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1 Purpose of and Need for Action

1.1 Proposed Action

The Mount Taylor Ranger District of the Cibola National Forest and Grasslands (NF&NG) proposes the following actions to improve conditions in the Puerco Landscape Restoration Project:

- Commercially thin trees, including public fuelwood removal, and/or implement prescribed fire on approximately 31,434 acres.
- Implement prescribed fire alone on approximately 8,538 acres.
- Hand thin and lop and scatter slash without prescribed fire to improve soil condition by improving ground cover and woody material on approximately 23,087 acres.
- Hand thin and implement prescribed fire on approximately 3,034 acres.
- Mechanically thin or masticate and implement prescribed fire on approximately 14,892 acres.
- Implement more intensive even-aged treatments on up to 5,900 acres of stands that are moderately to heavily infected with dwarf mistletoe.
- Mechanically thin and/or implement prescribed fire on up to 3,694 acres of Mexican spotted owl (MSO) protected activity centers (PACs), up to 1,697 acres of MSO recovery habitat, and approximately 4,210 acres of northern goshawk post-fledging family areas (PFA).
- Rehabilitate up to 200 miles of unauthorized roads.
- Improve road drainage and crossings.
- Restore approximately 19 springs.
- Restore up to 250 acres of riparian areas including associated stream habitats for threatened, endangered, and sensitive aquatic species.
- Improve the function of streams, including gullies.
- Construct protective barriers around springs, aspen, and willows as needed for protection of approximately 300 acres.

This project is located primarily in McKinley County with the southeastern portion located in Cibola County, south of Interstate 40, southeast of the city of Gallup, New Mexico, with the following legal description: The legal description of the project area includes all or portions of Township 12 North, Range 15 West: Sections 6, 12, 14, 16, 22, and 23; Township 13 North, Range 14 West: Sections 5-7, 18, and 31; Township 13 North, Range 15 West: Sections 1-28, and 34; Township 13 North, Range 16 West: Sections 1-24, 26-34, and 36; Township 13 North, Range 17 West: Sections 1-3, 10-15, 22-24, 26, 34, and 36; Township 14 North, Range 15 West: Sections 4-10, 13-15, and 17-35; Township 14 North, Range 16 West, Sections: 1-3 and 5-36. (See Figure 1-1).
1.2 Background

This project was initiated in 2011, as part of the Zuni Mountain Priority Landscape set forth in the Forest Leadership Team (FLT) priorities as an extension to the Bluewater Landscape Restoration Project. The FLT, Mount Taylor Ranger District, New Mexico Game and Fish Department, the Zuni Mountains Collaborative group and Mount Taylor Landscape Team have recognized the need for landscape scale restoration and building mutually beneficial, cross jurisdictional working relationships. The purpose of this project is to protect community, cultural and natural resources at a landscape scale by implementing vegetation treatments for wildlife habitat and watershed improvement, and increase resiliency to natural disturbances. The level of documentation and analysis for this project, an Environmental Assessment (EA), is based on the initial analysis and comments received from the public in response to the proposed action.

The Puerco Landscape Restoration Project is a planning effort designed to restore forest resiliency and ecosystem function to ponderosa pine, mixed conifer and pinyon-juniper forests across the western Zuni Mountains of the Cibola National Forest (NF). Management Areas included within the Puerco Project are described in Table 1.2.1. (1996 Amended Cibola National Forest Land and Resource Management Plan (ALRMP)).

Table 1.2.1. Puerco Management Areas

<table>
<thead>
<tr>
<th>Management Area (MA)</th>
<th>Management Emphasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 8 – Ponderosa Pine Suitable Timberlands 33,590 acres</td>
<td>The primary management emphasis is on regulated even-aged timber management. Slash from timber harvests will be made available to the public as firewood. Opportunity for dispersed and developed recreational experiences will increase through new construction and rehabilitation of existing facilities. Wildlife habitat will be enhanced through structural and nonstructural improvements and through coordination of timber management activities. Grazing use will be balanced with grazing capacity.</td>
</tr>
<tr>
<td>MA 10 – Mixed Conifer Suitable Timberlands 156 acres</td>
<td>Primary emphasis is on wildlife, especially those species favoring late successional stage vegetation. Grazing use will be balanced with grazing capacity.</td>
</tr>
<tr>
<td>MA 13 - No Capacity Rangelands 12,382 acres</td>
<td>The primary emphasis in on wildlife management activities. Wildlife habitat carrying capacity will increase through structural and nonstructural improvements. Firewood will be provided as a result of wildlife management practices.</td>
</tr>
</tbody>
</table>

1 MA acres do not add up to the project area total because of acres that have been subsequently acquired by the Cibola National Forest, such as Tampico Springs Ranch.

2 This is original 1985 Cibola Land and Resource Management Plan language. The plan was amended in 1996 to incorporate direction from the Mexican Spotted Owl Recovery Plan (1995) and Management Recommendations for the Northern Goshawk (1992) to emphasize uneven-aged management.
1. Purpose of and Need for Action

<table>
<thead>
<tr>
<th>Management Area (MA)1</th>
<th>Management Emphasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 14 – Full Capacity Rangelands 28,600 acres</td>
<td>Pinyon-juniper will be managed for personal use and commercial firewood. Grazing use will be balanced with capacity. Wildlife habitat will be enhanced through structural and nonstructural improvements and from integrating range and firewood management activities with wildlife habitat needs. Zuni Bluehead Sucker habitat will be protected. Maintenance and protection of sensitive soils is an important management objective.</td>
</tr>
</tbody>
</table>

In 2003, the Record of Decision for the Bluewater environmental impact statement (EIS) for the eastern portion of the Zuni Mountains of the Cibola NF was signed. The Puerco Landscape Restoration Project continues that ecosystem restoration effort on about 81,000 acres covering the western portion of the Zuni Mountains on the Mount Taylor Ranger District of the Cibola NF. The project area includes portions of Cibola and McKinley Counties.

**Figure 1.2.1. Puerco Landscape Restoration Analysis & Treatment Area**
1.3 Purpose of and Need for Action

The purpose and need for the Puerco Landscape Restoration Project was determined by comparing the existing conditions in the project area to the desired conditions in the Cibola National Forest Land and Resource Management Plan (ALRMP) related to forest and ecosystem function and resiliency. In addition, relevant research, the best available science and information, and the landscape restoration criteria found in the Omnibus Public Land Management Act of 2009 (P.L. 111-11, Title IV Forest Landscape Restoration) were used to develop the purpose and need. These criteria for landscape-scale restoration address community, wildlife habitat, and forest protection while retaining as many large trees as possible.

The purpose of the Puerco Project is to reestablish and restore forest structure and pattern, forest health, and vegetation composition and diversity in forest ecosystems to conditions within the natural range of variability, thus moving the project area toward the desired conditions. The outcome of improving structure and function is increased ecosystem resiliency. Resiliency allows for the ability of an ecological system to absorb disturbances, such as fire, insects and disease, and climate change, while retaining the same basic structure and ways of functioning and the capacity to adapt to stress and change (FSM 2020.5). This project is needed to:

- Increase forest, shrubland and grassland resiliency, sustainability
- Reduce the risk of uncharacteristic fire effects
- Improve wildlife and aquatic species habitat
- Improve the condition and function of watersheds
- Improve the condition and function of riparian areas, wet meadows, streams, and springs
- Preserve cultural resources

Forest Resiliency and Sustainability. Resiliency increases the ability of the pinyon-juniper woodlands, ponderosa pine and mixed conifer-frequent fire forest types to survive natural disturbances and stressors such as fire, insect and disease outbreaks, and climate change (FSM 2020.5). There is a need to restore the frequent low-severity fire regimes in which the forest in the Puerco Project area evolved. The Puerco Landscape Restoration Project is expected to move over 55,000 acres toward comprehensive, landscape-scale restoration (includes prescribed burning or a combination of thinning and burning).

There is a need to move tree group pattern, interspaces, and stand density toward the natural range of variability. This is a sum of reference conditions that provides a mix of open, moderately closed, and closed canopy conditions at the fine (group) to landscape (ponderosa pine forest cover type) scales as defined by the Forest Plan. In the oak woodland and shrubland forest

---

3 The Cibola NF is in the midst of revising its plan, this project will apply the 1985 Cibola Forest Plan (as amended). This project will incorporate the revised Forest Plan guidance upon plan implementation.
types, there is a need to stimulate new growth, maintain vigor in large-diameter trees, encourage faster growth in young smaller oaks, and provide for a variety of shapes and sizes of trees across the forest cover types. Where aspen is found in the frequent fire forest cover types, there is a need to stimulate growth, reduce conifer encroachment, and increase individual tree recruitment. In grassland forest cover types, there is a need to reduce or remove tree encroachment, which has decreased the size and function of these systems that were historically grasslands and savannas.

There is a need to manage forest density, structure, and composition to increase forest health and reduce adverse effects from bark beetles or dwarf mistletoe, while also providing a diversity of habitat types and features. Stand Exam data and dwarf mistletoe infection surveys indicate that 10,600 acres (13% of the project area) of ponderosa pine, pine-oak and mixed conifer forest types are moderately to heavily infected, where greater than 20% of the host trees or 25% of the area is infected. If management goals are to retain the host species (ponderosa pine and Douglas-fir) on the site, even-aged prescriptions are recommended (Conklin & Fairweather 2010). Of those moderately to heavily infected stands, approximately 5,900 acres (7% of the project area) have been identified as potentially suitable for more intensive even-aged management.

There is a need to improve the condition of native plant communities, improving the resiliency of rare species. There is also a need to improve understory vegetation to provide food and cover for wildlife where it is absent under dense forest stands where fire has been excluded.

The Puerco Project includes extensive areas where the ponderosa pine and mixed conifer forest cover types interface with the pinyon-juniper and deciduous oak woodland types. Because of this close association, treatments may be needed in these other forest cover types to facilitate and increase the effectiveness of treatments to restore the frequent fire forest structure.

**Uncharacteristic Fire Effects.** There is a need to reduce the risk of uncharacteristic fire behavior and effects, which currently pose a threat to ecosystem function and services, and human safety, lives, and values. Restoring forest, grass and shrubland structure will decrease the risks of post-fire flooding and debris flows that cause loss of soil productivity, water quality, and watershed function. Reducing the potential for uncharacteristic fire effects and reducing excessive fuel loadings will protect wildlife and aquatic species habitat, including areas within and adjacent to Mexican spotted owl habitat. Protected activity centers (PAC) currently contain high fuel loadings due to limited disturbance or management.

**Wildlife and Aquatic Species Habitat.** There is a need to move the Puerco Project area toward desired conditions for snags, coarse woody debris, forest structural stages, and stream habitat complexity that are currently deficit. There is a need to retain as many old and large trees as possible, recognizing the ecological and socio-political importance of these trees. Where restoration activities occur in the ponderosa pine and dry mixed conifer forest types, there is a need to maintain and promote the development of old growth characteristics and components. There is a need to maintain or improve aquatic habitats to meet the needs of aquatic species,
recognizing the ecological and socio-political importance of these streams and associated riparian areas.

The Zuni Bluehead Sucker is listed as an endangered species in New Mexico with 9.7 miles of critical habitat designated within the project area in Agua Remora, Rio Nutria and Tampico Creek drainages. Habitat management objectives and aquatic/riparian species protection measures from the approved Zuni Bluehead Sucker Recovery plan will be applied to all activities.

**Streams and Springs.** There is a need to improve the condition and function of riparian areas, wet meadows, streams, and springs in the Puerco Project area in order to sustain these features and aquatic habitat. Reducing road density and improving road and stream crossings would maintain natural flow regimes, provide connectivity for aquatic species and habitats, and reduce sedimentation. Approximately 2 miles of the Agua Remora drainage within the Puerco Project area has been designated as an eligible wild and scenic river because of outstanding remarkable values related to fish populations (Zuni Bluehead Sucker). In eligible rivers with “wild” classifications, cutting of trees and other vegetation shall not be allowed except when needed in association with a primitive recreation experience, to protect users (including hazard tree removal or trail maintenance), or to protect identified outstandingly remarkable values.

**Roads.** There is a need to have adequate access for project implementation, but then rehabilitate unauthorized routes identified during project implementation or the district Travel Management Rule review processes after use.

**Cultural Resources.** There is a need to reduce threats to cultural resources caused by overly dense vegetation and soil erosion. Though most archaeological sites can tolerate low severity fire, all are very vulnerable to the effects of high severity fire in unnaturally high fuel loads and to the soil loss that occurs in post-fire flooding. In particular, there is a need to reduce fuels accumulation around cultural resources to reduce threats to these non-renewable resources.

**Water Developments.** There is a need to improve distribution of water developments to benefit range and wildlife across the four allotments covered under this analysis. Many of these developments are not functional and are degrading the riparian ecosystems associated with them. Improved design and alternative water sources are needed to reduce impacts and move toward desired conditions.

**Watershed Improvements.** There is a need to improve watershed condition in the project area, which has been impacted by unnatural fire regimes, poor soil conditions, impaired riparian conditions, road and trail impacts, and range conditions. There is a need to implement vegetation treatments that will restore natural fire regimes, and for other projects that will address other factors contributing to impaired watershed conditions.
Plan Amendments. To meet the project’s purpose and need, the existing Cibola Forest Plan would need to be amended to provide for areas of grass, forbs, and shrubs interspersed with tree groups and allow for treatments to move tree group patterns, interspaces, and stand density toward the natural range of variability. Amending the forest plan would allow for treatments that improve Mexican spotted owl nesting and roosting habitat as defined in the Revised 2012 Mexican spotted owl recovery plan. Amendment(s) to the Cibola Forest Plan would provide consistency in meeting desired conditions for ponderosa pine – Gambel oak and mixed conifer forest types across the Puerco Project area (Appendix A).

1.4 Existing Conditions

Vegetation

Tables 1.4.1 and 1.4.2 display project area acreage by existing vegetation cover type and existing conditions, while Figure 1.4.1 displays the general location of the existing vegetation cover types. Existing vegetation cover (forest) types are assigned by the Forest Vegetation Simulator (FVS) during the initial data analysis and imputation of Nearest Neighbor (NN) attributes for stands with no data collected. Imputation is a process of ‘filling in’ missing data with plausible values from sampled stands with similar attributes (slope, elevation, aspect). The Field Sampled Vegetation (FSVeg) Data Analyzer uses NN imputation methods to fill in the missing vegetation data with imputed data that is based on existing vegetation data from similar stands located within the project area and stored in the FSVeg corporate database.

