assessment provides a “baseline” at which to assess all of the action alternatives versus the alternative A.

Alternative A

Under alternative A, there would be no implementation of mechanical vegetation treatments; prescribed fire treatments; stream, riparian, and erosion control treatments; range management treatments; or motorized transportation treatments. Current watershed condition classifications (table 55) would remain the same, with no improvements to any of the watershed indicators. Watersheds with high concentrations of fuel loading would remain at risk of negative impacts to watershed health if uncharacteristic wildfire occurs.

Implementation of alternative A would result in no change in cumulative impacts to watershed, soil and aquatic condition at the 6th code level, and thus no change to watershed condition classification of any watershed.

Alternative B

Alternative B proposes implementation of mechanical vegetation treatments; prescribed fire treatments; stream, riparian, and erosion control treatments; range management treatments; or motorized transportation treatments. This alternative addresses forest and watershed health issues at a landscape scale. These activities do result in varying amounts of ground disturbance. Impacts related to mechanical vegetation and prescribed fire treatments, including construction

of 3 to 5 miles of temporary roads and temporary reopening and then closing or decommissioning of 34.5 miles of roads and skid trails are expected to be short-lived, with implementation of recommended best management practices and design features, and would not result in negative cumulative impacts. Localized short-term impacts to water quality and soils would occur during implementation of stream, wetland, and upland stabilization projects, as well as disturbance to soils during construction of range improvements. These short-term impacts would result in long-term benefits by stabilizing these degraded systems, thus resulting in positive cumulative impacts. The addition of 0.3 miles of all-terrain vehicle route would have long-term impacts to the soil resource in its location, however the long-term positive cumulative impacts the relocation of routes provides to stream systems would outweigh the localized negative soil impacts. The addition of 4.2 miles of user-created routes, reopening of 3.5 miles of closed routes for administrative use, and reopening of approximately of 13.8 miles of currently closed routes would continue long-term impacts related to these road beds that are currently in place. While these road activities would provide no positive cumulative effects to watershed resources, there would be no additional negative impacts as the disturbance currently exists.

Overall, implementation of alternative B with all of the restoration activities planned to benefit watershed, soil, riparian and aquatic resources would result in positive cumulative impacts to watershed conditions. The limited amount of road disturbance remaining would not negatively impact cumulative effects. The treatments project-wide would result in upward trends in watershed condition classification to all of the watersheds with proposed restoration treatments, with some watersheds likely moving to an improved condition class.

Alternative C – Herbicide Utilization

Alternative C would have the same cumulative effects as alternative B. The only difference in this alternative is the use of herbicide on rabbitbrush and juniper trees, in addition to, or in lieu of, mechanized removal of these species. There would be no additional positive or negative cumulative effects to watershed conditions with the added use of herbicide to vegetation.

Alternative D

Alternative D is similar to alternatives B and C, minus 4.2 miles of user-created routes added to the system, minus construction of 0.3 miles of all-terrain vehicle routes, and minus reopening of 13.6 miles of closed routes (which would instead be decommissioned). The absence of these activities provides the least amount of disturbance to soils of any action alternative over the long-term. The 13.6 miles of closed routes would be decommissioned and the 4.2 miles of user routes would receive restoration treatments. Long-term impacts related to these road beds would be reduced and positive cumulative effects would result. The lack 0.3 miles of reroute would result in existing negative impacts remaining in Dillman Creek related to stream crossings. As this disturbance currently exists, there would be no additional negative impacts, but no positive benefits to the stream resource. Similar to alternatives B and C, this alternative would receive all of the other restoration activities planned to benefit watershed, soil, riparian and aquatic resources, which would result in positive cumulative impacts to watershed conditions. This alternative provides the most positive cumulative effects of all action alternatives by reducing the proposed motorized transportation treatments. However, considering the scale of the project area and the reduced number of proposed routes and disturbed acreage between alternatives B, C, and D, the difference in positive cumulative effects is minor.

Summary of Cumulative Effects

Past and ongoing activities on the Gila National Forest include a variety of actions such as fuelwood harvest, timber sale activities, mining, prescribed burns, fires, road and trail construction and maintenance, rangeland grazing, hunting and camping, wildlife use, off-highway vehicle use, other recreational uses, and water impoundments. Current timber sale activities have been minimal and small, and fuelwood cutting has been dispersed and would continue to be. Mining activities are minimal to nonexistent within the eleven watersheds.

Existing National Forest System roads receive periodic maintenance designed to improve drainage and reduce excessive runoff and sediment into connected drainages. Future runoff and sediment are not expected to increase on existing improved National Forest System roads.

The average road density within the watersheds is fair, ranging between 1 and 2.4 miles per square mile. Roads remain one of the larger contributors of sediment to the drainage network. All action alternatives propose to reduce road densities, mostly through decommissioning of maintenance level 2, high-clearance routes. As noted prior, two stream reaches are currently not attaining State water quality standards. With many roads across the Gila National Forest lacking adequate drainage features, roads have been identified by the State as being one probable source of impairment for Centerfire Creek. Water quality issues would continue to be a concern in these watersheds for stream reaches that are impaired and for those that have designated or occupied habitat for threatened, endangered, and sensitive species. While other perennial streams are not listed as impaired, many of these stream reaches have not yet been assessed by the State of New Mexico. Sediment input would be reduced by decommissioning of routes under all action alternatives but would still remain a concern in all perennial and intermittent streams impacted by remaining routes. Motorized crossing will be reduced under all action alternatives, as well as a reduction in stream miles adjacent to perennial, intermittent, ephemeral, and impaired water bodies.

Livestock grazing across the Gila has seen reductions, with added measures taken to either exclude riparian areas or implement riparian specific management along streams. Future impacts should be consistent with current impacts. Fires managed for benefit of natural resources and vegetation treatments would continue to play a role in these watersheds, when possible, in attempts to restore ecosystem health. There are several localized areas within the project area at high risk for current and/or future resource degradation without attention to best management practices and design features. In particular those areas having sensitive soils, riparian areas, and wetlands would be most vulnerable.

Reasonable foreseeable actions that are expected to occur include reauthorization of livestock grazing permits, vegetation management projects, and watershed and road/trail improvement projects. In addition, the adjacent Apache-Sitgreaves National Forests are conducting the similar West Escudilla Restoration Project, and are expected to improve watershed conditions at a landscape scale via vegetation, watershed, and motorized transportation treatments. This neighboring Forest shares four sixth code watersheds with the Gila National Forest, and improvements on its adjacent National Forest System lands would have beneficial cumulative impacts, watershedwide.

Existing watershed, soil, and aquatic conditions were used to determine current watershed condition classification which can be viewed as a collective assessment of all prior activities, both natural and human caused, that have cumulatively impacted watershed, soil, and aquatic

resources. Careful planning should occur in watersheds that are Functioning at Risk or Impaired to ensure that future projects are distributed over space and time. Some programs and activities in the project area have localized, short-term, adverse effects to watershed, soil, and aquatic resources, however the cumulative effects of past, present and reasonable foreseeable future activities, including the implementation of the Luna Restoration Project, would be beneficial.

In comparison to alternative A, selection of any of the action alternatives would result in positive cumulative effects to watershed condition classification as they provide for the benefit and restoration of multiple watershed resources. Several watersheds are anticipated to move to an improved watershed condition classification over the life of the project due to restoration activities.

Roads

Transportation Specific Assumptions

- Motor vehicle use authorized by state law is occurring on National Forest System roads unless there are Gila-National-Forest-specific prohibitions. Analysis assumes compliance.
- There is some cost for maintenance that will have to be borne by the Forest Service for all National Forest System roads.
- There will be implementation costs regardless of the alternative selected.

Affected Environment

National Forest System roads are managed for the use and administration of National Forest System lands. Although generally open and available for public use, that use is at the discretion of the Secretary of Agriculture. Through authorities delegated by the Secretary, the Forest Service may restrict or control traffic to meet specific management direction (USDA Forest Service 2008). Roads in the National Forest Transportation System are not public roads in the same sense as roads under the jurisdiction of State and County road agencies. National Forest System roads are designed, constructed, and maintained to provide access for the utilization and management of the national forest and are tracked in the Gila National Forest transportation atlas. National Forest System roads are managed in one of three ways: as closed long-term to motor vehicles (closed roads), roads maintained for high-clearance vehicles only (high-clearance roads), and roads maintained for passenger car vehicles.

As of January 1, 2017, the Gila National Forest fully implemented the record of decision for the Travel Management Rule (USDA Forest Service 2005). Across the entire forest, there are 3,657 miles of National Forest System roads designated open (operation maintenance levels 2 through 5) to motor vehicle use by the public or by written authorization and 1,407 miles of roads closed to motor vehicle use (operation maintenance level 1) (table 59).

Table 59. Existing Gila National Forest System roads by operation maintenance level (OML) and general description of each maintenance level.

Operation Maintenance Level	Miles
1 - Intermittent service roads during the time they are closed to vehicular traffic	1,407
2 - Roads open for use by high-clearance vehicles	3,261
3 - Roads open and maintained for travel by prudent drivers in standard passenger cars	247
4 - Roads that provide a moderate degree of user comfort and convenience at moderate travel speeds	125
5 – Roads that provide a high degree of user comfort and convenience	24
Total Miles	5,064
Miles open to motor vehicle use (OML 2-5)	3,657

There are approximately 587 miles of roads that lie within the Luna Restoration Project area (table 60). The majority, 478 miles, are under Forest Service jurisdiction, of which approximately 298 miles are open to all motor vehicle use (table 61). The remaining 109 miles are a mix of Federal, County, or private jurisdiction. Many of these roads provide access for local communities as well as access to and through the area for recreational and business purposes. National Forest System roads within the project area are also used for research, fish and wildlife habitat management, range management, timber harvesting, fire protection, mining, insect and disease control, and private land use.

Table 60. Roads under other jurisdiction within the Luna Restoration Project area.

Road Jurisdiction	Miles
National Forest System Roads	478
County	76
Private	20
U.S. Highway	14
Total Miles	587

Source: INFRA, GIS

Table 61 depicts the breakdown of the existing 478 miles of National Forest System roads by operational maintenance level within the Luna Restoration Project area.

Table 61. Existing National Forest System roads within the Luna Restoration Project area broken down by operation maintenance level and general description of each maintenance level.