<table>
<thead>
<tr>
<th>Vegetation Cover Type</th>
<th>Approximate Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaking Aspen</td>
<td>14</td>
</tr>
<tr>
<td>Dry Mixed Conifer (frequent fire)</td>
<td>569</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>25,959</td>
</tr>
<tr>
<td>Ponderosa Pine-Gambel Oak</td>
<td>14,791</td>
</tr>
<tr>
<td>Pinyon-Juniper Woodland</td>
<td>25,701</td>
</tr>
<tr>
<td>Rocky Mountain Juniper</td>
<td>3,184</td>
</tr>
<tr>
<td>Grasslands/Shrublands</td>
<td>7,407</td>
</tr>
<tr>
<td>Other (Deciduous oak woodland, Miscellaneous Hardwoods and Non-stocked Forestlands)</td>
<td>3,359</td>
</tr>
<tr>
<td></td>
<td><strong>80,984</strong></td>
</tr>
</tbody>
</table>

The forested landscapes in the Puerco project area are highly departed from their desired conditions, lacking desired multi-storied structure, spatial arrangement, and are very dense as measured by basal area, trees per acre and percent canopy cover (Table 1.4.2). Because of the existing conditions most forest and woodlands in the project area are prone to uncharacteristic
disturbances such as active crown fire behavior, insects and disease, and climate change. Other cover types, such as deciduous oak woodland, would also receive treatments to move toward desired cover types, improve wildlife habitat, reduce uncharacteristic fire risk, or restore natural fire regimes. Desired Conditions are discussed in more detail in Section 1.5 of this Chapter.

<table>
<thead>
<tr>
<th>Existing Vegetation Cover Type</th>
<th>Basal Area/Acre (ft²)</th>
<th>Trees per Acre</th>
<th>Trees per Acre (5”+)</th>
<th>Trees per Acre (18”+)</th>
<th>Average Diameter (QMD 5”+)</th>
<th>Canopy Cover (%)</th>
<th>DMR5</th>
<th>Crowning Index (MPH)6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Conifer</td>
<td>138</td>
<td>2,900</td>
<td>227</td>
<td>7</td>
<td>9.6</td>
<td>59</td>
<td>0.23</td>
<td>26</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>119</td>
<td>1,503</td>
<td>167</td>
<td>9</td>
<td>11.4</td>
<td>44</td>
<td>0.12</td>
<td>36</td>
</tr>
<tr>
<td>Ponderosa Pine-Gambel oak</td>
<td>127</td>
<td>1,513</td>
<td>167</td>
<td>10</td>
<td>10.7</td>
<td>45</td>
<td>0.09</td>
<td>38</td>
</tr>
<tr>
<td>Pinyon-juniper</td>
<td>116</td>
<td>1,103</td>
<td>152</td>
<td>10</td>
<td>11.2</td>
<td>41</td>
<td>0.34</td>
<td>27</td>
</tr>
<tr>
<td>Rocky Mtn. Juniper</td>
<td>127</td>
<td>1,932</td>
<td>171</td>
<td>9</td>
<td>11.0</td>
<td>45</td>
<td>0.0</td>
<td>51</td>
</tr>
<tr>
<td>Deciduous Oak</td>
<td>121</td>
<td>2,428</td>
<td>162</td>
<td>6</td>
<td>10.0</td>
<td>47</td>
<td>.01</td>
<td>59</td>
</tr>
<tr>
<td>Misc. Hardwoods</td>
<td>148</td>
<td>2,402</td>
<td>113</td>
<td>6</td>
<td>11.0</td>
<td>76</td>
<td>.001</td>
<td>34</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>119</td>
<td>1,399</td>
<td>166</td>
<td>9</td>
<td>11.2</td>
<td>43</td>
<td><strong>0.18</strong></td>
<td><strong>35</strong></td>
</tr>
</tbody>
</table>

4 Quadratic Mean Diameter (QMD) is the diameter of the tree of average per tree basal area, which is considered more appropriate than arithmetic mean for characterizing a group of measured trees.

5 DMR is Dwarf Mistletoe Rating; the percentage of trees infected per acre.

6 Crowning Index is the open wind speed at which fully active crown fire is possible.
Figure 1.4.1. Approximate Distribution of Existing Vegetation
Several different fire regimes are represented across the project area, ranging from frequent low-intensity fires that historically occurred in ponderosa pine and dry mixed conifer (Fire Regime I: 0-35 year frequency) to mixed severity and stand replacing fires that occurred in pinyon-juniper woodlands Fire Regime III-V: 35-100+ year frequency). Currently, across much of the project area, fuel loading and tree densities are such that mortality would be high in the event of a wildfire burning under undesirable conditions. The average crowning index across the project area is 35 miles per hour, which is fairly typical on spring day in the Zuni Mountains. In the grass and shrublands of the Puerco project, fire has been excluded and conifers have encroached into these naturally open areas, decreasing their size and function.

Quaking aspen in the Puerco project area does not occur in large pure stands, and is dying or rapidly declining due to the combined effects of conifer encroachment, browsing, insects, disease, and lack of fire disturbance. Aspen and willows provide habitat for songbirds and small mammals, as well as soil and stream bank stability, and are also declining in health, vigor, and number in the project area.

Stand Exam data and dwarf mistletoe infection surveys indicate that 10,600 acres (13% of the project area) of ponderosa pine, pine-oak and mixed conifer forest types are moderately to heavily infected, where greater than 20% of the host trees or 25% of the area is infected. If management goals are to retain the host species (ponderosa pine and Douglas-fir) on the site, even-aged prescriptions are recommended (Conklin & Fairweather 2010). Of those moderately to heavily infected stands, approximately 5,900 acres (6% of the project area) have been identified as potentially suitable for more intensive even-aged management.

**Wildlife**

Agua Remora is home to the Zuni Bluehead sucker population, a Federally-endangered species for which Agua Remora is one of only 3 locations where the species can still be found in the state of New Mexico and thus represents a nationally important population of this indigenous species. Approximately 602 acres of the Puerco project are included within the eligible wild and scenic river designation. Of this, 524 acres (87%) are also included within MSO PACs or on slopes exceeding 40%.

There are six Mexican spotted owl (MSO) protected activity centers (PAC), and four Northern goshawk post-fledging family areas (PFA) and three additional dispersal PFAs were created within the project area. There is a need to restore resilient late-successional forest and increase habitat diversity, particularly within MSO PACs and nest stands for the Northern goshawk.

**Recreation and Scenery Management**

The Puerco project area contains a wide range of recreation opportunities and infrastructure, including two developed picnic grounds, one developed group campground, seven motorized dispersed camping corridors, two trailheads, approximately 47 miles of national forest system
trails, and approximately 152 miles of existing national forest system roads (excluding those listed as decommissioned or converted).

In 2011, the Mount Taylor District Travel Management Decision Notice was released which designated national forest system (NFS) roads and NFS trails for motor vehicle use, including seven corridors designated along certain roads for motorized dispersed camping (see Figure 1.4.2) and prohibited motorized cross country travel. The Mount Taylor Motor Vehicle Use Map (MVUM) displays these designations. There are no defined locations for campfires within the dispersed camping corridors; as a result, users are creating multiple fire scars within each corridor.

Approximately 8 miles of maintenance level 3 roads are open and suitable for passenger cars. Even though motorized cross country travel is prohibited, approximately 200 miles of existing unauthorized roads are scattered across the landscape. These unauthorized roads are contributing to the degradation of watersheds, riparian ecosystems, wildlife habitat, and cultural resources. Many of these unauthorized roads provide access to areas that are currently departed from desired conditions.

Approximately 2 miles of the Agua Remora drainage has been designated as an Eligible Wild and Scenic River during the Cibola National Forest’s Plan Revision process. Wild and Scenic Rivers are managed to protect or enhance existing outstanding remarkable values and classifications until designated or released from consideration. Agua Remora is eligible for fish population(s) and outstandingly remarkable values.

The only trailheads in the project area are Strawberry Canyon and Hilso. McGaffey Lake is a fishing site that is stocked by the New Mexico Department of Game and Fish (NMDGF).

**Soil/Watershed**

Many riparian streams in the Puerco project area are currently non-functioning or functioning-at-risk, due to a lack of adequate vegetation, landform, and woody material needed to filter sediment, dissipate stream energies, and support recharge to groundwater. Affected riparian areas include stream habitat for threatened, endangered, and sensitive aquatic species. Restoration is needed to restore the functionality of these streams, reestablishing former drainage patterns, restoring appropriate vegetation, woody material, and returning fire to the system (prescribed fire). Impaired intermittent and ephemeral stream channels are also in need of restoration, including reducing tree encroachment and noxious weeds, revegetating, and repairing headcuts.

**Water Resource Features and Wetland/Riparian**

Approximately 250 acres of riparian meadows and stream habitat are currently non-functioning or functioning-at-risk, due to a lack of adequate vegetation, landform, and woody material needed to filter sediment, dissipate stream energies, and support recharge to groundwater.
Affected riparian areas include stream habitat for threatened, endangered, and sensitive aquatic species.

At least 12 springs in the Puerco project area exhibit downward trends or static-degraded conditions. The condition and function of these springs needs to be improved to sustain these features.

**Heritage and Cultural resources**

In the Zuni Mountains and adjacent areas, there is evidence of Paleoindian, Archaic, Ancestral Pueblo, Navajo, and Anglo-European uses of the land in a span of time from about 12,000 years ago to the modern era.

**Range Management**

There are numerous water developments and infrastructure investments throughout the project area, including windmills, water tanks, stock troughs and corrals. Many of the existing developments are not functional and are contributing to the degradation of watersheds and the riparian ecosystems associated with them. Improved design and alternative water sources are needed to reduce impacts and move toward desired conditions.

**Transportation**

There are 151.7 miles of National Forest System (NFS) roads (system roads) in the analysis area. When referring to the route number of a system road, the acronym NFSR is often used. Table 1-4 displays the NFS road miles in the analysis area by maintenance level (ML).

<table>
<thead>
<tr>
<th>Maintenance Level*</th>
<th>Length (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11.2</td>
</tr>
<tr>
<td>2</td>
<td>132.4</td>
</tr>
<tr>
<td>3</td>
<td>8.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>151.7</strong></td>
</tr>
</tbody>
</table>

The Forest Service uses five maintenance levels: ML 1 to ML 5. An ML 1 road requires the least amount of maintenance effort and an ML 5, the greatest. There are no ML 5 roads in the analysis area. ML 1 roads are closed to all motorized traffic for periods exceeding one year. ML 2 roads are maintained for high clearance vehicles. These are typically single lane roads with a native material surface and limited turnouts. ML 3 and 4 roads are maintained for standard passenger cars and generally provide for a greater degree of driver comfort. ML 3 roads typically have a gravel surface, while ML 4 roads can be surfaced with either gravel or asphalt.

In addition to the system roads, there are approximately 200 miles of unauthorized routes that exist in the analysis area. The term unauthorized route can be defined as:
• a road or trail that was created by repeated off-road travel along the same path, without the knowledge and approval of the Forest Service, or

• a temporary road constructed by the Forest Service for a particular project that was not decommissioned when it was no longer needed.

Some of the unauthorized roads adversely affect the surrounding environment through degradation of wildlife habitat, vegetation or soil productivity, interruption of natural hydrologic processes, or disturbance to archeological sites. They also provide access for illegal wood product removal activities.

1.5 Desired Conditions

Vegetation

Overall desired vegetation conditions for the entire project area are for the composition, structure, and function of vegetative conditions to be resilient to the frequency, extent and severity of disturbances and climate variability. The mosaic of tree groups generally comprises an uneven-aged forest with all age classes present. Fires burn primarily on the forest floor and do not spread between tree groups as crown fire. Desired conditions for other resources will largely be maintained or improved by vegetation management and prescribed fire treatments designed to meet desired conditions, and these restoration activities would be implemented so that they would not increase departure of the associated natural resources.

Desired condition acres for each vegetation cover type were determined from Terrestrial Ecosystem Unit Inventory (TEUI) data collected from the Cibola National Forest. The terrestrial ecosystem survey maps ecosystems across landscapes based on climate, geology, soils, and late-successional vegetation. The major concept underpinning this system is that climate, geology, soils, and vegetation are interrelated and form repeating combinations across the landscape that can be classified and mapped (Abella et al 2011). Data provided from individual TEUI map units, in conjunction the Cibola Land and Resource Management Plan (LRMP) (USDA 1996) direction were used as a guide to develop desired conditions for species composition and vegetation cover type across the project area. Figure 1.5.1 displays the general location of the desired vegetation cover types. Table 1.5.1 displays the distribution of desired vegetation cover types based on the TEUI.

<table>
<thead>
<tr>
<th>Vegetation Cover Type</th>
<th>Approximate Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Mixed Conifer (frequent fire)</td>
<td>776</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>24,970</td>
</tr>
<tr>
<td>Ponderosa Pine-Gambel Oak</td>
<td>15,033</td>
</tr>
<tr>
<td>Ponderosa Pine / P-J Mix</td>
<td>13,403</td>
</tr>
</tbody>
</table>
### Vegetation Cover Type

<table>
<thead>
<tr>
<th>Vegetation Cover Type</th>
<th>Approximate Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinyon-Juniper Woodland</td>
<td>18,545</td>
</tr>
<tr>
<td>Grassland/Shrubland</td>
<td>8,237</td>
</tr>
<tr>
<td>Riparian Meadow</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td><strong>80,984</strong></td>
</tr>
</tbody>
</table>

*Aspen is included within mixed conifer, ponderosa pine, and pine-oak types.

The acres of existing vegetation cover types differ from the desired vegetation distribution because of a variety and combination disturbances, plant succession, and past management activities such as timber harvesting practices, fire exclusion, and grazing. Treatments described in the Proposed Action Alternative would move vegetation toward more desired composition and distribution as described in the Cibola ALRMP and TEUI Inventory.

**Figure 1.5.1. General Location of the Desired Vegetation Cover Types**
Ponderosa Pine:

Within the ponderosa pine forest type the desired condition would be to provide goshawk habitat that is consistent with the northern goshawk guidelines (Cibola Land and Resources Management Plan (LRMP), page 71-5; *Management Recommendations for the Northern Goshawk in the Southwestern United States, General Technical Report RM-217. 1992*).

Tree density within forested areas generally ranges from 22 to 89 square foot basal area per acre (Reynolds et al. 2013). Size of tree groups is typically less than 1 acre, and most commonly ranges from 0.1 - 0.5 acres. Groups at the mid- to old-age stages consist of 2 to approximately 40 trees per group. Ground cover consists primarily of perennial grasses and forbs capable of carrying surface fire, with basal vegetation values ranging between about 5 and 20% depending on the TEUI unit (USDA Forest Service 1986, 2006).

Overall the desired conditions include:

- Managing for uneven-age stand conditions for live trees to include a combination of tree groups and openings
- Retaining all trees 24” diameter at breast height (DBH) and greater, regardless of age, health or condition.
- Retaining snags (2/acre), large downed logs (3/acre), and woody debris levels (5-7 tons/acre) throughout woodland, ponderosa pine
- Managing for old age trees such that as much old forest structure as possible is sustained over time across the landscape
- Sustaining a mosaic of vegetation densities, age classes, canopy gaps and species composition across the landscape
- Maintaining a range of Vegetation Structural Stages (“VSS”, or growth stages of living trees) - treatments would strive to achieve, over time, a VSS distribution of 10% VSS 1 (grasses, forbs, and shrubs); 10% VSS 2 (seedlings and saplings; 1”-4.9” DBH); 20% VSS 3 (young forest; 5”-11.9” DBH); 20% VSS 4 (mid-aged forest; 12”-17.9” DBH); 20% VSS 5 (mature forest; 18”-23.9” DBH); and 20% VSS 6 (old forest; 24”+ DBH) across the landscape.
- Within Goshawk Post Fledgling Family areas (PFAs) and dispersal PFAs, residual basal area per acre (ft²) would contain 10 percent or greater due to habitat needs compared to foraging areas (lands outside PFAs).
- Goshawk nest areas would consist of, or be managed to attain, a minimum 30-40 TPA in a size class distribution of VSS 5 (18-23.9” DBH) and/or 6 (24”+ DBH) where existing.
- On 20% of the desired 24,969 acres of ponderosa pine acres (approximately 4,994 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines, page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process.
• Temporary openings, for regeneration purposes, may be up to four acres with a maximum width of 200 feet exist on approximately 10-20% of the area. Three to five reserve trees per acre are maintained as a seed source in openings greater than 1-acre in size.

• Dwarf-mistletoe occurs in less than 15 percent of host trees in uneven-aged forest structures and less than 25 percent in even-aged forest structures.

Forest conditions in goshawk post-fledging family areas (PFAs) are similar to general forest conditions except these forests contain 10 percent or higher basal area in mid- to old-age tree groups than in goshawk foraging areas and the general forest. Goshawk nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than other areas in the ponderosa pine type. Figure 1.5 displays the general arrangement of leave groups and rooting zones that would remain after treatment in goshawk foraging areas. Not shown are the temporary openings created for regeneration purposes.

Figure 1.5.2. Illustration of Desired Spatial Arrangement of Leave Group
Ponderosa Pine – Gambel Oak:

This forest type would be treated similar to ponderosa pine, but additional emphasis placed on retaining and promoting the growth of additional large hardwoods (>5” diameter at root collar (drc)), retention of ponderosa pine greater than 18” dbh, and retention large snags (>18” dbh) and downed logs (>18” dbh). Manage for at least 10% of total stand basal area (ft²) consisting of Gambel oak 5” DRC or greater, or 20 ft² of basal area per acre of Gambel oak. On 20% of the desired 15,033 acres of ponderosa pine – Gambel oak (approximately 3,007 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines, page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process. Retain all trees 18” DBH and greater, per Mexican Spotted Owl recovery Plan (2012).

On a minimum of 10% of the 15,033 acres of desired pine-oak type (approximately 1,503 acres), manage for MSO Recovery Nest-Roost minimum desired conditions of:

- 30% of basal area in trees 12-18” DBH
- 30% of basal area in trees 18”+ DBH
- 110 square feet of basal area per acre
- Twelve 18”+ trees per acre.

Dry Mixed Conifer (frequent fire):

Dry mixed-conifer forests are dominated by shade-intolerant trees such as ponderosa pine, Douglas-fir, Southwestern white pine, quaking aspen, and other hardwoods. Trees typically occur in irregularly shaped groups, trees within groups are variably spaced, and group sizes generally range from a few trees up to about an acre in size, similar to ponderosa pine forest types.

Trees within groups are of similar or variable ages and groups are composed of one or more species. Crowns of trees within the mid-aged to old groups are interlocking or nearly interlocking. Size, shape, number of trees per group, and numbers of groups per area are variable. It is desirable that stands have an uneven-aged forest structure with an approximate balance of age classes ranging from young to old. Infrequently, stands of even-aged forest structure may be present. Surface fuels and small trees facilitate this fire regime. While fires burn primarily on the forest floor, occasionally individual trees or tree groups may torch. Crown fires rarely spread from tree group to tree group. Overall the desired conditions include:

- Managing for uneven-age stand conditions for live trees to include tree groups and openings. Trees typically occur in irregularly shaped groups and are variably-spaced with some tight clumps.
1. Purpose of and Need for Action

- Some natural openings contain individual trees or snags. Trees within groups are of similar or variable ages and one or more species. Size of tree groups typically is less than 1 acre.
- Crowns of trees within the mid- to old-age groups are interlocking or nearly interlocking. Interspaces surrounding tree groups are variably-shaped and comprised of a grass/forb/shrub mix. Groups at the mid- to old-age stages consist of 2 to approximately 50 trees per group.
- Openness typically ranges from 10 percent in more productive sites to 50 percent in the less productive sites.
- Tree density within forested areas generally ranges from 30 to 100 square foot basal area per acre.
- Managing for old age trees such that as much old forest structure as possible is sustained over time across the landscape. Retain all trees 18” DBH and greater that have no sign of insect or disease damage.

On a minimum of 25% of the 776 acres of desired mixed conifer type (approximately 194 acres), manage for Recovery Nest-Roost minimum desired conditions of:

- 30% of basal area in trees 12-18” DBH
- 30% of basal area in trees 18”+ DBH
- 120 square feet of basal area per acre
- Twelve 18”+ trees per acre.

The acres managed for Recovery Nest-Roost will meet the LRMP Forest Wide Standards and Guidelines, page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth”.

**Ponderosa Pine & Pinyon-Juniper Mix:**

These transition zones include a variable tree component that may range from sparse to relatively dense and may include any of the pinyon and juniper species, ponderosa pine and oak. It is desired to maintain uneven-aged conditions and sustain a mosaic of vegetation densities (overstory and understory), age classes, and species composition well distributed across the landscape. Overstory vegetation in trees ranges from about 15-50%, and ground cover consists of shrubs, perennial grasses, and forbs with basal vegetation values ranging between about 5 and 20% depending on the TEUI unit (USDA Forest Service 1986). Trees typically occur in even-aged patches, with patches ranging from young to old, and where patch size of (persistent) woodlands range to 10 of acres or larger (Muldavin et al. 2003). Retention of ponderosa pine will focus on the most vigorous and healthy dominant and co-dominant trees in irregularly sized-groups and stringers, while removing mid-story ladder fuels. Where pinyon-juniper dominates, focus will be on thinning from below and restoring historic openings between tree groups.

**Ponderosa Pine** - Tree density within ponderosa pine dominated areas generally ranges from 22 to 89 square foot basal area per acre (Reynolds et al. 2013). Size of tree groups typically is
less than 1 acre, but averages 0.5 acres. Groups at the mid- to old-age stages consist of 2 to approximately 40 trees per group. All trees 24” DBH and greater, regardless of health or condition, will be retained.

**P-J Woodland** – In areas dominated by P-J Woodland, trees occur as individuals or in smaller groups ranging from young to old. Typically groups are even-aged in structure with all ages represented across the landscape for an overall uneven-aged grouped appearance. Patch sizes of woodlands range from individual trees and clumps that are less than one-tenth acre, to tree groups of approximately an acre, and occasionally from 1 to 10s of acres.

- On 20% of the desired 13,403 acres of Ponderosa Pine / P-J Mix (approximately 2,681 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines, page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process.

**Pinyon - Juniper:**

The pinyon-juniper (P-J) vegetation community in the Puerco Project is primarily composed of P-J Woodland, with a small amount of P-J Grass. These are dominated by one or more species of pinyon pine and/or juniper and can occur with a grass/forb dominated understory (P-J grassland), or a discontinuous understory of some grasses and/or shrubs (P-J Woodland). Two-needle pinyon pine and One-seed juniper are common. Rocky Mountain and alligator junipers are well-represented, with a lesser abundance of oaks. Species composition and stand structure vary by location primarily due to precipitation, elevation, temperature, and soil type.

On 20% of 18,544 P-J acres (approximately 3,709 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines found on page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process.

**P-J Woodland** - trees occur as individuals or in smaller groups ranging from young to old. Typically groups are even-aged in structure with all ages represented across the landscape for an overall uneven-aged grouped appearance. The patch size of woodlands ranges from 1 to 10s of acres.

**P-J Grass (Savanna)** - is generally uneven aged and open in appearance. Trees occur as individuals, but occasionally in smaller groups, and range from young to old. Patch sizes of woodlands range from individual trees and clumps that are less than one-tenth acre, to tree groups of approximately an acre (Muldavin et al. 2003).

**Grasslands/Shrublands:**

Approximately 8,237 acres of grassland and shrubland types, based on TEUI, would be moved toward the following desired conditions:
Sagebrush Shrubland – Historically dominated by big sagebrush and primarily occurs adjacent to Great Basin grassland and pinyon juniper woodlands. While big sagebrush is the dominant species, other shrubs and grasses and forbs are present. Historically, tree canopy cover exceeded 10%, with the exception of early, post-fire plant communities (USDA 2015). The historic average fire return interval was 35–200 years from mixed-severity fire. Sagebrush shrubland is highly departed for vegetation structure, species composition, and patch size (too small), ecological need for change may hinge on restoring the historic mixed-severity fire regime.

Colorado Plateau/Great Basin Grassland - In general, found at lower elevations with vegetation coverage consisting of mostly grasses and interspersed shrubs. May have had over 10% shrub cover historically, but had less than 10% tree cover. The historic average fire return interval was 0–35 years from stand-replacing fire; however, most recent fires have been non-lethal. Departure is moderate with moderate–high risk from vegetation structure, high risk from altered fire regime, and high risk from decreased patch size, future management should strive to restore vegetation structure to reference conditions. In turn, this may simultaneously (either passively or actively) return fire regime and patch size to reference conditions (USDA 2015).

Montane/Subalpine Grassland - Occurs at elevations ranging from 8,000-11,000 feet, and often harbors several plant associations with varying dominant grasses and herbaceous species. Trees may occur along the periphery of the meadows, and some shrubs may also be present. These meadows are seasonally wet, which is closely tied to snowmelt. They typically do not experience flooding events. Historically, tree and shrub canopy cover were each less than 10% and stand-replacing fires occurred every 0–35 years. The most substantial risks are from a lack of frequent stand-replacing fire and patch size (currently highly departed; too small). May be considered especially sensitive to climate change, as it occurs at the highest elevations and is therefore incapable of uphill migration as a climate change response. Future management should use stand-replacing fire to reduce tree encroachment, increase patch size, and potentially restore species composition.

Fuels and Fire Behavior
The best way to alleviate the potential of unwanted large destructive fires within the project area is to create fuel situations that would reduce the energy output of fire starts to a point where conventional firefighting methods can be effective. A condition in which natural and/or prescribed fire is used to maintain fuel loadings and tree densities is desired. The desired outcome of the treatments is to reduce the likelihood of large scale crown fires and to provide fire management forces the opportunity to manage fires for ecosystem benefits.

Desired future conditions would mimic natural ecosystem traits, having a diverse mosaic of fuels that are arranged in a fashion not subject to uncharacteristic wildfire. The desired condition would have; fewer trees, especially small diameter trees, that act as ladder fuels and increase the risk of torching, and an open canopy with lower crown bulk density which reduces the risk of sustained crown fire. The ecosystem should be resilient to natural disturbance events including fire, drought, disease, and insect infestations. A desired future condition would allow fire to play
its natural role in the environment, and be maintained in a manner to alleviate resistance to control.

- An average FRCC of 1 is desired across the Puerco Landscape analysis area.
- Desired future conditions would have canopy bulk densities at or below 0.0065 lb./ft³ in any given stand in order to minimize the potential of a sustained crown fire.
- Fuel loadings (tons/acre) and crown bulk density (CBD), around wildland/urban interface should be lower in order to reduce fire hazard. *Crown Bulk Density* is an indicator of the incidence of interlocking crowns which can tells us how a crown fire can spread. CBD is the primary controlling factor of crown fire behavior and it depends on both species composition and stand density (Graham and others 1999). CBD is measured in lb. per ft. cubed and is the amount of mass in the canopy of a stand. In general, the lower the CBD, the higher the wind speed has to be to sustain a crown fire.
- Desired fuel loadings in ponderosa pine and P-J are 5 to 7 tons per acre and in mixed conifer 10 to 15 tons per acre over the project area.

**Wildlife**

- Native ecosystems are within reference conditions, are distributed throughout their potential range, and are sustainable across the Forest and able to support a full complement of native species.
- Habitat conditions and compatible multiple uses contribute to the recovery of federally listed species and the persistence of species of conservation concern.
- Habitat configuration and availability allow wildlife populations to adjust their movements in response to major disturbances (such as climate change and uncharacteristic fire) and promote genetic flow between wildlife populations across the Forest and beyond.

**Recreation and Scenery Management**

- The recreation program is integrated into all forest resource management decisions and activities and is adaptable to changes in recreation use and trends.
- Forest thinning and related actions are integrated with recreation and scenery objectives to enhance scenic quality, to impede future illegal motorized cross-country travel.
- Vegetation management activities along road and trail corridors are designed to reinforce travel management objectives of keeping motor vehicles on the designated routes and prohibiting motorized cross-country travel by not opening up large swaths of ground without barriers along the corridors.
- Provide high quality campground and picnic grounds with adjacent trail opportunities, sufficient screening, reduced overhead hazards, and a vibrant uneven-aged forest canopy.
- Scenery management, scenic character, and scenery values are integrated into the design, planning, and implementation of all resource management decisions.
• High quality scenery and scenic values are protected in areas of high public use, such as scenic byways, major roads and trails, and developed recreation sites.

• Scenic resources and scenic character reflect ecosystem diversity, enhance the recreation settings, and contribute to the quality of life of local residents and communities.