Operation Maintenance Level (OML)	Miles
1 - Intermittent service roads during the time they are closed to vehicular traffic	180
2 - Roads open for use by high-clearance vehicles	250
3 - Roads open and maintained for travel by prudent drivers in standard passenger cars	35
4 - Roads that provide a moderate degree of user comfort and convenience at moderate travel speeds	13
5 – Roads that provide a high degree of user comfort and convenience	0
Total Miles	478
Miles open to motor vehicle use (OML 2 through 5)	298

Source: INFRA, GIS

Environmental Consequences

Alternative B and C are the same in regards to proposed changes to the National Forest road system. The differences between all of the alternatives are summarized in table 62.

Table 62. Changes to National Forest System road miles by alternative

Proposed Changes	Alt A	Alt B	Alt C	Alt D
Road decommissioning	0	116	116	130
Re-open operation maintenance level 1 closed National Forest System roads for permitted use for proposed treatment activities and decommission after activities are completed (included in road decommissioning above)	0	12	12	12
Total road miles removed from national forest road system	0	116	116	130
Re-open operation maintenance level 1 closed National Forest System roads to all vehicle types	0	13.8	13.8	0.2
Add unauthorized roads to National Forest System roads open to all vehicle types	0	4.2	4.2	0
Total additional road miles open to all vehicle types	0	18	18	0.2
Re-open operation maintenance level 1 closed National Forest System roads for permitted use for proposed treatment activities and close after activities are completed (no net change to national forest road system mileage)	0	22.6	22.6	22.6
Construct 3 to 5 miles of temporary roads for proposed treatment activities and decommission upon completion of activities (no change to system miles as temporary roads are not tracked in the forest transportation atlas)	0	3 to 5	3 to 5	3 to 5
Add unauthorized road to National Forest System roads for administrative use or by written authorization only (Tucson Electric Power Company)	0	0.5	0.5	0.5
Re-open operation maintenance level 1 closed National Forest System roads for administrative use or by written authorization only (Tucson Electric Power Company)	0	3.5	3.5	3.5
Total additional road miles for administrative use or by written authorization only	0	4.0	4.0	4.0
Total road miles added to national forest road system	0	22	22	4.0
Net reduction in National Forest System road miles	0	94	94	126

Tucson Electric Power Company has a main transmission line that runs through the project area that they need to access for maintenance, emergency repair, and structure replacements. To accommodate Tucson Electric Power Company needs, all action alternatives (B, C, and D) would reopen 3.5 miles of closed roads and add 0.5 miles of unauthorized roads to the forest transportation atlas.

Other publics provided comments requesting additional access for recreational activities. Those comments resulted in proposals to re-open 13.8 miles of closed National Forest System roads and add 4.2 miles of unauthorized roads under alternatives B and C. In alternative D, the 13.8 miles are proposed for decommissioning, putting the decommissioning total miles at 130 miles while the 4.2 miles of unauthorized roads would be subject to decommissioning.

The table does not address the decommissioning of unauthorized roads as they are not recognized as National Forest System roads and are not tracked in the forest transportation atlas. The same can be said for the 3 to 5 miles of proposed temporary roads (common to all action alternatives). Temporary roads are not tracked as they are not intended to become part of the national forest road system. Temporary roads are used for a short period for a specific purpose and then obliterated.

The proposal to re-open 22.6 miles of National Forest System roads in alternatives B, C, and D is to access proposed treatment sites. Reopening these roads, will not result in an increase of miles to the road system; because these roads would be closed as treatments are completed.

Trends

Under alternatives B and C, the proposal is to decommission 116 of the 180 existing miles of operation maintenance level 1 roads within the planning area (table 62). Decommissioning 116 miles of roads would be completed once all landscape treatments have been accomplished. The same 116 miles plus an additional 13.8 miles would be decommissioned in alternative D.

The reopening of previously closed roads and adding unauthorized roads to the forest's transportation atlas would result in more flexibility and increased opportunity for the recreating public. Alternatives B and C would add 18 miles to the existing 298 open miles (table 53) within the planning area. The additional 18 miles would result in an increase of approximately 6 percent of open National Forest System roads within the planning area. The 4 miles that would be added on behalf of Tucson Electric Power Company in all action alternatives would assist them in operating and managing their transmission line. These 4 miles would seldom see traffic as they would be under written authorization to Tucson Electric Power Company and wouldn't be added to the motorized vehicle use map.

Regardless of which action alternative is selected, the reduction to the overall national forest road system is negligible and would do little to help align the Gila National Forest road budget with the maintenance needs. Alternatives B and C would reduce the overall system by 94 miles, approximately 2 percent of the existing national forest road system, and alternative D would reduce the mileage by 126 miles or nearly 2.5 percent. Even though these reductions are small, the watersheds they reside in would benefit (less sediment migration from roadbeds, better water quality, reduced road density, etc.) as well as wildlife habitat (less fragmentation). The Travel Management Rule (USDA Forest Service 2005) provides flexibility when designating the motorized system. Roads previously closed may be reopened and roads designated for motorized use may be closed at a later date. Even though all the action alternatives propose to reopen roads and add unauthorized routes, the proposals net effect to the national forest road system would result in a mileage reduction due to the decommissioning proposals in all the action-alternatives. There would be some implementation costs associated with the use of the National Forest System roads within the planning area including National Forest System Road 3050 (0.2 mile) where drainage features would be maintained and existing berms would be removed or reworked to allow passage (applicable to all action alternatives).

There are also several bridges within the project area which may be used if any of the action alternatives are selected. Six are located on Catron County Road B007 and one is located along National Forest System Road 220 at Romero Creek. All these bridges have been evaluated and approved for highway legal loads. The additional traffic associated with proposed treatments (including logging trucks, semi tractors hauling heavy equipment, etc.) could also result in the

need for additional maintenance on roads operated and maintained by Catron County, specifically Catron County Roads B007, B080, and B024. Some of the roads on the Apache-Sitgreaves National Forests could also see additional traffic associated with proposed treatments.

There are no measureable maintenance cost savings associated with any of the action alternatives. The Gila National Forest will continue to seek opportunities to better balance the national forest road system with available funding. The more significant benefit is likely to be seen over time once the decommissioned roads identified in any of the action alternatives have been fully reclaimed by the natural landscape. Some of the anticipated benefits include reduced habitat fragmentation, better watershed conditions, reduced road density, etc.

Range

Range Resources

The Luna Restoration Project area includes portions of eight range allotments. Table 63 indicates how many acres of each allotment are located within the project area and have the potential to be impacted by project activities. The Centerfire, Dillman/Trout Creek, Luna, Spur Lake and Underwood Lake allotments are located entirely or almost entirely within the analysis area. The Laney and Mangitas allotments have large portions of the allotment within the analysis area and the Toriette allotment has minimal acres located within the analysis area.

Table 63. Grazing allotments located within the Luna planning area.

Allotment Name	Total Allotment Acres	Acres Within the Luna Analysis Area	Percent of Allotment within the Luna Analysis Area
Centerfire	20,551	20,307	99%
Dillman/Trout Creek	9,589	9,589	100%
Laney	26,449	13,343	50%
Luna	44,927	44,927	100%
Mangitas	25,116	6,144	24%
Spur Lake	74,457	62,874	84%
Toriette	39,442	256	less than 1%
Underwood Lake	13,053	13,053	100%

Environmental Consequences

Alternative A

Under the no-action alternative, none of the proposed treatments or activities would be implemented within the planning area. There would be no direct effects to the range resource.

Indirect effects associated with the no-action alternative would include continued encroachment of woody vegetation into neighboring grasslands and canopy closure of forested and woodland vegetation types that could lead to the decrease in the amount and diversity of herbaceous vegetation on the landscape. The fuels reduction projects and prescribed fire activities would not occur, increasing the opportunity for high-severity fire to occur across the landscape and negatively impact the range resource. The proposed watershed treatments would not be implemented allowing for continued degradation of these systems. This could present negative

effects to the range resource through continued erosion and loss of soil productivity in these systems. Water availability to vegetation, livestock and wildlife could be reduced by down cutting of stream banks that can cause the water table to recede and decrease the duration in which precipitation is available for infiltration and use by the surrounding vegetation.

There would be no cumulative effects to the range resource under this alternative.

Effects Common to Alternatives B, C, and D

The direct effects of action alternatives would include disturbance to the herbaceous vegetation and soils during implementation of the proposed projects that could require rest of a pasture or portion of a pasture. These effects are expected to persist for a short duration and have minimal impacts through the proposed mitigations. This effect is mitigated through the coordination of activities with the range management specialist and the affected permittee to allow for adaptive management to be incorporated into the allotment management plan and to ensure that the timing and scale of the project would not place an undue burden on the range resource and livestock management. Adaptive management actions that may occur to mitigate effects include adjustments in pasture rotation schedules, herding, salting and reduced numbers.

The indirect effects of the action alternatives would primarily be of benefit to the range resource. The proposed vegetation, prescribed fire and watershed activities would increase the opportunity for the occurrence and diversity of herbaceous vegetation throughout the analysis area. This, along with the proposed water developments and pasture division, would lead to the improvement of livestock distribution and use across the landscape, allowing for improved livestock management and resilience of the range land vegetation during times of drought and unforeseen climate conditions. With any soil disturbing activity the opportunity exists for noxious weeds to become established. The proposed activities would implement strategies to reduce or eliminate the opportunity for introducing weed seed through the implementation of proposed projects. Reseeding when necessary and appropriate would also occur within disturbance sites to decrease the opportunity for noxious weeds to establish and to reduce the exposure of soils to erosion. If noxious weeds immerge within the analysis area, they would be addressed through the environmental assessment for noxious weed management (Gila National Forest 2000 and 2015 supplement plant list).

Alternatives B and D

In alternatives B and D, rabbitbrush treatment by mowing alone would likely require several consecutive years of reentry to achieve measurable mortality of rabbitbrush within a given treatment area and has the potential to expose the soils and associated vegetation to increased disturbance. Single entry mowing would likely change the physical structure of the plant community allowing for the growth of herbaceous vegetation for a short duration until the rabbitbrush becomes reestablished. Some acres identified for rabbitbrush treatment cannot be accessed with mowers exclusively, therefore desired conditions may not be reached on these acres.