• The Agua Remora eligible wild and scenic river corridor is managed to protect or enhance existing outstanding remarkable values and classifications until designated or released from consideration.

• Desired conditions for Agua Remora provide for the necessary ecological conditions to contribute to the recovery and maintenance or restoration of critical habitats for threatened and endangered species and integration of habitat management objectives and species protection measures from the most recent approved recovery plan.

**Soil/Watershed**

• Soil condition is satisfactory, soil functions are sustained and soil is functioning properly. The ability of soil to maintain resource values and sustain outputs is high.

• Vegetation contributes to soil condition, nutrient cycling, and hydrologic regimes at natural levels.

• Downed woody material occurs at levels (size, decay, and amount) sufficient to support soil productivity.

• Soils do not exhibit excessive rill, sheet, or gully erosion.

• More than 50 percent of each 12 digit sub-watershed is in a satisfactory fire condition class as described in the watershed condition framework.

• No more than 20 percent of the forested land in each 12 digit sub-watershed should be at imminent risk of high levels of mortality due to insects and disease.

• Watersheds are not at risk due to the fuels composition and uncharacteristic disturbance.

• The hydrologic regime within a watershed is not impacted by the density and distribution of roads, trails, and impervious surfaces.

**Water Resource Features and Wetland/Riparian**

• Riparian areas are in proper functioning condition and support higher ecological values.

• Sufficient reproduction of native species appropriate to the site is occurring to ensure sustainability.

• Native riparian plants such as willow (such as Bebb, peachleaf) are reproducing with all age classes present where the potential exists.

• Bank characteristics including vegetation are stable within the natural range of variability.

• In aquatic and riparian systems that evolved with wood near the streams, large woody material is present and continues to be recruited into the system at near natural rates.
• Springs, riparian areas, and wetlands have the necessary soil, water, and vegetation attributes to be healthy and properly functioning

**Puerco Aquatic Resources:**

• **Shade:** Shading over perennial and intermittent water surfaces that is at least 80 percent of natural levels.

• **Bank Cover:** Natural bank protection of at least 80 percent of natural levels. Stream bank stability provided by woody plant roots, particularly on outside bends of stream channel meanders.

• **Streambed Sedimentation:** Composition of sand, silt, and clays within streambeds should not exceed 20 percent of natural levels.

• **Habitat:** Aquatic pools are wet for longer periods of time to provide persistent habitat for aquatic species

**Puerco Riparian Vegetation Resource (where site is capable of supporting woody plants):**

• **Species Composition:** 60 percent of woody plant composition in three or more riparian species or as appropriate for the site.

• **Plant Structure:** Three age classes of riparian woody plants with at least 10 percent of the woody plant cover in the sprout seedling and sapling stages and 10 percent in the mature and over-mature.

• **Crown Cover:** Both trees and shrubs are at least 60 percent of natural levels

• **Ground Cover:** Ground cover and litter for site and overstory conditions.

**Heritage and Cultural Resources**

• As a result of this project, no physical destruction of or damage to any cultural/heritage property.

• All cultural/heritage properties will remain undisturbed in their current locations historic location.

• There will be no change of the character of a property’s use or of physical features within the property’s setting that contribute to its historic significance.

• No visual, atmospheric or audible elements that diminish the integrity of a property’s significant historic features will be introduced.

**Range Management**

• Livestock grazing and associated management activities are in balance with the needs of wildlife forage, watershed ground cover, natural fire regime, and resilience to climate variability.

• Herbaceous native plant communities occur within the natural range of variability.

• Range improvements minimize impacts to soil, watershed, and wildlife resources.
• Sustainable livestock grazing contributes to the long-term socioeconomic and diversity and stability of rural communities and the cultural identity tied in with traditional uses.

**Transportation**

• Unauthorized roads are decommissioned after restoration and prescribed fire treatments are completed to reduce resource damage to soils, water quality, wildlife habitat, and heritage resources.

• Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is given to maintaining drainage facilities and runoff patterns.

**1.6 Decision Framework**

The decisions to be made are:

• Whether or not to restore ecosystem conditions through vegetation treatments, including individual tree and group selection, creating temporary regeneration openings, thinning, mastication, and fuelwood gathering;

• Whether or not to manage up to 5,900 acres of moderately to heavily dwarf mistletoe-infected stands with even-aged silvicultural treatments;

• Whether or not to reduce fuel loads and what prescribed fire actions to take;

• Whether or not to improve riparian areas, including installation of protective barriers

• Whether or not to perform treatments designed to restore up 19 springs;

• Whether or not to rehabilitate up 200 miles of unauthorized roads;

• Whether or not to modify existing and construct additional infrastructural needs such as wells, pipelines, cattle guards, fences and dirt tanks;

• Whether or not to install wildlife trick tanks;

• Whether or not to amend the forest plan to provide for areas of grass, forbs, and shrubs interspersed with tree groups and allow for treatments to move tree group patterns, interspaces, and stand density toward the natural range of variability;

• Whether to amend the forest plan would allow for treatments that improve Mexican spotted owl nesting and roosting habitat as defined in the Revised 2012 Mexican spotted owl recovery plan.

**1.7 Public Involvement**

On March 14, 2017, a scoping letter with links to a detailed Proposed Action was mailed to approximately 145 different agencies, businesses, individuals, tribes, and organizations interested in or determined to be potentially impacted by the proposed project. Comments were requested by April 14, 2017, but comments received after that date were accepted and considered. In addition, the proposal was posted on the Cibola NF&G website on March 10th and was published.
in the Schedule of Proposed Actions on April 1, 2017. See Project Record for a list of comments received. Comments received during scoping were used to develop a list of issues and these issues helped guide the development of alternatives.

On April 4, 2017 the proposed action for Puerco Project was presented at the Zuni Mountains Collaborative Meeting held in Gallup, NM. Formed in 2005, the purpose of the Zuni Mountains Collaborative is to provide recommendations for actions concerning the use and management of lands and waters within the Zuni Mountain Landscape in west-central New Mexico. On April 5, 2017 the proposed action was also presented at a public meeting held in Grants, NM. A field tour of the Puerco Project area was conducted on June 6, 2017 visiting numerous sites across the project area to view existing conditions and discuss needs for change and proposed treatments.

The Cibola National Forest consults with seven American Indian Tribes and 13 Chapters of the Navajo Nation regarding proposed projects and management activities on the Mt. Taylor Ranger District. These include: the Hopi Tribe, the Navajo Nation, and the Pueblos of Acoma, Laguna, Zuni, Jemez, and Santa Ana and the following Navajo chapters: Baca/Prewitt, Casamero Lake, Crownpoint, Mariano Lake, Ojo Encino, Ramah, Smith Lake, Thoreau, To’hajiilee, Torreon, Whitehorse Lake. In 2016, the Forest began consulting with the Baahaali and Churchrock Chapters.

Consultation pursuant to Section 106 of the National Historic Preservation Act was initiated in 2013. The Puerco Landscape Restoration project was highlighted in the Forest’s annual project consultation letter sent to the Tribes and Chapters in 2013, and again in 2014 and 2015. Project consultation meetings were initiated in the summer of 2013 and have continued into 2018. The Cibola National Forest has received additional comments during project consultation and other meetings.

The Forest Stewards Guild hosted meetings with the Cibola National Forest and the Pueblos of Acoma, Zuni, and Laguna, as well as the Ramah and Baahaali Chapters in 2016 to discuss new and expanded opportunities for collaboration in the Zuni Mountains. The Puerco project was discussed as a part of those meetings. In June 2017, the Forest Stewards Guild assisted the Cibola National Forest in organizing a fieldtrip to the Puerco project area to look at existing conditions, and discuss desired conditions and proposed treatments. Correspondence related to the fieldtrip was sent to the neighboring Tribes and the two Chapters that share a common boundary and/or have expressed an active interest in restoration work in the Zuni Mountains. A representative from the Pueblo of Zuni participated in the field trip.

The Puerco project was added to the SOPA (Schedule of Proposed Actions) in January 2017. A scoping letter (letter dated 3/14/2017) was sent to all the Tribes and Chapters. That letter contained an invitation to a public meeting which was held on 4/5/2017. One tribal representative, from the Pueblo of Laguna, attended the public meeting. The Forest received written comments from one Tribe in response to scoping. In a letter dated 3/27/2017, the Hopi
Tribe’s Cultural Preservation Office expressed its interest in continued consultation on the project, as well as a copy of the cultural resource survey report(s) and any proposed treatment plan, if the project will adversely affect prehistoric cultural sites. The letter states that the Tribe supports the identification and avoidance of prehistoric sites. A consultation meeting was held with the Hopi Tribe in early July 2017. The Tribe made a request that the Forest invest some effort into identifying traditionally-used plants within the Puerco project area. Desert Tobacco (*Nicotiana obtusifolia*) was specifically mentioned, and a comment made that it responds well to prescribed burning.

A field-based consultation meeting was held with the Navajo Nation Historic Preservation Department and the Baahaali Chapter in November 2017. One objective of the fieldtrip was to determine an appropriate course of action to ensure that cultural items potentially affiliated with the Navajo remain undisturbed during project implementation. Another objective was to look at the treatments proposed in and around the Hogback. The project area was expanded westward to include the Hogback and extend all the way to the Forest’s common boundary with the Baahaali Chapter and the Pueblo of Zuni, based upon input received from the Chapter at a meeting in 2016. During the field consultation, the Navajo Nation provided input on the proposal to treat two-culturally significant landscape features using prescribed fire, as well recommendations for avoiding impact to the identified cultural items. This input has been incorporated into the proposed action.

A meeting with Zuni Mountains Collaborative Group was held on July 17, 2018 in Grants, NM, where the modified proposed action and timeline for the Puerco project was shared with participants. A sign-up sheet was made available for attendees who wanted to be included on the project mailing list.

### 1.8 Issues

The Forest Service separated the issues into two groups: relevant and non-relevant to the proposed action. Relevant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-relevant 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 for Environmental Quality (CEQ) NEPA regulations require 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 (Sec. 1506.3)…” A list of non-significant issues and reasons regarding their categorization as non-significant may be found in the project record.

A total of 6 comments were received on the Puerco Collaborative Restoration Project. From the public comments received, the Forest Service did not identify any issues that would drive the analysis of any alternatives other than the Proposed Action and No Action Alternatives. Internal
comments brought to light that a significant portion of the project area located on sensitive soils (Chinle Formation) had been proposed for thinning and burning treatments. Because these soils are in unsatisfactory condition with severe hazard, the proposed action has been modified to omit burning and limit thinning treatments to be done only by hand to protect the soil.
2 Alternatives

Two alternatives were analyzed in detail; the No Action (Alternative A) and the Proposed Action (Alternative B). The proposed action was developed to maximize attainment of the purpose and need. Alternative A provides a baseline for comparison to the Proposed Action.

2.1 Alternative A – No Action

None of the proposed management activities would be implemented under this alternative. No new treatments would be implemented to address existing vegetation, fuels, wildlife, watershed, or recreation concerns. Suppression of wildfire would continue but previously treated areas would not be maintained and no new treatment areas would be created. This alternative would not be consistent with the Cibola National Forest Land and Resources Management Plan (LRMP) over the long term as it would not meet the goals and objectives or provide the desired conditions described in the LRMP.

2.2 Alternative B – The Proposed Action

The Proposed Action has been modified since public scoping. The following are the changes:

1. During the field verification process after scoping, areas located in the northern portion of the project area on sensitive Chinle Formation soils were reclassified from hand thin, lop and scattering slash and prescribe burning to thinning, lop and scattering and no prescribe burning to protect soil conditions and reduce potential erosion. Proposed acres of hand thinning with no burning increased from approximately 4,500 to 22,000 acres.
2. During the field verification process after scoping, areas with poor road condition and access located in and around McKenzie Ridge in the northeastern portion of the project area were reclassified from thinning and prescribe burning to burn only, increasing from approximately 3,750 to 9,350 acres.
3. Acres of proposed commercial treatments were adjusted from 43,000 down to 31,000 acres.
4. Mexican Spotted Owl surveys conducted in 2017 found two new draft protected activity centers (Aqua Remora and McGaffey) located inside of the project area that will result in timing restrictions and less intensive treatments on 624 acres.
5. Dwarf mistletoe surveys were conducted in 2017 to field verify infection levels on over 10,000 acres determined that approximately 5,900 acres may be suitable for more intensive even-aged management treatments designed to improve forest health and resiliency.

The Proposed Action as originally scoped has been revised and the new information will be carried through the modified proposed action alternative.

To meet the purpose and need for the Puerco Landscape Restoration Project and move toward desired conditions, the Cibola National Forest proposes a combination of mechanical thinning, mastication, prescribed fire, and other restoration activities throughout the project area that would make forests, shrub and grasslands more resilient to natural disturbances such as fire,
insects and disease, and climate change. Restoration activities are needed to maintain or restore structure and pattern, the desired fire regimes, and watershed and ecosystem function in ponderosa pine, frequent fire mixed conifer, ponderosa pine-Gambel oak, pinyon-juniper woodlands, riparian, shrub and grassland cover types, moving them toward conditions within the natural range of variability. Other existing cover types, such as deciduous oak woodland, may also receive treatments to move toward desired cover types, improve wildlife habitat, reduce uncharacteristic fire risk, or restore natural fire regimes.

The proposed treatments will move these areas toward their desired conditions and help to reestablish functioning ecosystems that are sustainable and resilient. The proposed mechanical treatments (low thinning and uneven-aged selection cutting methods) are designed to establish openings and promote multi-aged stand structure, restore historic fire regimes, mitigate adverse effects of active crown fire, climate change and maintain or improve ecosystem health and function.

Implementing mechanical treatments and prescribed fire would decrease surface and canopy fuel loading, as well as ladder fuels in the immediate vicinity of desired trees and groups of trees. This would decrease potential fire-induced mortality in large and/or old trees, as well as in established seedlings and saplings needed to promote uneven-aged structure. Use of prescribed burning, particularly when combined with mechanical thinning, would reduce the potential for damage from wildfires (Fule et al 2012, Waltz et al 2014), as well as the costs associated with fire suppression.

Grass and shrubland restoration would include reducing or eliminating undesirable tree encroachment, and applying prescribed fire to reestablish historic fire regimes and vegetation composition. Spring restoration would include reducing tree encroachment and noxious weeds, returning fire to the system (prescribed fire), and placing protective barriers and/or planting.

Stream habitats and aquatic species depend upon perennial streams or reaches and their habitat is maintained by the watershed, soil, and riparian conditions within the ecosystem. Proposed stream habitat treatments may be needed within all or some portion of streams within the project area. Restoration treatments may include channel restoration (rock dams, grade control or induced meandering) and channel structural improvements (felling or girdling trees to provide large woody debris for cover and habitat complexity). All proposed riparian treatments would also improve or maintain stream habitat by restoring watershed function or resiliency. Treatments in watersheds may also improve soil condition, soil infiltration and subsurface flows.

To stimulate growth, recruit younger age classes, and increase individual recruitment of aspen and riparian species, competing conifers would be thinned from within and around existing aspen and willows where they occur within other vegetative cover types. Protective barriers may be placed around aspen and willows to reduce browsing and other disturbances, recruit younger age classes, increase populations, and retain these diverse habitats. Where monitoring indicates that
recruitment of younger age classes is not sufficient, planting of appropriate species adapted to the growing sites would be considered.

Proposed treatment types are developed based upon the combination of existing conditions, soil condition and erosion hazard determined from Terrestrial Ecosystem Unit Inventory data. Table 2.2.1 displays proposed activities based upon current soil condition and erosion hazard. Where existing vegetation conditions are not highly departed from desired conditions, less intensive treatments such as hand thinning or burn only may be prescribed.

The existing condition for ponderosa pine, pine-oak, and mixed conifer forest types is deficient of large and old trees greater across the landscape. The Cibola National Forest Supervisor made the decision in November 2015 that within the Zuni Mountain Collaborative Forest Landscape Restoration (CFLR) Project area, which includes the Puerco Project, an old tree retention strategy would be implemented. The strategy states that every effort should be made to conserve old trees to promote a balanced, uneven-aged forest condition that maintains, or contributes to the restoration of pre-settlement old growth conditions characteristic of the forest type. This should be achieved by retaining pre-settlement trees, often the largest and tallest trees on site. All trees greater than 24” diameter at breast height (DBH) will be retained on site regardless of condition or old tree characteristics, unless deemed an imminent hazard to people or property. This strategy describes tree characteristics that are indicative of old trees (~150 years old) such as bark, branching and form (Appendix B).

### Table 2.2.1. Proposed Activities by Soil Condition and Erosion Hazard

<table>
<thead>
<tr>
<th>Soil Condition</th>
<th>Erosion Hazard</th>
<th>Potential Activities</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfactory</td>
<td>Slight/ Moderate</td>
<td>Mechanical or Hand Thinning, Mastication, Prescribed Burning, Public or Commercial Removal of Wood Products within ¼ mile of Roads</td>
<td>136</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>Severe</td>
<td>Hand Thinning or limited Mechanical and Mastication, Prescribed Burning, Commercial Removal within ¼ mile of Roads, with rehabilitation of soils.</td>
<td>670</td>
</tr>
<tr>
<td>Impaired</td>
<td>Slight/ Moderate</td>
<td>Mechanical or Hand Thinning, Mastication, Prescribed Burning, Commercial Removal within ¼ mile of Roads</td>
<td>57,677</td>
</tr>
<tr>
<td>Impaired</td>
<td>Severe</td>
<td>No Impaired/Severe Soil Types exist within Project Area</td>
<td>0</td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td>Slight/ Moderate</td>
<td>No Impaired/Severe Soil Types exist within Project Area</td>
<td>0</td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td>Severe</td>
<td>Hand Thin only, Prescribed Burning, No Removal of Wood Products</td>
<td>22,501</td>
</tr>
</tbody>
</table>

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7 A hazard tree is defined as a tree that has both: a structural defect that increases the chance of a tree or its parts to fail, and a target (people, buildings, cars, etc.) would be hit when the tree fails. USDA Forest Service, Southwestern Region. 2015. Tree Risk Detection and Management in the Southwestern Region.
Restoration activities proposed for the Puerco Landscape Restoration Project include:

- Commercially thin trees, including public fuelwood removal, and/or implement prescribed fire on approximately 31,400 acres.
- Implement prescribed fire alone on approximately 9,354 acres.
- Hand thin and lop and scatter slash for soil protection without prescribed fire on approximately 22,270 acres.
- Hand thin and implement prescribed fire on approximately 3,000 acres.
- Mechanically thin or masticate and implement prescribed fire on approximately 14,900 acres.
- Mechanically thin and/or implement prescribed fire on up to 6,416 acres of Mexican spotted owl (MSO) protected activity centers (PACs), up to 1,346 acres of MSO recovery habitat, and approximately 3,248 acres (including 1,850 acres of dispersal PFAs) of northern goshawk post-fledging family areas (PFA).

Table 2.2.2 displays acres proposed to be thinned and/or burned by existing forest cover type, and Figure 2.2.1 displays general locations for the proposed vegetation thinning and prescribed fire.

Table 2.2.2. Acres of Proposed Mechanical Treatments and Prescribed Fire by Cover Type

<table>
<thead>
<tr>
<th>Vegetation Cover Type</th>
<th>Mechanical Treatment with Prescribed Fire</th>
<th>Mechanical Treatment Only</th>
<th>Prescribed Fire Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Mixed Conifer</td>
<td>263</td>
<td>300</td>
<td>212</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>19,417</td>
<td>2,059</td>
<td>3,494</td>
</tr>
<tr>
<td>Ponderosa Pine-Gambel Oak</td>
<td>10,904</td>
<td>1,046</td>
<td>3,083</td>
</tr>
<tr>
<td>Pinyon-juniper Woodland</td>
<td>875</td>
<td>17,280</td>
<td>390</td>
</tr>
<tr>
<td>Ponderosa Pine/P-J Transition</td>
<td>10,209</td>
<td>1,875</td>
<td>1,319</td>
</tr>
<tr>
<td>Grassland/Shrubland</td>
<td>7,670</td>
<td>527</td>
<td>39</td>
</tr>
<tr>
<td>Riparian Meadow</td>
<td>21</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td><strong>49,359</strong></td>
<td><strong>23,087</strong></td>
<td><strong>8,538</strong></td>
</tr>
</tbody>
</table>
Figure 2.2.1. General locations for the proposed vegetation thinning and prescribed fire.
• Rehabilitate up to 200 miles of unauthorized roads.
• Improve road drainage and crossings.
• Restore approximately 19 springs.
• Restore up to 250 acres of riparian areas including associated stream habitats for threatened, endangered, and sensitive aquatic species.
• Improve the function of streams, including gullies.
• Improve soil condition by improving ground cover and woody material.
• Construct protective barriers around springs, aspen, and willows as needed for protection of approximately 300 acres.

Existing infrastructure including but not limited to water developments, fences, corrals and buildings would be inventoried and assessed to determine if their current location and design facilitate movement toward desired conditions. Alternative or additional locations or designs would be recommended where appropriate. Many water developments are not functional and are degrading the riparian ecosystems associated with them. Improved design and alternative water sources are needed to move toward desired conditions that increase water availability to wildlife and allow for better distribution of livestock to reduce overall impacts across the project area. To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

• Clean or reconstruct approximately 15 existing dirt tanks, and construct 2 new dirt tanks.
• Reconstruct approximately 15 miles of fence, and 1 corral.
• Install approximately 3 new cattle guards.
• Re-drill 3 existing wells and establish 3 new wells
• Install or extend 2 pipelines

**Plan Amendments**

To meet the project’s purpose and need, the existing Cibola Forest Plan would need to be amended to provide for areas of grass, forbs, and shrubs interspersed with tree groups and allow for treatments to move tree group patterns, interspaces, and stand density toward the natural range of variability. Amending the forest plan would allow for treatments that improve Mexican spotted owl nesting and roosting habitat as defined in the Revised 2012 Mexican spotted owl recovery plan. Amendment(s) to the Cibola Forest Plan would provide consistency in meeting desired conditions for ponderosa pine, ponderosa pine – Gambel oak and mixed conifer forest types across the Puerco Project area (Appendix A).

In 2012 the Mexican Spotted Owl Recovery Plan, First Revision was published (USFWS 2012). There is a need for the project activities to be in alignment with the management direction provided in the revised recovery plan. A project-specific plan amendment is needed because the
1986 Carson National Forest Plan, as amended, includes direction from the former (1995) recovery plan. In order to be consistent with the current recovery plan, the proposed plan amendment would:

- Update definitions and direction for protected (protected activity centers (PACs)), recovery habitat, and other forest and woodland types.
- Update language and direction related to prescribed cutting and fire treatments in PACs.
- Add forest structure guidelines for recovery habitat.
- Add direction for riparian forest habitats.
- Update survey information.
- Remove the direction for treating habitat in incremental percentages.

There is a need for the project activities to be in alignment with the best available science for northern goshawk management, particularly with regard to interspaces. Recent science (Reynolds et al. 2013) has shown that frequent-fire forests were historically characterized by the presence of interspaces of variable sizes and shapes. Interspaces are areas between tree groups which are generally composed of grass-forb-shrub vegetation and may contain scattered individual trees. The Cibola National Forest Plan provides guidelines to manage for uneven-aged stand conditions, but does not provide guidelines for the management of interspaces at the fine-scale. In order to meet restoration objectives there is a need for a project-specific Forest Plan amendment to address the management of habitat for northern goshawk, particularly regarding interspaces.

The Forest Plan provides direction for frequent-fire forest types on three levels: management scale, outside goshawk post-fledgling areas, and within goshawk post-fledgling areas. Therefore a project-specific Forest Plan amendment would need to address the direction provided on all three levels (Appendix A). The plan amendment would:

- Replace Forest Plan standards and guidelines for ponderosa pine and dry mixed-conifer (including northern goshawk direction) with desired conditions and guidelines.
- Add a desired condition for the percentage of interspaces within uneven-aged stands to facilitate restoration.
- Add the desired interspace distance between tree groups.
- Add a description of how canopy cover would be measured across the landscape.

**Vegetation Treatments**

**Mixed Conifer Treatments**

Dry mixed-conifer forests would be managed for shade-intolerant trees such as ponderosa pine, Douglas-fir, Southwestern white pine, quaking aspen, and other hardwoods at densities that would have been maintained under an uninterrupted frequent low-severity (Fire Regime 1) and
infrequent mixed-severity (Fire Regime 3) schedule. Groups of reserve trees would be created in irregularly shaped groups that are variably spaced, with group sizes generally ranging from a few trees up to about an acre in size. Interspaces would be created where natural openings have become ingrown or from overstocked mid-aged trees.

Trees within groups may be of similar or variable ages and groups would be composed of one or more species of the best available dominant or codominant trees. Crowns of trees within the mid-aged to old groups (approximately 80 years old and greater) would be interlocking or nearly interlocking. Treated stands would be managed for an uneven-aged forest structure with an approximate balance of age classes ranging from young to old. Where established seedlings and saplings are lacking, temporary openings would be created to encourage natural regeneration. Overall the proposed treatments would include:

- Creation of tree groups that are typically less than 1 acre in size, but most commonly range from 0.1 - 0.5 acres with 2-50 trees per group.
- Tree density may range from 20-100 trees per acre and 30-120 ft² of basal area per acre. Some natural openings may contain individual trees or snags.
- Creation of temporary openings on approximately 10-20% of the area, for regeneration purposes, up to two acres in size with a maximum width of 200 feet. Three to five seed trees would be retained where openings exceed 1 acre in size.
- Retention of snags (2/acre), large downed logs (3/acre), and woody debris levels (5-7 tons/acre)
- Interspaces surrounding tree groups are variably-shaped and comprised of a grass/forb/shrub mix. The size and arrangement of grass-forb-shrub interspaces would reflect local site conditions and may be as wide as 1-2 mature tree heights from the nearest drip lines of adjacent tree groups.
- Openness typically ranges from 10 percent in more productive sites to 50 percent in the less productive sites.
- Managing for old age trees such that as much old forest structure as possible is sustained over time across the landscape. Retention of all trees 18” DBH and greater that have no sign of insect or disease damage. All trees 24” diameter at breast height (DBH) and greater, regardless of health or condition.

On a minimum of 25% of the 776 acres of mixed conifer (approximately 194 acres), manage for Recovery Nest-Roost minimum desired conditions of:

- 30% of basal area in trees 12-18” DBH
- 30% of basal area in trees 18”+ DBH
- 120 square feet of basal area per acre
- Twelve 18”+ trees per acre.
The acres managed for Recovery Nest-Roost will meet the LRMP Forest Wide Standards and Guidelines, page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth”. Where these attributes are not currently present, those stands most closely resembling recovery nest-roost conditions will be managed to maintain and achieve them in the shortest possible amount of time.

**Ponderosa Pine Treatments**

**Ponderosa Pine:** Ponderosa pine forests would be managed for ponderosa pine, with incidental Douglas-fir, Southwestern white pine, quaking aspen, and other hardwoods. Within the ponderosa pine forest type the desired condition would be to provide goshawk habitat that is consistent with the northern goshawk guidelines (Cibola Land and Resources Management Plan (LRMP), page 71-5; Management Recommendations for the Northern Goshawk in the Southwestern United States, General Technical Report RM-217. 1992).

Ponderosa pine forests would be managed for uneven-aged stand conditions to include irregularly shaped tree groups, interspaces and regeneration openings. A mosaic of stand densities, age classes, and canopy gaps would be created across the landscape. Where established seedlings and saplings are lacking, temporary openings would be created to encourage natural regeneration. Ground cover consists primarily of perennial grasses, forbs and shrubs capable of carrying surface fire, with basal vegetation values ranging between about 5 and 20% depending on the TEUI map unit (USDA Forest Service 1986, 2006). Overall the proposed treatments would include:

- Creation of tree groups typically less than 1 acre in size, but most commonly range from 0.1 - 0.5 acres. Tree density within treated areas would generally range from 22 to 89 ft² of basal area per acre (Reynolds et al. 2013).
- Creation of groups at the mid- to old-age stages consisting of 2 to approximately 40 trees per group, retaining all trees 24” diameter at breast height (DBH) and greater, regardless of health or condition.
- Creation of temporary openings, for regeneration purposes, up to four acres with a maximum width of 200 feet exist on approximately 10-20% of the area. Three to five seed trees per acre would be maintained in created openings larger 1 acre.
- Retention of snags (2/acre), large downed logs (3/acre), and woody debris levels (5-7 tons/acre)
- Maintaining a range of Vegetation Structural Stages (“VSS”, or growth stages of living trees) - treatments would strive to achieve, over time, a VSS distribution of 10% VSS 1 (grasses, forbs, and shrubs); 10% VSS 2 (seedlings and saplings; 1”-4.9” DBH); 20% VSS 3 (young forest; 5”-11.9” DBH); 20% VSS 4 (mid-aged forest; 12”-17.9” DBH); 20% VSS 5 (mature forest; 18”-23.9” DBH); and 20% VSS 6 (old forest; 24”+ DBH) across the landscape.
- Goshawk nest areas would consist of, or be managed to attain, a minimum 30-40 TPA in a size class distribution of VSS 5 (18-23.9” DBH) and/or 6 (24”+ DBH).
On 20% of the desired 24,969 acres of ponderosa pine acres (approximately 4,994 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines, page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process.