Cutting of alligator juniper from grasslands will initially result in increased herbaceous ground cover. This species re-sprouts and within a decade may be of size where it competes with herbaceous ground cover.

Alternative C

The use of herbicides to treat rabbitbrush and alligator juniper will move the landscape towards desired conditions in a shorter timeframe than alternatives B and D. Herbicide treatments would increase mortality in rabbitbrush and alligator juniper therefore, minimizing re-sprouting of these species. More acres of rabbitbrush treatments could be accomplished utilizing herbicides versus mowing in alternatives B and D; due to access not being limited by topography or other features. The use of herbicides reduces the potential for increased ground disturbance from the need of repeated mowing.

Cumulative Effects

There would be an increase in herbaceous cover, acres of grassland, and water availability and distribution from implementing alternatives B, C, or D. When considering past, present, reasonably future activities, and activities proposed in the alternatives it is anticipated to result in a positive cumulative effect for range management.

Recreation

Affected Environment

The primary recreational opportunities, as identified in the 2011 Gila national visitor use monitoring data and district staff, are dispersed in nature and include; driving to view scenery and wildlife, dispersed camping, big game hunting, hiking cross country and on system trails, horseback riding, off-highway vehicle riding, shed hunting, photography, night sky viewing, bird watching, botanizing, and general nature observation.

There is one developed recreation site in the project area: Head of the Ditch Campground. The campground offers an easily accessible rustic streamside camping experience. It is located approximately 1.5 miles west of Luna, New Mexico on U.S. Highway 180. Its proximity to this major thoroughfare, makes it popular with folks traveling through the region. The campground also receives substantial use during the hunting seasons.

Dispersed camping and picnicking are popular in the Stone Creek, San Francisco River and Trout Creek corridors.

There are fifteen National Forest System trails in the planning area, totaling approximate 39.4 miles. Most trails are restricted to horses, hiking and mountain biking. Two motorized trails are located in the Dry Blue drainage.

Off-highway vehicle riding is popular in the Luna area. Roads provide opportunities for all vehicle types, this includes off-highway vehicles greater than 50 inches in width. The popular utility task vehicles, which provide side-by-side operation, fall into the greater-than-50-inches category. Low maintenance level roads (maintenance level 2) provide the opportunity for this width of vehicle class as well as the unimproved trail-like experience desired by the off-highway vehicle rider.

Hunting is a major recreational use in the Luna planning area. Hunting seasons and restrictions are administered by the New Mexico Department of Game and Fish. Big game is the primary type of hunting: elk, bear, mountain lion, and deer. Wild turkey hunting is also popular. There are

24 special use permits for outfitter and guides in the project area. Hunting is dispersed in nature; however, some hunting parties revisit the same areas annually.

Environmental Consequences

Alternative A – No Action

Under the no-action alternative, there would continue to be approximately 39.4 miles of National Forest System trail. Head of the Ditch Campground would remain open. Visuals would mostly remain unchanged due to being constrained by existing vegetation conditions, such as tree densities. Hunting and other recreational pursuits would continue. The motorized transportation network would not change from the 2013 travel management decision. Driving for pleasure would continue. Off-highway vehicle recreation would continue on low level maintenance roads open to the public.

Without vegetation and prescribed fire treatments the potential risk for high severity, wildfires, such as the Wallow Fire, would continue. These fires adversely could affect recreation by damaging infrastructure, including damaging trail networks and accessibility; and heavily modifying the recreational setting.

Low-water fords on the Dry Blue Creek (trails #61 and #64) and Head of the Ditch would remain in their current state and location. Issues with sedimentation and aquatic resource damage would continue.

Cumulative Effects

There are no cumulative effects to recreation due to no activities proposed under the no-action alternative.

Effects Common to Alternatives B, C, and D

In the short-term, there would be some inconvenience to visitors to the Luna Restoration Project area during implementation. Areas or facilities may be temporarily closed to help ensure public safety. Project implementation would likely result in a more aesthetically pleasing recreational setting.

Thirteen of the 15 trails are located within active treatment areas or would be worked on. Treatments would alter the visuals in the immediate foreground. Affected portions of the trails would be temporarily closed to help ensure public safety. Prescribed fire may result in the creation of snags along trails. If snags fall they could impact the accessibility along the trail.

People recreating within the planning area could encounter the sights and sounds of equipment and workers during implementation. There would likely be temporary effects to the flow of traffic on these travel ways, such as delays or detours. Treatments would alter the visuals in the immediate foreground such as; slash, piles, landings, skid trails and disturbed ground would be evident in the short term. In the long term, scenic integrity would be improved by restoring structure to vegetation communities, with sight lines becoming more open.

Implementation would temporarily displace opportunities for recreation and hunting. However, implementation would be localized; while work is implemented in one area, other areas within the project area would be open. Some visitors may choose to avoid the area entirely.

Head of the Ditch Campground would temporarily close during construction of the low-water crossing and diversion to help ensure public safety. This is the only developed campground within the project area. During implementation there are no other opportunities for developed camping within the planning boundary. Relocation of the low-water crossing would improve access to campground sites located across the San Francisco River.

Motorized trails in the Dry Blue Creek (trails #61 and #64) would be improved through design and construction of six water crossing and rerouting 0.1 mile of trail. This would move towards reducing impacts to threatened and endangered species and their habitat, and reducing sedimentation.

Decommissioned roads would be available to the public to hike, bike, or ride horses on. This recreational experience would likely be enhanced due to the absence of motorized vehicles. In addition 4.2 miles would be added to the foot and horse trail system by leaving a trail tread on National Forest System Roads 4023 V; 4029 E, and 4030 W during decommissioning.

Roads open for administrative use only are available to the public to hike, bike or ride horses on.

Roads and trails could be temporarily closed during prescribed fire activities to help ensure public safety. The presence of active fire and smoke could cause some visitors to change their travel plans. Smoke could linger for days in some areas, causing visitors to avoid those locations. Smoke from prescribed fires may have a direct effect to the quality of the recreation experience by temporarily reducing air quality and visibility.

Effects Common to Alternatives B and C

In collaboration with the Luna Riders, 18.0 miles of closed and user-created routes were identified to be added to motorized transportation system. These select closed system roads and user-created routes were identified for provide access from the community of Luna, access into Arizona, loop opportunities, and to access favorite spots for scenic views and picnicking. Opening existing closed and user-created routes would enhance recreational opportunities through improving connectivity of the road system and enhancing riding experience.

The proposed action during scoping limited the 18.0 miles of road to all-terrain and utility task vehicles less than 50 inches in width. As proposed in alternative B, these 18.0 miles would be open to all motorized vehicle types; which includes popular utility task vehicles that allow for side-by-side riding. Therefore, adding roads of this class provides more opportunity for this type of recreation.

In collaboration with the Luna Riders, a new route was identified to connect an open road in the Luna rodeo grounds to a system of open roads in the Stone Creek area. Construction of a 0.3 miles of 4x4 trail addresses sensitive riparian resource concerns in Dillman Creek and enhances connectivity of road systems for recreational opportunities. The tread width of 60 inches would provide utility task vehicle opportunities.

Alternative C - Herbicide Utilization

The use of herbicides to increase effectiveness of restoration would have a few effects to recreation opportunities. The sights and sounds of herbicide application would be apparent during implementation. Following manufacture instructions and design features related to

notification and posting, would minimize any potential negative impacts to Gila National Forest visitors during or from herbicide applications.

Herbicide treatment activities may temporarily displace visitors. Visitors may choose to avoid an area where herbicide treatments have been applied.

Proposed herbicide treatments would likely have an overall beneficial effect to visual quality. Short-term impacts from chemical treatments would include dying vegetation that could be visible. Long-term effects would be beneficial through the enhancement and restoration of areas of grasslands, forested, and woodland areas.

Alternative D - No Addition of Motorized Routes

The 18.0 miles of closed and user-created routes that were identified in collaboration with the Luna Riders would not be added to motorized transportation system under this alternative to address an issue identified from scoping comments. Therefore, access from the community of Luna, access into Arizona, loop opportunities, and access to favorite spots for scenic views and picnicking would not be provided. Connectivity of the road system to enhance riding experience would remain a public concern, including the connection between the Luna rodeo grounds to a system of open roads in the Stone Creek area.

Cumulative Effects

Recreation opportunities and scenic quality as a result of implementing alternative B, C, and D would result in cumulative impacts, when considering past, present, reasonably future activities, activities proposed in this alternative, and activities identified in the West Escudilla Project on the Apache-Sitgreaves National Forests.

Recreation opportunities could be cumulatively impacted due to the increased management activities. Road networks along the state line of New Mexico and Arizona could be utilized by both national forests for implementation of projects. This could result in traffic, dust, and noise which could lead to a slight inconvenience and displacement of visitors. This would be of episodic and extent is dependent upon what activity treatment(s) are being implemented.

Cumulative impacts to scenic quality are possible if evidence of multiple activities are visible during the same season. Similar vegetation treatments are planned in the West Escudilla Project. Cumulative impacts to visual resources along the state line would likely only last during implementation. Long-term cumulative impacts are likely to be beneficial as healthy forest conditions are restored.

Climate Change

Climate change influences such things as the weather, vegetation, habitat, water, and wildlife across the landscape. Depending on the changes to these resources due to climatic change, recreational opportunities or users may change or alter those opportunities and uses. But determining the relation of climate change and recreation uses is not easily identifiable.

Recreation – Inventoried Roadless Areas

Inventoried roadless areas are designated pursuant to 36 CFR section 294, subpart B, section 294.11. Inventoried roadless areas are identified in a set of maps contained in Forest Service

Roadless Area Conservation, final environmental impact statement, and volume 2 (USDA Forest Service 2000a).

This analysis describes the existing condition of the three inventoried roadless areas within the Luna Restoration Project area. This includes all of the Mother Hubbard portions of the Nolan and Frisco Box Inventoried Roadless Areas.

Low-severity prescribed fire is proposed in the Mother Hubbard and Nolan Inventoried Roadless Areas. There is none prescribed within the Frisco Box Inventoried Roadless Area, but a short section of trail is proposed to be enhanced by reducing its width from a road to single-track trail. This roadless analysis also describes the potential effects to the roadless characteristics and wilderness attributes of the inventoried roadless areas from the proposed treatment activities identified in the alternatives.