Forest conditions in goshawk post-fledging family areas (PFAs) are similar to general forest conditions except these forests contain 10 to 20 percent higher basal area in mid- to old-age tree groups than in goshawk foraging areas and the general forest. Goshawk nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than other areas in the ponderosa pine type.

There are approximately 3,100 acres of the ponderosa pine type that are moderately to heavily-infected with dwarf mistletoe, where greater than 20% of the host trees or 25% of the area is infected. If management goals are to retain the host species (ponderosa pine and Douglas-fir) on the site, even-aged prescriptions are recommended (Conklin & Fairweather 2010). During project layout, if field validation shows that mistletoe infection levels are so severe that an uneven-aged prescription would not move stands toward conditions, then an intermediate thinning would be prescribed and regeneration would not an objective until maturity or beyond.

Even-aged prescriptions (intermediate thinning) would generally focus on retaining the best dominant and codominant trees with the least amount of mistletoe. Improved growth and vigor of the best trees is a primary objective. Intermediate thinning would hasten the development of larger trees—including larger infected trees often now deficient on the landscape (Conklin & Fairweather 2010). Eventually, some proportion of these stands could be regenerated and replaced and then, over time, converted to an uneven-age condition.

**Ponderosa Pine – Gambel Oak**: This forest type would be treated similar to ponderosa pine, but additional emphasis placed on retaining and promoting the growth of additional large hardwoods (>5” diameter at root collar (drc)), retention of ponderosa pine greater than 18” dbh, and retention large snags (>18” dbh) and downed logs (>18” dbh). Manage for at least 10% of total stand basal area (ft²) consisting of Gambel oak 5” DRC or greater, or 20 ft² of basal area per acre of Gambel oak. On 20% of the desired 15,033 acres of ponderosa pine – Gambel oak (approximately 3,007 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines, page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process. Retain all trees 18” DBH and greater, per Mexican Spotted Owl recovery Plan (2012).

There are approximately 2,165 acres of the ponderosa pine type that are moderately to heavily-infected with dwarf mistletoe, where greater than 20% of the host trees or 25% of the area is infected. If management goals are to retain the host species (ponderosa pine and Douglas-fir) on the site, even-aged prescriptions are recommended (Conklin & Fairweather 2010). During
project layout, if field validation shows that mistletoe infection levels are so severe that an uneven-aged prescription would not move stands toward conditions, then an intermediate thinning would be prescribed and regeneration would not an objective until maturity or beyond.

On a minimum of 10% of the 15,033 acres of desired pine-oak type (approximately 1,503 acres), manage for MSO Recovery Nest-Roost minimum desired conditions of:

- 30% of basal area in trees 12-18” DBH
- 30% of basal area in trees 18”+ DBH
- 110 square feet of basal area per acre
- Twelve 18”+ trees per acre.

**Mixed Ponderosa Pine & Pinyon-Juniper Transition Treatments**

These transition zones include a variable tree component that may range from sparse to relatively dense and may include any of the pinyon and juniper species, ponderosa pine and oak. It is desired to maintain uneven-aged conditions and sustain a mosaic of vegetation densities (overstory and understory), age classes, and species composition well distributed across the landscape. Overstory vegetation in trees ranges from about 15-50%, and ground cover consists of shrubs, perennial grasses, and forbs with basal vegetation values ranging between about 5 and 20% depending on the TEUI unit (USDA Forest Service 1986). Trees occur in even-aged patches ranging from young to old, where patch size of these woodlands ranges from 10s to 100s of acres (Muldavin et al. 2003). Retention of ponderosa pine will focus on the most vigorous and healthy dominant and co-dominant trees in irregularly sized-groups and stringers, while removing mid-story ladder fuels. Where pinyon-juniper dominates, focus will be on thinning from below and restoring historic openings between tree groups.

**Ponderosa Pine dominated:** Tree density within ponderosa pine dominated areas generally ranges from 22 to 89 square foot basal area per acre (Reynolds et al. 2013). Size of tree groups typically is less than 1 acre, but averages 0.25 acres. Groups at the mid- to old-age stages consist of 2 to approximately 40 trees per group. Pinyon pine and juniper species would be maintained as a minor component of the mid-story, focusing on retention of the largest and oldest trees. All trees 24” DBH and greater, regardless of health or condition, will be retained.

There are approximately 600 acres of the mixed ponderosa pine & pinyon-juniper transition type that are moderately to heavily-infected with dwarf mistletoe, where greater than 20% of the host trees or 25% of the area is infected. If management goals are to retain the host species (ponderosa pine and Douglas-fir) on the site, even-aged prescriptions are recommended (Conklin & Fairweather 2010). During project layout, if field validation shows that mistletoe infection levels are so severe that an uneven-aged prescription would not move stands toward conditions, then an intermediate thinning would be prescribed and regeneration would not an objective until maturity or beyond.
P-J Woodland Dominated: In areas dominated by P-J Woodland, trees occur as individuals or in smaller groups ranging from young to old. Typically groups are even-aged in structure with all ages represented across the landscape for an overall uneven-aged grouped appearance. Patch sizes of woodlands range from individual trees and clumps that are less than one-tenth acre, to tree groups of approximately an acre, and occasionally from 1 to 10’s of acres. Retention of ponderosa pine would focus on the oldest, most vigorous and healthy dominant and co-dominant trees in irregularly sized-groups and stringers.

- On 20% of the desired 13,403 acres of Ponderosa Pine / P-J Mix (approximately 2,681 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines, page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process.

Pinyon – Juniper Woodland:

The pinyon-juniper (P-J) vegetation community in the Puerco Project is primarily composed of P-J Woodland, with a small amount of P-J Grass. These are dominated by one or more species of pinyon pine and/or juniper and can occur with a grass/forb dominated understory (P-J grassland), or a discontinuous understory of some grasses and/or shrubs (P-J Woodland). Two-needle pinyon pine and One-seed juniper are common. Rocky Mountain and alligator junipers are well-represented, with a lesser abundance of oaks. Species composition and stand structure vary by location primarily due to precipitation, elevation, temperature, and soil type.

On 20% of 18,544 P-J acres (approximately 3,709 acres) the desired condition will be to develop and maintain old growth conditions as defined in the LRMP Forest Wide Standards and Guidelines found on page 66, Table “The Minimum Criteria for the Structural Attribute Used to Determine Old Growth” These areas would be designated during the environmental analysis process.

P-J Woodland - trees occur as individuals or in smaller groups ranging from young to old. Typically groups are even-aged in structure with all ages represented across the landscape for an overall uneven-aged grouped appearance. The patch size of woodlands ranges from 1 to 10s of acres.

P-J Grass (Savanna) - is generally uneven aged and open in appearance. Trees occur as individuals, but occasionally in smaller groups, and range from young to old. Patch sizes of woodlands range from individual trees and clumps that are less than one-tenth acre, to tree groups of approximately an acre (Muldavin et al. 2003).

Grasslands/Shrublands:

Approximately 8,237 acres of grassland and shrubland types, based on TEUI, would be moved toward the following desired conditions:
Sagebrush Shrubland – Historically dominated by big sagebrush and primarily occurs adjacent to Great Basin grassland and pinyon juniper woodlands. While big sagebrush is the dominant species, other shrubs and grasses and forbs are present. Historically, tree canopy cover exceeded 10%, with the exception of early, post-fire plant communities (USDA 2015). The historic average fire return interval was 35–200 years from mixed-severity fire. Sagebrush shrubland is highly departed for vegetation structure, species composition, and patch size (too small), ecological need for change may hinge on restoring the historic mixed-severity fire regime.

Colorado Plateau/Great Basin Grassland - In general, found at lower elevations with vegetation coverage consisting of mostly grasses and interspersed shrubs. May have had over 10% shrub cover historically, but had less than 10% tree cover. The historic average fire return interval was 0–35 years from stand-replacing fire; however, most recent fires have been non-lethal. Departure is moderate with moderate–high risk from vegetation structure, high risk from altered fire regime, and high risk from decreased patch size, future management should strive to restore vegetation structure to reference conditions. In turn, this may simultaneously (either passively or actively) return fire regime and patch size to reference conditions (USDA 2015).

Montane/Subalpine Grassland - Occurs at elevations ranging from 8,000-11,000 feet, and often harbors several plant associations with varying dominant grasses and herbaceous species. Trees may occur along the periphery of the meadows, and some shrubs may also be present. These meadows are seasonally wet, which is closely tied to snowmelt. They typically do not experience flooding events. Historically, tree and shrub canopy cover were each less than 10% and stand-replacing fires occurred every 0–35 years. The most substantial risks are from a lack of frequent stand-replacing fire and patch size (currently highly departed; too small). May be considered especially sensitive to climate change, as it occurs at the highest elevations and is therefore incapable of uphill migration as a climate change response. Future management should use stand-replacing fire to reduce tree encroachment, increase patch size, and potentially restore species composition.

Areas Over 40% Slope
Dispersed throughout the project area is approximately 1,106 acres over 40% slope. These areas would not be treated mechanically, but could be treated by hand or prescribe burned as allowed by the Cibola LRMP. Tree densities would be reduced by thinning and disposing of designated trees on site through prescribed burning or exclusively by prescribed burning.

The following table describes proposed treatments to meet the desired condition for each Forest Type based on soil conditions, location and slope:
### Table 2.2.3. Proposed Vegetation Treatments and Treatment Types

<table>
<thead>
<tr>
<th>Product/Non-Product Removal Area</th>
<th>Treatment Type</th>
<th>Cutting Methods How will excess trees be cut or otherwise handled?</th>
<th>Tree Removal Will cut trees be removed from the areas?</th>
<th>Slash Treatment What happens to tree tops and other material that remains on the site after cutting?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Removal Area: Public and/or Commercial Removal of forest products</td>
<td>1 – Satisfactory soils with Slight/Moderate Erosion Hazard Rating on less than 40% slope: within 0.25 mile along national forest system (NFS) roads, NFS trails, or unauthorized roads. Approx. acres = 89.</td>
<td>Mechanical mastication Chainsaws – contract or Forest Service Mechanized feller, public</td>
<td>None where mastication occurs. Commercial fuelwood, service contracts and/or timber sale contracts. Where good access exists, material removed under permits for personal use firewood</td>
<td>Masticated material would be spread on site to a depth of 0”-4”, other cut material lopped and scattered to a depth of 18” max. Hand piles may be created where needed and piles will not exceed 10’x10’ Broadcast burning and/or pile burning when management prescription conditions are met.</td>
</tr>
<tr>
<td>Product Removal Area: Commercial removal only</td>
<td>2 - Impaired soils with Slight/Moderate Erosion Hazard Rating and satisfactory soils with Severe Erosion Hazard Rating on less than 40% slope: within 0.25 mile along NFS roads, NFS trails, or unauthorized roads. Approx. acres = 31,325</td>
<td>Mechanical mastication Chainsaws – contract or Forest Service Mechanized feller</td>
<td>None where mastication occurs Commercial fuelwood, service contracts and/or timber sale contracts.</td>
<td>Masticated material would be spread on site to a depth of 0”-4”, other cut material lopped and scattered to a depth of 18” max. Hand piles may be created where needed and piles will not exceed 10’x10’ Broadcast burning and/or pile burning when management prescription conditions are met.</td>
</tr>
<tr>
<td>Non-Product Removal Area</td>
<td>Treatment Type</td>
<td>Cutting Methods</td>
<td>Tree Removal</td>
<td>Slash Treatment</td>
</tr>
<tr>
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<td>3 – Satisfactory and Impaired soils inside &amp; outside 0.25 mile along NFS roads, NFS trails, or unauthorized roads. Approx. acres 14,892.</td>
<td>Mechanical mastication, Chainsaws – contract or Forest Service Mechanized feller and/or prescribe burned only</td>
<td>None</td>
<td>Masticated material would be spread on site to a depth of 0”-4”, other cut material will be lopped and scattered to a depth of 18” max. Hand piles may be created where needed and piles will not exceed 10’x10’. Broadcast burning and/or pile burning when management prescription conditions are met.</td>
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<td>Non-Product Removal Area</td>
<td>4 – Areas with poor access and Unsatisfactory Soil Condition on less than 40% slopes outside Chinle Soil Formation. Approx. acres 9,354.</td>
<td>None - these areas would be prescribe burned only</td>
<td>None</td>
<td>Broadcast burning when management prescription conditions are met.</td>
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<td>5 – Areas with poor access regardless of Soil Condition or Erosion Hazard Rating. Approx. acres 3,034.</td>
<td>Chainsaws – contract or Forest Service and/or Prescribe burned only</td>
<td>None</td>
<td>Cut material will be lopped and scattered to a depth of 18” max. Hand piles may be created where needed and piles will not exceed 10’x10’. Broadcast burning and/or pile burning when management prescription conditions are met.</td>
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<td>6 – Chinle Formation and areas with Poor Access. Approx. acres 22,291.</td>
<td>Chainsaws – contract or Forest Service</td>
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<td>Cut material will be lopped and scattered to a depth of 18” max. Hand piles may be created where needed and piles will not exceed 10’x10’.</td>
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Dollars generated from the sale of the harvested material and fuelwood permits would be retained by the Forest Service under authority in the Knutson-Vandenberg Act of 1930 (KV) for rehabilitation activities. The rehabilitation activities could include: 1) decommissioning of unauthorized roads within the project area by ripping compacted soils, installing erosion control features, seeding the impacted areas with native grasses and using slash to cover impacted corridors to up to 80% coverage, 2) rehabilitating cross country travel corridors by ripping compacted soils, installing erosion control features, seeding the impacted areas with native grasses and using slash to cover impacted corridors to up to 80% coverage, 3) hand piling slash where needed to provide for manageable prescribed fire conditions, 4) lopping and scattering slash not collected through fuelwood gathering to 18” maximum height, and 5) conducting thinning within the project area.