The recreational opportunity spectrum classes are not mapped and therefore unavailable. The Gila forest plan prescribes a forestwide standard to manage the three inventoried roadless area to semi-primitive spectrum of recreation opportunities.

Affected Environment

The inventoried roadless area contain a variety of vegetation types including pinyon-juniper, riparian, ponderosa pine, and mixed conifer at higher elevations. There are no municipal watersheds, but there are perennial water features such as Blue and Colyer Springs, and reaches of Pace, Dry Blue, and Centerfire Creeks in these areas. All roadless areas contain habitat for threatened and endangered species such as Mexican spotted owl, Mexican grey wolf, narrow-headed and northern Mexican gartersnakes and loachminnow but is not the only habitat for these species on the Gila National Forest. Dispersed recreation, such as hiking, hunting, and observing nature, are the main recreational uses.

Nolan Inventoried Roadless Area

The Nolan Inventoried Roadless Area is 13,050 acres in size with 8,912 being situated along the southwestern boundary south of the Dry Blue Canyon with a portion of the San Francisco Mountains of the planning area. This roadless area also extends across the state line into the Apache-Sitgreaves National Forests.

Summary of the roadless area characteristics and wilderness attributes of Nolan Inventoried Roadless Area:

- **Natural - The extent to which long-term ecological processes are intact and operating:** Due to decades of fire suppression, ecological processes have departed from historical norms. Forest stand densities have high crown fire potential which promotes high severity fire. The current state of this attribute is degrading.
- **Undeveloped - The degree to which development and uses are apparent to most visitors:** Evidence of human activity is present across much of the area but is subtle in appearance. Fuelwood cutting, recreation use, private land and road building are a few examples of what has contributed to defining the degree to which development and uses are apparent to most visitors and departure from the undeveloped characteristic within the roadless area.

- **Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation:** Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.

Nolan includes areas with more potential for solitude than others. Topographically constrained areas such as Frieborn and Colyer Canyons provide more isolation from the sight and sounds of civilization than do areas near U.S. Highway 180 or the motorized Dry Blue Creek Trail, where noise associated with motorized vehicles are common.

The area is managed for semi-primitive recreation per the Gila forest plan (USDA Forest Service 1986). A substantial area would likely qualify for semi-primitive nonmotorized (interior) and the periphery would likely qualify for semi-primitive motorized or roaded natural (areas near Horse Mesa and Dry Blue Creek Trail).

- **Special Features:** Colyer Spring is a perennial source of water, which is considered special in the arid region.
- **Manageability:** Nolan Inventoried Roadless Area within the planning area is defined mostly by landform and the presence of road and motorized trail. This shape renders it easily manageable. The portion of the roadless area outside the planning area was not considered for manageability.

Mother Hubbard Inventoried Roadless Area

The Mother Hubbard Inventoried Roadless Area is 5,895 acres in size and is situated entirely within the planning area along the southwestern boundary north of Dry Blue Canyon.

Summary of roadless area characteristics and wilderness attributes of Mother Hubbard Inventoried Roadless Area:

- **Natural - The extent to which long-term ecological processes are intact and operating:** Due to decades of fire suppression, ecological processes have departed from historical norms. Forest stand densities have high crown fire potential which promotes high-severity fire. The current state of this attribute is degrading.
- **Undeveloped - The degree to which development and uses are apparent to most visitors:** Evidence of human activity is present across much of the area but is subtle in appearance. Fuelwood cutting, recreation use, private land, and road building are a few examples of what has contributed to defining the degree to which development and uses are apparent to most visitors and departure from the undeveloped characteristic within the roadless area.
- **Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation:** Mother Hubbard has areas with more potential for solitude than others. Topographically constrained areas such as Pace Creek and Dry Blue Creek canyons provide more isolation from the sight and sounds of civilization than do areas near the north boundary or the motorized Dry Blue Creek Trail, east boundary, where noise associated with motorized vehicles are common.

The area is managed for semi-primitive recreation per the Gila forest plan (USDA Forest Service 1986). A substantial area would likely qualify for semi-primitive nonmotorized (interior) and the periphery would likely qualify for semi-primitive motorized or roaded

natural (areas near north, east and Dry Blue Creek Trail).

- **Special Features:** Blue Spring is a perennial source of water which is considered special in the arid region.
- **Manageability:** Mother Hubbard Inventoried Roadless Area is defined mostly by landform and the presence of road and motorized trail. This shape renders it easily manageable. The exception would be the northern and eastern boundaries might be difficult to locate on the ground.

Frisko Box

The Frisko Box Inventoried Roadless Area is 38,977 acres in size with 8,312 and is situated on the eastern boundary of the planning area. The roadless area contains the Centerfire Creek Valley and contains Upper Cottonwood, Joshua, Howell, and Curio Canyons.

Summary of roadless area characteristics and wilderness attributes of Mother Hubbard Inventoried Roadless Area:

- **Natural - The extent to which long-term ecological processes are intact and operating:** Due to decades of fire suppression, ecological processes have departed from historical norms. Forest stand densities have high crown fire potential which promotes high-severity fire. The current state of this attribute is degrading.
- **Undeveloped:** The degree to which development and uses are apparent to most visitors. Evidence of human activity is present across much of the area but is subtle in appearance. Fuelwood cutting, recreation use, private land and road building are a few examples of what has contributed to defining the degree to which development and uses are apparent to most visitors and departure from the undeveloped characteristic within the inventoried roadless area.
- **Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation:** Frisko Box has areas that have more potential for solitude than others. Topographically constrained areas such as Upper Cottonwood, Joshua, Howell, and Curio Canyons provide more isolation from the sight and sounds of civilization than do areas near the northern boundary where noise associated with motorized vehicles are more common.

The area is managed for semi-primitive recreation per the Gila forest plan (USDA Forest Service 1986). A substantial area would likely qualify for semi-primitive nonmotorized (interior) and the periphery would likely qualify for semi-primitive motorized or roaded natural (areas near Centerfire Creek Valley and northern boundary).

- **Special Features:** Centerfire Creek is a perennial stream, which is considered special in the arid region.
- **Manageability:** The Frisko Box Inventoried Roadless Area is defined mostly by landform and the presence of road. This shape renders it easily manageable. The exception is the northern boundary, which is difficult to locate on the ground.

Environmental Consequences

The effects to the inventoried roadless areas were analyzed using the duration and trend of the effect on roadless area characteristics and wilderness attributes.

Alternative A – No Action

Under alternative A, no activities would occur. Consequently, fuel loading would continue to increase over the project area. This would create an increased risk of wildfire. The potential event of an uncharacteristic wildfire could impact the naturalness, recreation values, or both in the area.

Alternative A would leave the current roadless character and potential wilderness values unchanged. Any direct or indirect effects of this alternative would be the result of continued natural processes in the area.

- **Natural - The extent to which long-term ecological processes are intact and operating:** Prescribed fire and vegetation treatments would not be reintroduced. The existing downward trend of species diversity, age diversity, and tree density diversity would continue. High-severity wildfire could result in large homogenous burned areas.
- **Undeveloped - The degree to which development and uses are apparent to most visitors:** No treatments would occur under this alternative, and no new development or uses would become apparent to visitors.
- **Outstanding opportunities for solitude or primitive unconfined recreation:** The existing condition for solitude would not be immediately affected under this alternative. However, over time conditions could become challenging for visitors to recreate due to forest stand conditions. Forest stand conditions could increase opportunities for solitude, for those who are able and willing to negotiate an increasingly dense and inaccessible area.

Wildfires could dramatically change the landscape, changing how people access or recreate in the roadless areas. In the case of wildfires, sight distance and topography screening could be changed for decades, impacting solitude, as sights and sounds of visitors in the area as well as activities on adjacent lands would more easily be seen and heard.

- **Special Features:** The existing springs and perennial water sources would not be affected under this alternative. However, existing stand conditions would render them susceptible to the effects of high-severity fire.
- **Manageability:** Choosing the no-action alternative would not change the manageability of the area.

Cumulative Effects

Since there are no activities being implemented under alternative A, current activities (for example, grazing, hunting, and hiking) would continue, but there would be no cumulative effects to roadless characteristics and wilderness attributes.

Effects Common to Alternatives B, C, and D

There are no differences in proposed activities between the alternatives B, C and D within the three inventoried roadless areas. Each alternative proposes low-severity prescribed fire within the Mother Hubbard and Nolan Inventoried Roadless Areas and a road to trail conversion in the Frisco Box. All alternatives would have some short-term effect to the undeveloped, natural, and opportunities for solitude or primitive unconfined recreation attributes of the area but would result in a long-term beneficial effect.

In summary, the effects from low-severity prescribed fire are expected to be minor and short term. Few characteristics such as plant and animal communities, habitat for threatened and endangered species, and recreation opportunities would expect slightly degrading effects in the short-term and then improving in the long term. Prescribed fire may cause direct short-term impacts to air resources from smoke.

Temporary effects to solitude and recreation could occur along roadless boundaries from the greater Luna Restoration Project activities, including sights and sounds of people working, chainsaws, dust and smoke; however, long-term impacts to recreation and opportunities for solitude are not expected to occur.

- **Natural - The extent to which long-term ecological processes are intact and operating:** Prescribed fire would begin modifying the trends caused from past fire suppression and reduce the potential probability of severe wildfires. Prescribed fire would enhance the characteristic of “naturalness” throughout the area, by re-establishing forest characteristics typical of frequent fire ecosystems.

Low intensity prescribed fire would be classified as a type of human manipulation with methods of ignition emulating a lightning fire. No fire line is expected to be constructed. Fire behavior is expected to be low creeping through the understory. The resulting pattern on the landscape would be small patch sizes of burned area (mosaic) with irregular shapes. Over time, as multiple entries are made to meet fuel objectives, vegetation communities within the Nolan and Mother Hubbard roadless would begin to move towards conditions that include mosaic of various size and age classes which and more resilient to changing environmental conditions and stressors.

The road to trail conversion in Frisco Box roadless area would restore the subsurface hydrology to the existing road prism that trail number 119 currently uses. Portions of the decommissioned road would revegetate through successional processes.

- **Undeveloped - The degree to which development and uses are apparent to most visitors:** In the short term, visitors to the areas would see isolated patches of blackened and charred vegetation and soils. Although these visible effects of prescribed burning can mimic natural fire disturbances, such blackened landscapes are often perceived negatively by the public. In the long term, the prescribed burning actions would reduce fuel loading and promote regeneration of trees, shrubs, wildflowers, and other herbaceous plants. This activity would diversify the mosaic of vegetation.

Soil and vegetation disturbance associated from road to trail conversion would be evident to visitors. However this would be a short-term effect, as the disturbed area would revegetate, leaving single-track trail that is appropriate for the design use (pack and saddle and hiking).

- **Outstanding opportunities for solitude or primitive unconfined recreation:** It is likely portions of the Mother Hubbard and Nolan Inventoried Roadless Areas may be temporarily closed during prescribed fire implementation to ensure public safety and welfare. This would be a short-term effect. Visitors that are temporarily displaced would find comparable opportunities within and outside of the planning area. The degree of primitive recreation is not expected to be affected.

Multiple prescribed fire entries over time would be needed to achieve objectives of reducing the probability of high-severity fire. With multiple entries over time the sight distance may change from current; but this change would not be to the extent of the

potential effects of a wildfire.

Solitude of segments of trail # 119 would be affected during implementation while work is completed. This is a short-term effect, as solitude would quickly be restored after implementation.

It is possible that visitors to, and outside, the inventoried roadless areas would experience the sights and sounds of on-the-ground staff and aerial operations implementing the prescribed fires. Smoke emissions from prescribed fires across the planning area. The duration is expected to be short term and solitude would be restored shortly after implementation.

- **Special Features:** Springs, perennial water sources, and cultural resources are the only known special features in the three inventoried roadless areas. It is not expected that there would be impacts to these features during implementation.
- **Manageability:** All action alternatives would not affect the existing manageability of the roadless areas. Roadless boundaries are not clearly definable on the ground; therefore, the issue of manageability along boundaries is anticipated to continue.

Cumulative Effects

Cumulative effects to roadless resources from all action alternatives would generally be short term and related to an increased presence of people, noise that may affect solitude. These effects would be more evident along the boundaries of the roadless areas where treatments are both inside and outside the areas. In some of the units, there would be a greater sight distance than existing conditions. For several years, visitors could become more aware of other activities in the area as well as on private lands. This effect would not be as great as potential effects from a large wildfire, which would likely denude the landscape of all vegetation. An indirect effect of proposed prescribed fire activities could be displacement of visitors to untreated areas for recreation, mostly because of visuals however, this effect would last for about 1 to 2 years after prescribed fire activities when green-up would occur.

The long-term forest health and resiliency would be most improved under the action alternatives than the no-action alternative due to the development of a less homogenous forest, more diversity of species, and a mosaic of age classes. In the long term, treated areas would be more resilient to wildfire and other natural disturbances, which would more likely maintain the quality of soil, water, and air in the future.

Climate Change

The effects of climate change were considered during the effects analysis of proposed actions to roadless resources. It is expected that climate change effects would increase the length of fire season and increase likelihood of high-severity fire. As discussed in the no-action alternative, the existing vegetation conditions within the roadless areas have potential for a high-severity fire with high crown fire potential. Roadless resources could be at risk to irretrievable outcomes including species and habitat loss until vegetation becomes re-established

Roadless Rule Consistency

All alternatives comply with the Roadless Area Conservation Rule and applicable forest plan standards as amended by this rule. All action alternatives are within the exceptions identified in 36 CFR section 294.13(b)(1), in paragraphs (b)(2) through (b)(4), or both. Management activities

focus on restoring the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period.

Heritage Resources

Gila National Forest History

The Gila National Forest has a rich archaeological and cultural history. The Gila National Forest includes lands that have been used and occupied by humans through the prehistoric era, beginning with the Paleoindian period (circa 10000 B.C. to 5500 B.C.), into the Archaic period (circa 5500 B.C. to A.D. 200). Both the Paleoindian and Archaic period peoples were relatively mobile on the landscape. However, during the Archaic period the transition from a hunter-gatherer lifeways to agricultural lifeways occurred.

Over time, Archaic period peoples began to develop cultural lifeways that would come to be known as the Mogollon Culture. The Mogollon Culture spans two broad time periods: the Pithouse period (circa A.D. 200 to 1000) and the Pueblo period (circa A.D. 1000 to 1450). As the name implies, Pithouse period structures were at least partially subterranean, and dug sub-grade below the surrounding surface. The beginning of the Pueblo period (circa A.D. 1000 to 1400) is marked primarily by the appearance of above ground architecture.

The historic period began in New Mexico with Spanish contact in 1539. On the Gila National Forest and elsewhere in New Mexico, the historic period is divided by the rise and fall of political control by the Spanish (A.D. 1539 to 1821), Mexican (A.D. 1821 to 1848), and American (A.D. 1848 to present) governments (Opler 1983).

Contemporary and historic land uses include mining, ranching, grazing, logging, frontier settlement, frontier military activities, and government land management. Evidence of these activities persists in the archaeological record today. Since the establishment of the Gila National Forest in 1905, ranger stations, administrative sites, lookouts, and recreational areas have been built as well. Finally, Civilian Conservation Corps (CCC) camps and their constructed infrastructure (for example, roads, bridges and campgrounds) are found across the Gila.

Today, land use in the Gila National Forest continues to follow the multiple use mission of the Forest Service, including grazing, mining, ranching, and vegetation and fuels management. Native American Tribes also continue to intermittently use the Gila for traditional activities including plant gathering and visits to special places. Tribes have not identified any traditional cultural properties or sacred sites within the Luna Restoration Project area through consultation, nor have any been identified as being affected by other projects within the planning area.

Affected Environment

For around the past 50 years, Forest Service cultural resource specialists, in compliance with sections 106 and 110 of the National Historic Preservation Act of 1966, as amended, have inventoried approximately 17,415 (10 percent) of the 185,586 acre Luna planning area to current professional standards. An additional 50,638 acres have been inventoried within the Luna planning area; these inventories do not meet current standards.

For the Gila National Forest and the Southwest Region (Region 3) of the Forest Service, a cultural resource site is defined as “a locus (location) of purposeful human activity which has

resulted in a deposit of cultural material beyond one or a few accidentally lost artifacts” (USDA Forest Service, Southwestern Region 1987). In practical terms, cultural resource sites include such entities as prehistoric surface structures (pueblos); concentrations of broken pottery sherds, stone tool waste flakes, grinding implements, or a combination of these things; or the remains of historic structures or mines.

The survey endeavors discussed above have recorded 513 heritage resource sites within the planning area. No properties listed in the National Register of Historic Places are located within the Luna planning area. About 209 sites located in the planning area have been determined to be eligible for inclusion in the National Register of Historic Places, about 37 sites have been determined to be not eligible. About 278 sites remain unevaluated and will require further study before a formal determination of eligibility for inclusion in the National Register of Historic Places can be made. For this project, only sites considered eligible for inclusion in the National Register of Historic Places, and those sites whose eligibility is undetermined, will require treatments to protect them from potentially adverse effects associated with project activities.

Analysis

The National Environmental Policy Act analysis considers only the change to the existing condition. Changes include proposals for vegetation treatment through mechanical means, hand thinning, prescribed burning, herbicide application, or a combination of these treatments. Other treatments include the construction of temporary roads; the decommissioning of roads; the construction, installation, or both of various range management features (wells, fences, storage tanks, etc.); and watershed improvement activities (construction of hardened crossings, erosion control features, riparian enclosure areas, etc.).

For the intent of the current analyses, the area of potential effect for the Luna planning area environmental analysis is considered to be those areas where:

- heavy equipment will be used to implement project activities (vegetation thinning, watershed restoration treatments, range management treatments, treatments to the transportation system, etc.);
- there is a high probability of site location for prescribed burning activities (if these areas fall outside of those where heavy machinery will be used during implementation);
- there is a high probability of site location for areas to be opened up for personal fuelwood collection (if these areas are greater than 500 acres in size); or
- there is a high probability of site location for other methods of herbicide application (with hand pumps, spread from back of all-terrain and utility task vehicles, etc.).

Gila National Forest personnel believe this area of potential effect adequately measures and addresses the potential direct, indirect, and cumulative effects of the proposed undertakings and are in agreement with those identified section I, appendix J, of the Region 3 first amended programmatic agreement (USDA Forest Service, Region 3 2010).

Relative Risk Analysis

This report uses a relative risk analysis to compare alternatives. Relative risk is considered the potential impact that can result from one action (alternative) measured against the potential impact that might result from a different action (alternative).

For cultural resources, the measure for direct and indirect effects for all actions will be based on the total survey acres needed by different proposed project activities. Since only 10 percent of the Luna planning area has been intensively surveyed, simply using the number of sites potentially affected by undertakings would leave vast areas of the planning area unaccounted for. However, the number of known sites is positively correlated with the miles or acreage of survey, as one increases so does the other. Therefore, the alternatives proposing more miles or acres per action will pose a higher risk of direct and indirect effects to cultural resources. Conversely, those posing fewer miles or acres per action will pose a lower risk of these effects.

Background Assumptions

Only 25 percent of 6th code watershed will be treated within a three-year period. While this stipulation is posed in efforts to lessen direct, indirect, and cumulative effects to watersheds, it provides a maximum amount of work that can be conducted within each 6th code watershed within a three-year span. This stipulation also allows for areas to be monitored for treatment effects to resources and lessen the potential for adverse cumulative effects to various program resources.

We assume all areas listed within a particular treatment category (for example, grassland maintenance and restoration, group select commercial and noncommercial thinning, woodland/ponderosa pine transition maintenance and restoration vegetation treatments; decommissioning of roads; pipeline installation; etc.) will receive treatments. This assumption is made due to uncertainties concerning local conditions within the larger planning area. Thus while an area may be listed to receive group select commercial and noncommercial thinning, local conditions may not favor these activities across the entire proposed treatment area.

Measures

The measure for determining the relative risk of different alternatives is the total acres of archaeological survey needed for different activities associated with the different proposed alternatives. Over much of the larger Luna planning area, there is general correlation between the proportion of an area that has been covered by intensive cultural survey and the proportion of known sites within the planning area. ArcGIS was used to determine how many acres of inventory were needed for the different alternatives.

Environmental Consequences

Alternative A

No activities would be implemented under this alternative, therefore no acres of archaeological inventory are required and therefore no relative risk of potential impact to sites.