For location of treatment types as described in the table, refer to Puerco Landscape Restoration, Proposed Action w/ Vegetation Treatment Types and Implementation Phases, Figure 2.2.2.
Figure 2.2.2. Vegetation Treatment Types and Implementation Phases
### Slash Disposal

Activity fuel such as bole wood, tops and branches, hand piles, and mastication grindings would be treated as needed to meet fuels reduction and scenic quality objectives through prescribed burning and/or pile burning when conditions allow for safe and effective burning. All prescribed burning would comply with Cibola and McKinley County air quality regulations and will be approved through appropriate permitting processes.

### Transportation and Wood Hauling

No new roads or temporary roads would be constructed for this project. All wood products generated from this project would be removed under permit using National Forest System (NFS) roads or trails or unauthorized roads and trails (see Figures 5A & 5B in Appendix C). Road decommissioning would be coordinated with the implementation phase approach. Figure 2.2.3 shows National Forest System roads and unauthorized roads identified during project planning.
Figure 2.2.3. System Roads and Unauthorized Roads.

Table 2.2.4 shows the existing, as well as pre- and post-project, maintenance levels and the motor vehicle use designations for the potential haul routes. ML 1 roads used for project activities would be changed to ML 2 during implementation. When no longer needed for project activities, these roads would be returned to ML 1 status, unless they were designated for motor vehicle use under the 2011 Travel Management decision. All unauthorized road used for project activities would be decommissioned/rehabilitated when no longer needed, unless they were designated for motor vehicle use under the 2011 Travel Management decision.
Table 2.2.4. Potential Haul Routes

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<sup>8</sup> U – unauthorized roads (includes previously decommissioned roads).

<sup>9</sup> Travel management designation pending archaeological clearance.

<sup>10</sup> Wildlife seasonal closure area.

<sup>11</sup> Travel management designation pending archaeological clearance for another road needed for access.
## 3. Environmental Consequences

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3. Environmental Consequences

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In addition to the National Forest System roads listed above there are approximately 200 miles of GPSed non-system roads within the project area that could be used to facilitate access for forest/grassland restoration treatments, wood removal and as prescribed burn control lines. During the project these roads may receive maintenance work to mitigate resource damage and provide for safe use. Once these roads are no longer needed to implement the fuels reduction work they will be decommissioned by obliterating the roadbed by ripping compacted soils, installing erosion control features, seeding the impacted areas with native grasses and using slash to cover impacted corridors. A portion of this work could be accomplished using KV receipts generated from the sale of the woody material and/or Forest Service appropriated funds. The road decommissioning would improve watershed conditions and wildlife habitat while making portions of the project less accessible for illegal wood collection and illegal game retrieval. Refer to Figure 2 in Appendix C for locations of roads described above and haul route table for pre and post treatment status.

**Recreation Management**

Alternative B proposes the following recreation management activities:
1. Thin trees within developed recreation sites while maintaining screening in order to establish and maintain uneven-age managed stands, reduce overhead hazards, and reduce hazardous fuel loading in and around sites.

2. Smaller trees will be left between picnic/camping sites to create a screen, giving users privacy while enjoying the facilities. The majority of the wood cut from the recreation sites would be removed as fuel wood or timber sale. Quaking Aspen and McGaffey Campgrounds may be closed during thinning operations to ensure the safety of the public, which would most likely take place between August and March.

2.3 **Design Criteria Common to Action Alternatives**

**Vegetation Restoration**

- Retain native deciduous species (oak, mountain mahogany, box elder, etc) 10 inches DRC and larger. Species less than 10 inches DRC would be retained within groups where retention would not compromise treatment objectives.

- Retain mature (flattened crowns, red/yellow plated bark on more the half the length of the bole, little taper) ponderosa pine, regardless of size, and all timber species larger than 24” DBH.

- Ips Beetles – Minimize creation of activity slash before July or unless the potential for Ips infestation is determined to be low. Avoid creating activity slash in the same area multiple years. Remove as much woody material 3-inches or more in diameter from the site as possible. Promptly treat slash through lop/scatter, chipping/mastication, hand pile burning or prescribed burning.

- Do not allow concentrations of chipped/masticated material to accumulate over 4 inches in depth over large areas, or lie immediately adjacent to live standing trees. Distribute chipped/masticated materials in open areas or on slopes where they would dry quickly. Don’t consider burning of woody material to be an effective treatment for Pinyon Ips unless accomplished before beetles emerge from the woody material. Avoid mechanical damage to residual trees and their root systems to reduce risk of attracting bark beetles. Monitor slash during and after treatment for Ips beetle infestation. If found, contact Forest Silviculturist or Forest Health Protection Entomologist.

**Scenic and Recreation Resources**

- Project activities should avoid even spacing of retained trees, and instead leave a diversity of tree species, sizes, and ages, avoid damage to vegetation that will remain, and naturalize disturbed areas.

- Prescribed slash treatment in the immediate foreground (up to 300 feet) of concern level 1 and 2 travelways and recreation sites (areas with the most public concern for scenery) should be completed as soon as conditions permit.

- Mark trees that are to be removed on the backs of trunks, away from the primary viewing point (i.e. from roads and trails).

- In the immediate foreground along concern level 1 and 2 travelways and recreation sites, stumps should be treated to reduce their visibility by methods such as cutting as low as possible.
(no more than 6 inches above ground on uphill and downhill side) and angling large stump faces away from viewing locations unless doing so would pose a safety hazard.

- Effects from prescribed fire should be considered during project planning and implementation. For example: (1) blackened and scorched vegetation may be visible in project areas in the short term following treatments, but desired conditions for scenery and visual resources should be met in the long term, and (2) efforts should be made to minimize high-intensity fire in riparian areas along system trails and scenic vistas.

- Log decks should be removed and rehabilitated, and skid trails should be naturalized.

- National Forest System trails should not be used for vegetation project activities such as for landings and as skid trails. Impacts to system trails should be avoided and mitigated upon project completion if unavoidable. If trails are impacted, crossings are only at perpendicular angles and crossings are rehabilitated after project completion, using barriers or other rehabilitation measures to discourage future use.

  - Avoid using trails as treatment unit boundaries especially for mechanical treatments for Concern Level 1 trails.

- Provide public notice and information about treatment locations, timing and the type of treatment occurring prior to and during vegetation and fire treatments.

- Treatments extend up to the edges of the trail concern level 1 and 2 trails and recreation sites, and do not leave a screen of trees. Groups of trees complying with the prescribed treatment are left that visually connect with the treatment unit’s edge, to avoid an abrupt and noticeable change.

- Where meadows are not being restored, “feather” treatment edges along the trail from more to fewer trees as treatments move away from the trail. Edges of treatment units will be shaped as described below to avoid abrupt changes between treated and untreated areas. Edges will be natural-appearing, feathered, and will blend with general surroundings. Feathering refers to softening treatment edges by thinning in the following manner:

  - Where the treatment unit is adjacent to denser forest (treated or untreated), the percent of thinning within the transition zone is progressively reduced toward the denser edges of the unit. Similarly, where the treatment unit interfaces with an opening (including savannah and grassland treatments, and natural openings) the transition zone is progressively increased toward the open edges of the unit.

  - Treatment extends up to the edges and does not leave a screen of trees. Groups of trees complying with the prescribed treatment are left that visually connect with the unit’s edge, to avoid an abrupt and noticeable change.

- Healthy large trees should comprise the majority of the immediate foreground along designated unless doing so would not achieve project goals; some younger and mid-aged trees are retained to serve as replacement trees and as additional screening.

- Depth of masticated material not to exceed 4” along Concern Level 1 travelways and recreation sites

- Landings shall not be located within 600-foot-wide corridor (300-foot on either side of developed recreation sites or Concern Level 1 travelways.)
• Mark trees that are to be removed on the backs of trunks, away from the primary viewing point (i.e. from Level 1 travelways and trails).

• Minimize and avoid the placement of log decks, temporary roads, and skid trails within and adjacent to sensitive viewsheds, Concern Level 1 travelways, developed recreation sites, and private homes/communities.

• Reseed and mulch decks as soon as possible to speed recovery, with high priority along Concern Level 1 travelways, trails, and developed recreation sites.

• Skid trail crossings may cross designated trails, but will be kept to a minimum. Any crossings will be perpendicular to the designated system trail.

• If trails are used as skid trails, trail clean up and rehabilitation will be included in the contract. This should include restoring the trail to its original trail width.

• Changes to trail alignment and surfacing will be minimized; the trail will not be straightened nor its surface changed with an alternate material unless such actions are approved by the District Recreation Staff and are needed to enhance the trail and protect resources.

• Cull logs will not be abandoned on landings, and should be used for rehabilitating skid trails, closing user created roads or decommissioning roads.

• Cull logs may also be suitable to use as down woody material, but should be scattered away from the landings.

• Stump heights should be cut as low as possible within the foreground (300 feet from centerline of roads, trails, or edge of recreation sites) of Concern Level 1 roads and trails, with the cut angled away from the viewer in these areas.

• Locate slash piles and landings 300’ feet from edge of high sensitivity roads and trails where possible. Where slash occurs within the 300’ immediate foreground of Concern Level 1 roads and trails, treat slash as soon as possible, within one year, to bring the scenery back to prescribed levels after project implementation.

• Generally restore control lines to a near undisturbed condition in the foregrounds (within 300 feet) of sensitive roads, trails, and developed recreation sites.

• To hasten recovery and help eliminate unauthorized motorized and non-motorized use of control lines in these areas, use measures such as recontouring, pulling slash and rocks across the line, and disguising entrances.

• Where trails are used, rehabilitate trails to original width, condition, and designated class level.

• If spring restoration or aspen fencing is visible from any Concern Level 1 roads, developed recreation sites and trails, work with Landscape Architect during project implementation to determine fencing materials to mitigate potential impacts to scenery and minimize visual impacts. Work with Landscape Architect during project implementation to ensure stability of scenic quality.

**Watershed Resources**

• Soil disturbance would be reduced or prevented in some areas through design features and best management practices (BMPs) as described in Appendix D of this document.
• Water resource features including riparian areas will have a designated management zone with widths that vary according to the type of water resource features. For riparian areas and perennial streams, this buffer is 300 foot. Within this zone, mechanized and motorized activities would not be allowed, but chainsaws may be used.

**Fire/Fuels**

• Best Management Practices (BMPs) for smoke management and compliance with The New Mexico smoke Management Program would be followed along with the Clean Air Act requirements that would be state regulated.

• Local area fire weather forecasts will be monitored daily before and during the implementation of any prescribed burn. Spot weather forecasts will be obtained daily for the operational periods of the burn. On-site weather readings will be monitored during operational periods as directed by the burn boss using a belt weather kit. The weather data that is recorded from the belt weather kit will be the primary weather readings that will be the determination factor for the go-no-go and for the prescription parameters.

• The Burn Boss will ensure that the project complies with all local, county, state, and federal air quality regulations. The project will be registered with the New Mexico Smoke Management program at least 2 weeks prior to implementation. Notification will be given 24 - 48 hours prior to ignition and a copy of the spot weather forecast will be faxed to the Mt Taylor Ranger District. A copy of our smoke monitoring report will also be faxed. Coordination between the Albuquerque zone dispatch center and neighboring agencies will be established. Burn will be terminated if the National Weather Service issues an air stagnation alert.

• Smoke conditions must be monitored carefully to assess potential impacts to highway traffic and populated areas. Monitoring should be visual and also may include instrument monitoring. Adequate ventilation or winds that carry smoke away from traffic or populated areas may be required to minimize impacts. The Burn Boss will determine if conditions are favorable at time of ignition.

• Heritage Resources

• All eligible and unevaluated sites should be flagged for avoidance prior to the implementation of mechanical treatments. Mechanical treatments will not be allowed within eligible and unevaluated site boundaries. Mechanical equipment may pull material off the site (not drag) but may not cross the site unless crossings have been previously established and flagged by a qualified cultural resources specialist. Any mechanical treatment activities within site boundaries should be monitored by a qualified cultural resources specialist.

• Hand thinning treatments can be allowed within site boundaries provided:
  - Cutting is accomplished using hand tools only
  - Large diameter trees are felled away from all features
  - Materials removed from the site are removed by hand
  - No dragging of logs, trees, or thinned material across or within site boundaries.
  - No use of vehicles or other mechanized equipment within site boundaries.
No staging of equipment within site boundaries.

No slash piles within site boundaries.

If areas that have been thinned are going to be opened up to fuelwood collection, sites must be flagged prior to allowing collection in the area. Material thinned from the sites must be removed by hand from site boundaries prior to fuelwood collection. Logs, trees or thinned material should not be dragged across or within site boundaries. Vehicles or other mechanized equipment are not allowed within site boundaries during either hand thinning or fuelwood collection.

To ensure the protection of fire sensitive sites, various combinations of the following protection measures may be approved by the Forest or District Archaeologist to protect sites for projects listed in Section III of Appendix J of the First Amended Region 3 Programmatic Agreement. The protection measures do not require additional consultation with NMSHPO.

Protect fire-sensitive sites, by excluding the following activities from sites:

- Hand line
- Black line
- Wet line
- Foam retardant

Sites that lie adjacent proposed roadways will be flagged for avoidance prior to project implementation.

Standard protection measures have been developed to protect sites for projects listed in Section III.1 Appendix E of the First Amended Region 3 Programmatic Agreement. The protection measures do not require additional consultation with NMSHPO.

- No earth-disturbing decommissioning and closure activities within the boundaries of eligible or unevaluated sites
- No use or staging of heavy mechanized equipment within site boundaries
- Allow road decommissioning activities within the boundaries of eligible or unevaluated sites if the Forest and the SHPO agree that the activities will have no effect or no adverse effect on the identified historic properties.

Wildlife

The implementation of any of the proposed thinning activities within Mexican spotted owl Protected activity centers (PAC) would occur from September 1st - February 28th.

This project would be implemented in phases for the treatments types mentioned in Chapter 1 Proposed Action, so that fuel reduction activities and wood product removal would occur while providing mitigation for unintentional disturbance to migratory birds. The recommended Migratory Bird timing restriction for no management activity is from April 1st-July 31st. This timing restriction does not apply to vegetation treatments under the Migratory Bird Treaty Act.

The implementation of any of the proposed thinning activities within northern goshawk PFA’s and Nest Areas would occur from October 1st - February 28th.
• A dispersal PFA will be designated based on Forest Plan direction (pg. 71-7). No timing restrictions would apply in this area; however, the desired condition for PFAs would be created within the dispersal area.