The main concern with respect to heritage resources under the no-action alternative is the potential for high-severity wildfire to affect deposits associated with archaeological sites within the proposed project area. Under this alternative, fuel loads within the project area would be allowed to accumulate, increasing the severity and duration of fires that may spread into the area. These concerns are potentially exacerbated if one considers the possibility of increased fire susceptibility brought about by disease and deterioration which could occur if treatments are not implemented in the project area. If a wildland fire does not spread into the area, these concerns could still adversely affect heritage resources as trees within site boundaries are more prone to decay, uprooting, partially collapsing on or within deposits, or a combination of these things.

Similarly, poorly functioning watershed in the planning area are more prone to severe erosion episodes. Such episodes have the potential to adversely affect heritage resources due to arroyo head-cutting and channel cut-bank scouring. These effects will be allowed to continue under the no-action alternative. In short, the no-action alternative increases the probability heritage resources will be adversely affected in the foreseeable future.

Effects Common to Alternatives B, C, and D

Amount of Archaeological Inventory Needed per Alternative

In general, all action alternatives will require extensive survey for heritage resources and most proposed activities are common to all action alternatives. All areas where heavy machinery will be used in project implementation will require 100 percent intensive inventory. Mechanical treatments shared by all action alternatives include roughly 73,856 acres of mechanical vegetation treatments. The following acres may require heavy machinery for implementation:

- approximately 344 acres of range management treatments
- roughly 1,354 acres of treatments to the transportation system
- in excess of 1,000 acres of watershed restoration treatments

The implementation of treatments using traditional hand tools may require additional inventory especially if these activities require substantial ground disturbance (for example, construction of prescribed fire control line, construction of fence lines, etc.) or if they are located in areas determined to contain a high probability for archaeological site location. Hand thinning of vegetation may require additional inventory if heavy machinery (for example, skidder, masticator, etc.) will be used afterwards to treat activity fuels. Approximately 25,400 acres of grassland and portions of Mexican spotted owl protected activity centers may be treated by hand thinning. Likewise, areas that are to be burned by prescription will require inventory if these locales are determined to contain a high probability of site location and if these areas were not inventoried previously for other treatments. Roughly 36,000 acres in all action alternatives are planned to be treated solely by prescribed burning. An additional 70,000 to 100,000 acres will be burned by prescription following mechanized treatments in all action alternatives.

The amount of survey needed for the implementation of the different action alternatives is the same with respect to the proposed treatments. The main difference between action alternatives is the potential for additional inventory to implement the treatment of vegetation by the application of herbicide as proposed in alternative C. In alternative C, there is the potential need to survey areas where herbicide will be applied if these areas are determined to contain a high probability of site location. At present, areas where herbicide may potentially be applied cover an area of roughly 43,000 acres. Within this approximately 43,000 acre area, roughly 28,000 acres have been determined to be high site probability areas. Under alternatives B and D, roughly 20,283 acres of grassland will be mowed to treat rabbitbrush. These treatments may require additional inventory depending on the type of equipment used during implementation. Alternative C may actually require only 8,000 more acres of inventory for areas where herbicide will be applied to treat juniper encroachment than alternatives B and D. However, this depends on where implementation will occur within the larger 43,000 acre potential herbicide treatment area.

Under alternatives B and C, roughly 13.8 miles of level 1 closed roads will be reopened to all motor vehicles types, roughly four miles of user-created roads will be designated as National

Forest System roads and opened to all motor vehicle use, and roughly a half a mile of 4x4 trail will be constructed. These changes are not proposed under alternative D. However, under alternative D, the 13.8 miles of level 1 closed roads that are proposed to be reopened under alternatives B and C will be decommissioned. Under these circumstances, alternative D may require an additional 167 acres of inventory for the additional 13.8 miles of road. However, maintenance work may need to be conducted along these road sections that will be reopened under alternatives B and C to make them operable. Thus, the discrepancies with respect to treatments to the transportation system under all action alternatives amount to negligible changes in the amount of inventory needed prior to implementation.

Direct Effects

Direct effects to heritage resources associated with the proposed undertakings under all action alternatives include those brought about ground-disturbing activities, those potentially associated with the increased visibility of archaeological sites on the landscape, and those potentially associated with the introduction of either prescribed fire or riparian woody species within the planning area. These activities all have the potential to adversely affect deposits associated with heritage resources.

To mitigate the effects associated with the proposed undertakings heritage resources within the different project areas, such things as flagging may be utilized to avoid sites or other alternative methods depending on the activity being performed. In most instances, avoidance of sites will be the preferred mitigation measure. However, in certain circumstances like vegetation thinning and the prescribed burning of areas, other measures may be implemented, such as hand thinning of vegetation within archaeological sites following mechanized treatments or removing additional fuels from archaeological sites. This will increase the likelihood that treatment measures will attain the desired outcome. This is particularly true for areas where high site densities are avoided. This will increase the likelihood that prescribed fire treatments will not adversely affect heritage resources. Hand treatments (for example, cutting rabbitbrush, herbicide application, and other similar activities) would pose no adverse effect to heritage resources.

In the event new heritage resources are discovered during the implementation of any of the activities outlined above, work would cease in the area and a Forest Service archaeologist notified as to its presence. Work may resume in the area surrounding the newly identified archaeological site once appropriate treatment measures have been identified and consulted upon.

Indirect Effects

The primary indirect effects associated with proposed undertakings with respect to heritage resources are the potential for increased erosion rates within or near heritage resources resulting from the loss of canopy and ground cover; the increased visibility of archaeological sites during and after treatment implementation which could lead to increased looting; and the potential for increased cattle grazing within archaeological sites due to changes in vegetation communities and ground cover. However, because the proposed action stipulates activities will be conducted in stages (for example, in units or individual stands within units), the indirect effects of previous treatments can be monitored to determine if heritage resources are being adversely impacted.

Cumulative Effects

As stated above, cumulative effects refer to the impact of an action on the environment which results from the incremental impact of the action when added to other past, present, and

reasonably foreseeable future actions. Since the National Historic Preservation Act was fully implemented in the 1970s, cultural resource surveys have been conducted and potential effects to cultural resources addressed through consultation between the Gila National Forest staff, State Historic Preservation Officer, the Tribes, Advisory Council on Historic Preservation personnel, and interested members of the public. Future projects occurring on National Forest System lands will require appropriate compliance with National Historic Preservation Act including cultural resources inventories and evaluation of effects of the undertaking. If effects are identified, they will be addressed under the section 106 process of the act. Adverse effects will be minimized through avoidance or mitigation measures, as appropriate.

To date, approximately 400 previous projects have been conducted within the planning area and cover a variety of resource areas (for example, engineering, timber, range, heritage, recreation, etc.). Those that have been conducted within the past five years have dealt with impacts associated with the Wallow Fire of 2011 (for example, hazard tree salvage sales, prescribed burning of hazardous fuel loads, etc.), those associated with implementation of the Travel Management Rule, and those seeking to improve the rangeland management infrastructure (for example, water systems, tank cleaning, etc.). At present, the only projects slated for the foreseeable future are those proposed as part of the current landscape restoration proposal.

Implementation of the proposed treatments, combined with past, present, and reasonably foreseeable activities is not expected to negatively impact heritage resources within the project area. The greatest potential for cumulative impacts to heritage resources in the area come from the potential for increased erosion rates associated with decreased canopy and ground cover. However, archaeological sites in the larger Mogollon area are, more often than not, located on stable landforms which do not experience sediment transfer rates greater than five tons per acre per year regardless of the canopy, ground cover conditions, or both (Toney 2012; Toney and Taliaferro 2008). This value (five tons per acre per year) was that determined to be the extreme erosion rate based on Z-score values for areas on the Gila National Forest and surrounding lands (Toney 2012; Toney and Taliaferro 2008). The majority of heritage resources tend to be located on landforms that experience less than this amount of erosion in a year.

Beneficial Effects

As stated in the analysis of effects associated with the no-action alternative (alternative A), if current conditions are allowed to continue, heritage resources stand a greater chance of being adversely affected by severe erosion episodes as well as wildland fire. The proposed treatments will mitigate the possibility of a catastrophic wildland fire affecting heritage resources and the proposed watershed restoration treatments will lessen the probability that heritage resources are adversely affected by arroyo head cutting and stream channel scouring within the treatment areas. Similarly, the changes to the transportation system will decrease the probability that motorized travel will impact heritage resources due to the fact that more miles of road are slated for decommissioning than are being added to the road system.

Effects of Climate Change on Cultural Resources

The Intergovernmental Panel on Climate Change posits that if emission of greenhouse gasses (for example, carbon dioxide, methane, nitrous oxide, etc.) continues along its current trajectory, that global temperatures will continue to rise (IPCC 2014). This will lead to a decrease in cold temperature extremes, an increase in warm temperature extremes, an increase in extreme high sea levels, and an increase in the number of heavy precipitation events in some regions of the world. In some portions of the world, heat waves are expected to increase in frequency and

duration and precipitation events are expected to increase in intensity though will become sporadic in their frequency of occurrence (IPCC 2014). All of these general trends have the potential to adversely affect heritage resources in the planning area.

Perhaps the greatest threat that climate change poses to heritage resources is the increased threat of erosion. As temperatures rise, vegetation communities are likely to be affected. Elevational shifts in vegetation communities, extreme fire events, or both could lead to reduced canopy cover available to intercept precipitation and reduce raindrop impact energies and loss of vegetative ground cover (basal area plus litter). This loss of vegetative ground cover combined with more of the precipitation falling in higher intensity storms increases the risk of erosion. This erosion risk can lead to increased sediment delivery to stream channels and potentially altered flow regimes and stream channel dynamics such as degradation (downcutting) or aggradation. Channel downcutting events, increased arroyo formation, and shifts in stream channel dimension or location have the potential to destroy or damage heritage resources located in the Luna planning area.

Social and Economics

Affected Environment

The Luna Restoration Project is located entirely within Catron County. The main community within the planning area is Luna, New Mexico, a non-incorporated area of Catron County with a population of 158 (U.S. Census Bureau 2010). The project is adjacent to Apache and Greenlee Counties in Arizona along the state line. These three counties form the social and economic analysis area. County-level data are used for the analysis, since reliable demographic and economic data are readily available.

Population and Demographics

Each of the counties have experienced positive population growth between 2000 and 2015. Catron County had the smallest estimated change of 1.1 percent over that period compared to Apache County at 3.9 percent and Greenlee County, 5.6 percent. But all are far below the national growth of 12.5 percent (U.S. Department of Commerce 2016, Economic Profile System 2017).

The median age of the population in Catron County and the community of Luna is approximately 57. The median age of the population in Catron County is much older compared to the other two Arizona counties (median age 33), both states (median age 37), and the nation (median age 37) (U.S. Department of Commerce 2016, Economic Profile System 2017).

The racial and ethnic composition of the study area offers context for the social analysis. Table 64 shows the racial and ethnic breakdown of the counties and their respective states. The majority of the residents self-identify as white in Catron and Greenlee Counties. Apache County differs with having a higher percentage of American Indians than the others. Greenlee County almost half of their population self-identified as Hispanic or Latino. Racial identification within Catron and Greenlee Counties are similar, but for ethnic composition Catron and Apache Counties had similar trends.

Compared to state information, different ethnic and racial compositions of the counties varied from state percentages. Noticeable differences between each of the states and their respective

counties are the variability of the ethnic breakdowns and the difference in percent population in White and American Indian populations across the analysis area.

Table 64. Racial and ethnic breakdown of counties within the analysis area

Area	Ethnicity Non-Hispanic	Ethnicity Hispanic	Race White	Race African American	Race American Indian	Race Asian Pacific Islander	Race Other
Catron County	82%	18%	96%	<1%	<1%	0%	1%
Greenlee County	53%	47%	89%	2%	4%	<1%	1%
Apache County	94%	6%	23%	1%	72%	<1%	2%
New Mexico	52%	48%	39%	2%	9%	1%	2%
Arizona	70%	31%	56%	4%	4%	3%	2%

Note: Ethnicity relates to identification as either Hispanic/Latino or not. Hispanic/Latino individuals may identify as any members of any racial groups. The "Other" group includes two or more races.

Sources: U.S. Department of Commerce 2016, Economic Profile System 2017a

Lifestyles, Values, Beliefs, and Attitudes

Firewood gathering on the Gila National Forest is particularly tied to livelihoods in some of the communities. Wood for fires continues to be widely used either aesthetically or as the primary heat source within homes. Approximately 46 percent of the housing units in Catron County rely on wood as their primary heat source (U.S. Census Bureau 2000). In comparison, the community of Luna, New Mexico within Catron County estimates 60 percent of the housing units rely upon wood (U.S. Census Bureau 2006-2010 American Community Survey). Apache County also has a high reliance of wood as heat source at 50 percent. In contrast, Greenlee County reports more than 75 percent of the housing units rely on utility gas as primary heat source (U.S. Census Bureau 2000). The use of wood for heating homes may be tied to long-term customs, traditions, and culture of the community.

The Gila National Forest is currently undergoing forest plan revision. Participants relayed concerns regarding the forest and natural resource management (USDA Forest Service 2017):

- there is a desire for the maintenance of quality recreational experiences
- there is wide recognition of the overgrown conditions of many of the forest types and juniper encroachment of the grasslands
- there is concern about the increased risk of uncharacteristic wildfire, and threats to private property and adjacent communities
- there is broad interest in fuel management strategies such as thinning and prescribed fire
- many people would like to see more timber harvesting and grazing to support local economies
- there is concern about diminishing water supplies and water quality, and conditions of the forest, wildlife habitat and watershed health

Employment and Income

Per capita income in the study area is lower than the per capita income per state and nation. Apache County has the lowest per capita income compared to other two counties (table 65).

Table 65. Per capita income and percentage of labor or non-labor source and unemployment for counties in the analysis area, state, and nation

Geographic Area	Per Capita Income (2015 Dollars)	Labor (2015)	Non-Labor (2015)	Unemployment (2016)
Catron County	\$20,685	38%	62%	8.2%
Greenlee County	\$21,994	77%	23%	7.6%
Apache County	\$13,011	62%	38%	11.3%
New Mexico	\$24,012	75%	25%	5.3%
Arizona	\$25,848	75%	25%	6.7%
United States	\$28,930	78%	22%	4.9%

Source: Economic Profile System 2017a

The percentage of people below the poverty level in Catron County is 17 percent, which is less than the New Mexico level of 21 percent. Poverty level in Greenlee County is 14 percent and Apache County 37 percent, with Arizona being at 18 percent. Apache County has the highest percentage of people below the poverty line. Catron and Greenlee Counties are comparable to the national level of 16 percent (table 66).

Table 66. Median household income and percentage of persons in poverty in 2015

Geographic Area	Median Household Income	Percentage of persons below poverty line
Catron County	\$42,973	17%
Greenlee County	\$51,628	14%
Apache County	\$31,757	37%
New Mexico	\$44,963	21%
Arizona	\$50,255	18%
United States	\$53,889	16%

Sources: U.S. Department of Commerce 2016; Economic Profile System 2017a

Forest Products Related Employment

According to the Gila National Forest Assessment Report (USDA Forest Service 2017):

“...the mill in Reserve, New Mexico employs eight people at the mill and up to ten people on timber sales. There are also approximately five active smaller mills that purchase timber to produce rough cut lumber and other forest products on a limited scale and at least seven fuelwood businesses based upon sales of permits. The number of employees in these businesses is not known and many may be self-employed businesses with no paid employees. In 2013, timber-related jobs accounted for less than one percent of private sector employment within the four counties: Catron, Sierra, Grant and Hidalgo; that the Forest is situated (Headwaters Economics 2016). Catron County has the largest percent of the total timber-related employment due to the number of permits sold and the location of these businesses.”

Employment in timber related jobs for 2015 (U.S. Dept. of Commerce 2017, Economic Profile System 2017b) in Catron County was approximately 3.5 percent of the total private employment and 1.3 percent in Apache County. No timber-related employment comprised private employment in Greenlee County.

Environmental Consequences

Alternative A

There would be no change in management within the planning area. Fuelwood gathering would still be allowed, access on the current motorized road and trail transportation system would continue. However, no restoration projects would occur. If a high-severity wildfire were to occur in the area, there is a potential for temporary impacts to recreational uses or enjoyments such as hunting, scenery or visual conditions. Smoke emissions generated would be greater and unplanned, causing impacts to those sensitive to smoke. Damage to infrastructure such as power lines, communication systems, etc. within the planning area as well as property damage could result in substantial costs for repair, replacement, or restoration.

With no proposed vegetation treatments, there would be no opportunity generated for economic benefit to local contractors or industries and employment associated with timber or other forest products that could be contracted. This lack of opportunity would be the same for not implementing any of proposed treatments.

Cumulative Effects

There are no activities being implemented under alternative A, current activities (for example, grazing, hunting, hiking) would continue. There are currently no other management activities within the planning area that would improve forest and watershed health relative to existing conditions. The Apache-Sitgreaves National Forests is currently implementing the West Escudilla Project which includes vegetation management projects, prescribed burning, and other restoration activities. Since alternative A would not prescribe additional treatments, it would not cause cumulative effects related to smoke emissions from prescribed fire. However, the risk of uncharacteristic wildfire and associated smoke emissions would be highest under this alternative.

Effects Common to Alternatives B, C, and D

The supply and demand for timber is driven by regional and national needs and markets. Demand for woody material is largely driven by fuelwood needs and other local demand for woody material for rough cut lumber, fuelwood, and other specialty products from local mills. With approximately 74,000 acres of forest and woodland to be treated, the Forest would be able to contribute to the demand for forest products and needs of local mills located in or adjacent to the planning area. There is the potential for economic benefit to local contractors or industries and increased employment associated with timber or other forest products that could be contracted.

The range of projects to be implemented under all action alternatives of the Luna Restoration Project have the potential for providing various employment and economic opportunities for local individuals, contractors, or industries.

Activities such as herbicide utilization under alternative C, smoke from prescribed fires, increased vehicle traffic on roads, and increased noise from equipment and vehicles have the potential for social consequences. Activities would be periodic and occurring across differing locations across the planning area. This may prevent individuals from partaking in various outdoor activities or recreating in their favorite places and may be displaced for short periods and may have less pleasure in their alternate locations.

Under alternative D, there would be a loss of motorized recreational opportunity compared to alternatives B and C. Alternative D does not add to the motorized transportation system closed and user-created routes that would provide loop and access in and around the community of Luna. This would not be favorable for members of the community who collaboratively worked with the Forest Service to identify these routes.

Environmental Justice

The goal of environmental justice is for agency decision makers to identify impacts that are disproportionately high and adverse with respect to minority and low-income populations and identify alternatives that will avoid or mitigate those impacts. None of the alternatives would reduce employment and income relative to current conditions, therefore, no disproportionate adverse economic effects would occur.

Smoke emissions from prescribed fire or wildfire can have health and quality of life consequences and is most likely to affect vulnerable populations – children, the elderly, and individuals with health or respiratory issues. The intensity and duration of emissions are variable, but prescribed fires follow a written prescription which allows managers to minimize smoke impacts. The Forest Service is also required to work with the State Air Quality Department to ensure smoke impacts to human health are avoided or minimized. The advance notice associated with prescribed burns allows individuals with sensitivity to smoke to engage in averting behavior, reducing the negative quality of life impacts.

Households that rely upon fuelwood as their primary heat source would be able to continue to collect fuelwood and with vegetation treatments, the opportunity for additional sources may be realized. None of the alternatives are expected to adversely affect low-income families who depend on fuelwood.

Forest Plan Amendments

The amendments to exceed acres per decade to treat activity fuels with prescribed fire; wildlife habitat improvement structures and acres; vegetation treatments in Mexican spotted owl habitat would have both negative and beneficial impacts on social and economic considerations and environmental justice. The ability to treat more acres of activity fuels with prescribed fire will contribute to negative impacts of smoke emissions on social and environmental justice considerations but would contribute to the associated vegetation treatments by reducing the risk of wildfire. The amount and type of restoration activities and employment and income would not change from previously described under alternatives. Amendments would assist in accomplishing restoration efforts across the landscape.

Cumulative Effects

Within the planning area, current activities (for example, grazing, hunting, and hiking) would continue. There are no other ongoing vegetation or prescribed burning activities within the Luna planning area, but restoration efforts within the larger Escudilla Landscape have started on the Apache-Sitgreaves National Forests with implementation of the West Escudilla Project. There is a potential for increase in employment and income, but it is not expected to significantly change the current percentages of forest product related employments in the three counties.

Ongoing prescribed fires from the Apache-Sitgreaves National Forests and Luna Restoration Project will contribute to smoke emissions, potentially affecting the health and quality of life of

individuals who live near or visit the Gila National Forest. Together, both could cause cumulative effects to health and quality of life for individuals who are sensitive to smoke. However, the cumulative effect of these treatments would go toward decreasing the risk of a wildfire, decreasing the impacts of smoke emissions from that type of event.

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 the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (National Environmental Policy Act section 101).

The implementation of any of the treatments within the action alternatives does not jeopardize the long-term productivity of the Gila National Forest. As described in chapter 3, implementing the action alternatives would improve forest and woodland stands health and improve wildlife habitat, including habitat for threatened, endangered, and sensitive species. There would be reduction in the risk of large uncharacteristic wildfires and its impacts to the landscape, watersheds, species, and human health and quality of life. As described throughout chapter 3, the overall implementation of the action alternatives would improve resources such as range condition, wildlife and aquatic habitat, soil conditions, and others. Actions like erosion control and reducing risk of wildfire would reduce impacts to sensitive resources like water quality, cultural resources, and air quality.

Unavoidable Adverse Effects

For all action alternatives, smoke emissions are an unavoidable adverse impacts that have the potential to affect health and quality of life for individuals who are sensitive to smoke. The potential impacts of smoke are addressed in the “Air Quality”, “Recreation”, and “Social and Economics” sections. The adverse effect would be reduced or minimized with the Gila National Forest personnel following written prescriptions for prescribed fires, working with State Air Quality Departments, and advance notice, allowing individuals with sensitivity to smoke to engage in averting behavior, to reduce the negative impacts of smoke.

There is a risk of introduction, establishment and spread of invasive plants to new locations with ground disturbing activities with mechanical equipment, prescribed fires, and adding new motorized routes. Implementation of design features and monitoring were included to reduce this risk.

Adding motorized routes to the system may cause a loss of soil productivity under all alternatives. Alternative B and C with 13.8 miles of roads being added to the system will result in more bare ground than alternative D, which adds 0.2 miles. There will be a loss of soil productivity in varying degrees and time for the other motorized transportation activities like temporary roads, reopening roads and then closing again, and decommissioning.

Irreversible and Irretrievable Commitments of Resources

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

All resources were evaluated to determine if there would be irreversible or irretrievable commitment of resources. Except for following resources, no other resources identified irreversible or irretrievable commitments.

Watershed and Soils

Alternative A already possesses an intrinsic commitment of the soil resource from closed roads that are not decommissioned. Continuation of closed roads, without attempts to decommission would allow this commitment to continue, with little possibility of soil conditions returning to their natural state.

The selection of any of the action alternatives allows for decommissioning of between 114 and 130 miles of travel routes which would aid in reversing and retrieving soil resource conditions. Time frames for recovery will vary, dependent on type of decommissioning implemented and site conditions, including parent material, soil depth, available nutrients, climatic conditions, and herbaceous recovery.

The addition of roads for administrative and recreation opportunities range from 4.2 to 17.8 miles for the action alternatives. Impacts to soil conditions on these miles would result in additional area of irreversible and irretrievable commitment of soil resources.

Heritage

There is a relatively low risk of irreversible commitment of heritage resources across all action alternatives. This risk of irreversible commitment primarily arises from the potential for ground disturbing activities to completely destroy archaeological sites. In general, this risk of irreversible commitment of resources is the same across all action alternatives as they essentially share similar proposed ground disturbing activities.

Inventoried Roadless Areas

Irreversible or irretrievable commitments of roadless resources could occur under alternative A. In the event of a wildfire due to continuing existing stand conditions (crown fire potential), the roadless resources could be at risk to irretrievable outcomes including species and habitat loss until vegetation becomes established. Special features, such as perennial water sources, could be affected by post fire erosion and debris flows. There are no irreversible commitments.

There would be no irreversible or irretrievable commitments to roadless resources with action alternatives B, C, or D. The likelihood of severe wildfire and the associated impacts would be reduced in the treated areas, lowering the risk of an irretrievable effect.

Preparers and Contributors

List of Preparers

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The Forest Service consulted the following Federal, State, and local agencies, tribes and other organizations during the development of this environmental impact statement:

Federal, State, and Local Agencies

Apache-Sitgreaves National Forests
Bureau of Land Management, Socorro Field Office
Catron County Commission, County Manager, and Emergency Manager
New Mexico Department of Game and Fish
New Mexico Environmental Department
New Mexico State Forestry Division
U.S. Fish and Wildlife Service

Tribes

Alamo Navajo Chapter	Ramah Navajo Chapter
Fort Sill Apache Tribe	The Hopi Tribe
Mescalero Apache Tribe	The Navajo Nation
Pueblo of Acoma	San Carlos Apache Tribe
Pueblo of Laguna	White Mountain Apache Tribe
Pueblo of Zuni	Ysleta Del Sur Pueblo

Others

Luna Irrigation Ditch Association
Luna OHV Riders

Distribution of the Environmental Impact Statement

This draft environmental impact statement has been distributed to individuals who specifically requested a copy of the document and those who submitted comments during scoping. The draft environmental impact statement is available on the worldwide web at Luna Restoration Project and available for review at the Quemado Ranger District office. In addition, copies have been sent or provided electronically to the following Federal agencies, federally recognized Tribes, State and local governments, and organizations representing a wide range of views:

Advisory Council on Historic Preservation	Ramah Navajo Chapter
Alamo Navajo Chapter	Salado Soil and Water Conservation District
Apache-Sitgreaves National Forests	San Carlos Apache Tribe
Bureau of Land Management	San Francisco Soil and Water Conservation District
Catron County	State Historic Preservation Office
Center for Biological Diversity	The Hopi Tribe
Ecological Restoration Institute	The Nature Conservancy
Federal Aviation Administration	The Navajo Nation
Federal Highway Administration	The Quivera Coalition
Fort Sill Apache Tribe	U.S. Army Corps of Engineers
Mescalero Apache Tribe	U.S. Coast Guard
New Mexico Department of Agriculture	U.S. Department of Energy
New Mexico Department of Game and Fish	U.S. Department of the Navy, Energy and Environmental Readiness Division
New Mexico Department of Transportation	U.S. Environmental Protection Agency
New Mexico Environmental Department	U.S. Fish and Wildlife Service
New Mexico Environmental Department, Air Quality Bureau	USDA APHIS PPD/EAD
New Mexico Environmental Department, Surface Water Quality Bureau	USDA National Agricultural Library
New Mexico Farm and Livestock Bureau	USDA Natural Resources Conservation Service
New Mexico State Forestry Division	USDI Office of Environmental Policy and Compliance
New Mexico Wilderness Alliance	White Mountain Apache Tribe
NOAA Fisheries Service	WildEarth Guardians
Pueblo of Acoma	Ysleta Del Sur Pueblo
Pueblo of Laguna	
Pueblo of Zuni	

Glossary

Administrative use - Authorized motor vehicle use on roads or trails to carry out forest management activities. This also includes use by permittees as authorized by permit or written authorization to conduct authorized activities.

Decommission - Demolition, dismantling, removal, obliteration, disposal, or a combination of these things of a deteriorated or otherwise unneeded asset or component, including necessary cleanup work. This action eliminates the deferred maintenance needs for the fixed asset. Portions of an asset or component may remain if they do not cause problems nor require maintenance. (Financial Health - Common Definitions for Maintenance and Construction Terms, July 22, 1998).

Forest Transportation Atlas - A display of the system of roads, trails and airfields of an administrative unit. (36 CFR 212.1, Forest Service Manual 7705)

National forest transportation system - The system of National Forest System roads, National Forest System trails, and airfields on National Forest System lands. (36 CFR 212.1, Forest Service Manual 7705) newly added to glossary

Maintenance levels - Defines the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria. (Forest Service Handbook 7709.59, 62.32)

- **Level 1** - These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate" all traffic. These roads are not shown on motor vehicle use maps. 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. However, while being maintained at level 1, they are closed to vehicular traffic but may be available and suitable for nonmotorized uses.
- **Level 2** - Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not provided with the exception that some signing, such as W-18-1 "No Traffic Signs," may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to:
 - ◆ discourage or prohibit passenger cars; or
 - ◆ accept or discourage high clearance vehicles.
- **Level 3** - Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. The Manual on Uniform Traffic Control Devices (MUTCD) is applicable. Warning signs and

traffic control devices are provided to alert motorists of situations that may violate expectations. Roads in this maintenance level are typically low speed with single lanes and turnouts. Appropriate traffic management strategies are either "encourage" or "accept." "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

- **Level 4** - Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. Manual on Uniform Traffic Control Devices is applicable. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.
- **Level 5** - Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. Manual on Uniform Traffic Control Devices is applicable. The appropriate traffic management strategy is "encourage."

Motor vehicle - Any vehicle that is self-propelled, other than: (1) A vehicle operated on rails; and (2) Any wheelchair or mobility device, including one that is battery-powered, that is designed solely for use by a mobility-impaired person for locomotion, and that is suitable for use in an indoor pedestrian area. (36 CFR 212.1, 36 CFR 261.2, Forest Service Manual 7705, Forest Service Handbook 2309.18.05)

National Forest System road (NFSR) - A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, County or other local public road authority. (36 CFR 212.1, 36 CFR 251.51, 36 CFR 261.2, Forest Service Manual 7705, Forest Service Handbook 7709.56.40.5) newly added to glossary

Road decommissioning (1) - Activities that result in the stabilization and restoration of unneeded roads to a more natural state. (36 CFR 212.1)

Road decommissioning (2) - Activities that result in restoration of unneeded roads to a more natural state. (Forest Service Manual 7705, Forest Service Manual 7734)

Temporary road or trail - A road or trail necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or trail and that is not included in a forest transportation atlas. (36 CFR 212.1, Forest Service Manual 7705)

Unauthorized road or trail - A road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas. (36 CFR 212.1, Forest Service Manual 2353.05, Forest Service Manual 7705)

Written authorization - A written document that authorizes specific activities; may be a permit, letter or other written document.

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