• High intensity crown fires are not acceptable in the post-fledging family area or nest areas. Low intensity ground fires are allowed at any time in all forested cover types. Avoid burning the entire home range of a goshawk pair in a single year. For fires planned in the occupied nest area, a fire management plan should be prepared. The fire management plan should minimize the risk of goshawk abandonment while low intensity ground fire burns in the nesting area. Prescribed fire within nesting areas should be planned to move with prevailing winds away from the nest tree to minimize smoke and risk of crown fire developing and driving the adults off or consuming the nest tree.

• In forested habitats, retain at least 2 snags per acre greater than 18 inches DBH and 30 feet tall, 3 downed logs per acre that are over 12 inches in diameter and 8 feet long, and 5-7 tons of woody debris per acre 3 inches or larger, except within fuel breaks and adjacent to control lines where retention would compromise fire fighter safety. Snags and logs that do not compromise fire fighter safety are to be left. Lighting techniques that allow for the retention of large logs and snags should be used.

• Large, downed woody materials (12-inch diameter midpoint and greater) and snags would be retained within riparian areas.

• Skid trails, landings and other intensely disturbed areas would be seeded with an approved native grass/forb/shrub seed mix.

**Range Management**

• Reconstruct burned fences.

• Treatment of invasive species should be designed to effectively control or eliminate them; multiple treatments may be needed.

• New livestock watering facilities shall be designed to allow wildlife access and escape.

**Transportation**

• Applicable soils and watershed best management practices (BMPs) will be used in the course of any project-related road work.

• All project-related traffic control (for example, signs warning road users of commercial vehicle traffic) will be conducted in accordance with the current versions of Manual on Uniform Traffic Control Devices (MUTCD) and Forest Service Engineering Manual 7100-15 (EM 7100-15): Sign and Poster Guidelines for the Forest Service.

• When road surface is wet, cease commercial activities that would cause excessive damage to the road surface.

**Monitoring**

1. Monitor potential sources of introduction of invasive species into the project area; included are rehabilitation of trails, roads, etc. through grass establishment or other means.
2. Smoke conditions must be monitored carefully to assess potential impacts to highway traffic and populated areas. Monitoring should be visual and also may include instrument monitoring. Adequate ventilation or winds that carry smoke away from traffic or populated areas may be required to minimize impacts. The Burn Boss will determine if conditions are favorable at time of ignition.

3. Precautions should be taken to ensure that the archaeological sites which may be fire sensitive are monitored before the onset of the proposed prescribe burns. Several of the possibly fire sensitive sites are located in areas with high fuel loads. In order to ensure that these sites are not subjected to damage from higher temperatures and prolonged exposure to heat, it is recommended that all possibly fire sensitive sites are monitored by a professional archaeologist prior to fire treatment plans. Depending upon the estimated fuel load and previous fire exposure, fuel loads and types that would adversely impact cultural material should be removed from sites prior to prescribed burns. It is essential that this effort is coordinated with the district or forest archaeologist. An archaeological monitor may be necessary to ensure that removal of fuels does not result in damage to sites.

4. Monitoring areas are reflective of the areas important to the livestock operation and reflective of the livestock management effects in pastures and, therefore, are important to assess when determining the return of livestock. Forage availability assessment on a pasture-by-pasture basis can provide reliable and valuable data. Important indicators to address when assessing forage availability include ground cover, species composition and forage production (R-3 Supplement, Consideration for Re-stocking and Management of Grazing Allotments Post Wildfire and Other Disturbances, 2015).

5. For a quick assessment of an allotment/pasture for grazing after prescribe burn or disturbance includes but not limited to: 1) seed heads or flowers present, 2) multiple leaves or branches present, and/or a root system that does not allow plants to easily pulled from ground (R-3 Supplement, Consideration for Re-stocking and Management of Grazing Allotments Post Wildfire and Other Disturbances, 2015).

Units of Measure/Indicators of Effects

- Percent ground cover – Percentage of ground surface covered by vegetation
- Lbs. of forage per acres – The amount of forage currently produced.

2.4 New Mexico Forest Restoration Principles

This project has considered all of the guidelines associated with the New Mexico Forest Restoration Principles.

1. Collaborate. Landscape scale assessment, and project design, analysis, implementation and monitoring should be carried out collaboratively by actively engaging a balanced and diverse group of stakeholders. Collaboration has occurred during all phases of the analysis and continues with a varied group of stakeholders, including known interested individuals and organizations, environmental and tribal groups, and governmental agencies at local, state and federal levels (EA, Chapter 1 Public Involvement Section, Chapter 4, and Project Record).
2. **Reduce the threat of unnatural crown fire.** A key restoration priority must be moving stands toward a more natural restored condition and the reduction of the risk of unnatural crown fires both within stands and across landscapes. Specific restoration strategies should vary based on forest vegetation type, fire regime, local conditions, and local management objectives. Forests and woodlands characterized by infrequent and mixed-severity fire should be managed toward a stand structure consistent with their historical ranges of variation—including, in some cases, high-density, continuous stands. Discontinuous stand structure may be appropriate to meet community protection objectives in areas such as the wildland urban interface for these forest and woodland types. *Reducing the threat of uncharacteristic wildfire is part of the purpose and need of this analysis (EA, Chapters 1 and 3, Fire/Fuels Specialists Report).*

3. **Prioritize and strategically target treatment areas.** Key considerations for prioritizing restoration treatment areas are: degree of unnatural crown fire risk, proximity to human developments and important watersheds, protection of old growth forests and habitats of federally threatened, endangered, or listed sensitive species, and strategic positioning to break up landscape-scale continuity of hazardous fuels. Treatments should be done at a landscape scale to decrease forest vulnerability to unnatural stand-replacing fire. This priority setting should take place during fire management planning, land management planning, and community wildfire protection planning. *See discussion in Background and Purpose and Need sections, Proposed Action, Treatment Types, CWPP, allocated old growth for Ponderosa Pine and woodland veg types (EA, Chapter 1, Vegetation and Fire/Fuels Specialists Reports).*

4. **Develop site-specific reference conditions.** Site-specific historical ecological data can provide information on the natural range of variability for key forest attributes, such as tree age structure and fire regimes that furnish local “reference conditions” for restoration design. A variety of constraints, however, prevent the development of historical information on every hectare of land needing restoration. General goals should be to restore ecological integrity and function. *The varied specialist reports and analyses are based on site-specific inventory information and were used as a basis to restore ecological integrity and function such as soil conditions, potential natural vegetation (PNV) and fire regime for Ponderosa Pine, woodland, and grassland/shrubland vegetation types (EA, Chapter 3).*

5. **Use low-impact techniques.** Restoration treatments should strive to use the least disruptive techniques, and balance intensity and extensiveness of treatments. In many areas, conservative initial treatments would be the minimum necessary to adequately reduce the threat of unnatural crown fire. Wildland fire use or management-ignited fires may be sufficient to re-establish natural conditions in many locations. In the extensive areas where fire alone cannot safely reduce tree densities and hazardous ladder fuels, mechanical thinning of trees may be needed before the introduction of prescribed fire. Patient, effective treatments would provide more options for the future than aggressive attempts to restore 120 years of change at once. In certain areas, however, such as some wildland urban interfaces (WUIs), trade-offs with imminent crown fire risks require considerations of rapid, heavy thinning of mostly small diameter trees. *A variety of tools, ranging from hand thinning to mechanical harvesting to prescribed fire, and mitigations would be used to meet treatment objectives. Mechanical treatments are strategically placed so prescribed fire can be used at a landscape scale as the primary restoration tool. (EA, Chapter 2).*
6. **Utilize existing forest structure.** Restoration efforts should incorporate and build upon valuable existing forest structures, such as large trees, and groups of trees of any size with interlocking crowns, excluding aspen (Populus sp.). These features are important for some wildlife species, such as Abert’s squirrel and northern goshawk, and should not be removed completely just to recreate specific historical tree locations. Since evidence of long-term stability of precise tree locations is lacking, especially for piñon and juniper, the selection of “leave” trees and tree clusters in restoration treatments can be based on the contemporary spatial distribution of trees, rather than pre-1900 tree positions. Maximizing use of existing forest structure can restore historical forest structure conditions more quickly. Leaving some relatively dense within-stand patches of trees need not compromise efforts to reduce landscape-scale crown fire risk. The underlying successional processes of natural tree regeneration and mortality should be incorporated into restoration design. Southwestern conifer regeneration occurs in episodic, often region-wide pulses, linked to wet-warm climate conditions and reduced fire occurrence. Periods with major regeneration pulses in the Southwest occurred in the 1910s–1920 and 1978–1998. Some of this regeneration would have survived under natural conditions. Restoration efforts should retain a proportion of these cohorts. *Working with and retaining, to the extent possible commensurate with project objectives, existing forest structure (including large trees and retention of groups of trees) is an integral part of the design of this project (EA, Proposed Action and Desired Condition, Chapter 1 and 2).*

7. **Restore ecosystem composition.** Missing or diminished compositional elements, such as herbaceous understories, or extirpated species also require restoration attention. The forest understory, including shrubs, grasses, forbs, snags, and downed logs, is an important ecosystem component that directly affects tree regeneration patterns, fire behavior, watershed functioning, wildlife habitat, and overall patterns of biodiversity. Similarly, soil organisms, such as mycorrhizal fungi, are vital elements that can influence community composition and dynamics. A robust understory provides a restraint on tree regeneration and is essential for carrying surface fires. The establishment and maintenance of more natural patterns of understory vegetation diversity and abundance are integral to ecological restoration. Restoration planning should include the conservation of habitats for diminished or extirpated wildlife species. Comprehensive forest ecosystem restoration requires balancing fire risk reduction with retention of forest structures necessary for canopy-dependent species. Recovery plans and conservation plans for threatened, endangered, and sensitive species should be incorporated to the fullest extent possible in planning for comprehensive forest restoration *(EA, Chapters 2 and 3).*

8. **Protect and maintain watershed and soil integrity.** Low impact treatments would minimize sedimentation, disruption of surface runoff, and other detrimental ecosystem effects. Equipment and techniques should be managed according to soil and water conservation “best management practices” applicable to site-specific soil types, physiographic and hydrological functions.

9. Reconstruction, maintenance, or decommissioning of existing roads to correct for poor hydrologic alignment and drainage condition can greatly reduce soil loss and sedimentation rates. Projects should strive for no net increase in road density.

10. Managing forest density and fuels to avoid uncharacteristically intense wildfire events would reduce the likelihood of uncharacteristic post-fire soil erosion and nutrient depletion.
from forested landscapes. Soil productivity should be protected and maintained by avoiding soil loss and compaction, and managing for on-site nutrient retention. Avoid repeated whole tree biomass removal from the forest to maximize nutrient retention. Whenever feasible, green foliage should be recycled by scattering on site followed by prescribed burning to release stored nutrients (EA, Chapter 2 and 3 and Soil and Water Resources Specialist Report).

11. **Preserve old or large trees while maintaining structural diversity and resilience.** Large and old trees, especially those established before ecosystem disruption by Euro-American settlement, are important forest components and critical to functionality of ecosystem processes. Their size and structural complexity provide critical wildlife habitat by broadly contributing crown cover, influencing understory vegetation patterns, and providing future snags. Ecological restoration should manage to ensure the continuing presence of large and old trees, both at the stand and landscape levels. This includes preserving the largest and oldest trees from cutting and crown fires, focusing treatments on excess numbers of small young trees.

12. Develop “desired” forest condition objectives that favor the presence of both abundant large-diameter trees and an appropriate distribution of age classes on the landscape, with a wide distribution of older trees. It is generally advisable to maintain ponderosa pines larger than 16 inches DBH and other trees with old growth morphology regardless of size (e.g., yellow-barked ponderosa pine or any species with large drooping limbs, twisted trunks, or flattened tops).

13. Treatments should also focus on achievement of spatial forest diversity by managing for variable densities. Overall, forest densities should be managed to maintain tree vigor and stand resiliency to natural disturbances. Disease conditions are managed to retain some presence of native forest pathogens on the landscape, but constrained so that forest sustainability is not jeopardized. Guidelines must provide opportunities to apply differing site-specific management strategies to work towards attainment of these goals and recognize that achievement may sometimes require more than one entry.

14. Stand level even-aged management may be appropriate for some objectives, including disease management, post-wildfire tree regeneration, accelerating development of old growth characteristics, or for forest types for which even-aged stands are characteristic, such as spruce (Picea sp.) or aspen. Treatments should be identified through collaboration with key stakeholders. Some ponderosa pine forests contain extremely old trees and dead wood remnants that may be small but are important because they contain unique and rare scientific information in their growth rings. Such trees have become increasingly rare in the late twentieth century, and the initial reintroduction of fire often consumes these tree-ring resources. Restoration programs should preserve them where possible. The existing condition for both ponderosa pine and piñon-juniper woodland is deficient of trees greater than 18” DBH and 12” DRC. This project proposes to focus on retention of trees over these diameters to assist in moving the area to desired uneven-aged conditions (EA, Chapters 2 and 3).

15. **Manage to restore historic tree species composition.** Forest density levels and the presence of fire in the ecosystem are key regulators of tree species composition. Where fire suppression has allowed fire-sensitive trees like junipers or shade-tolerant white fir or spruce
to become abundant in historical ponderosa pine forests, treatments should restore dominance of more fire-resistant ponderosa pines. However, fire intolerant species sometimes make up the only remaining large tree component in a stand. Retention of these large trees is important to canopy-dependent wildlife species. In mixed conifer forests, landscapes should be managed for composition and structure that approximates the natural range of variability (EA, Chapters 2 and 3 and Vegetation Specialist report).

16. **Integrate process and structure.** Ecological sustainability requires the restoration of process and structure. Natural disturbance processes, including fire, insect outbreaks, and droughts, are irreplaceable shapers of the forest. In particular, fire regimes and stand structures interact and must be restored in an integrated way; mechanical thinning alone would not re-establish necessary natural disturbance regimes. At the same time, fire alone may be too imprecise or unsafe in many settings, so a combination of treatments may often be the safest and most certain restoration approach.

17. The single best indicator of whether a proposed approach should be considered as “ecological restoration” is to evaluate if the treatment would help successfully restore the fire regime that is natural for that forest type. Approaches that do not restore natural fire regimes would not achieve full ecological restoration (EA, Chapter 3, Vegetation and Fuels Specialist Reports).

18. **Control and avoid using exotic species.** Seeding of exotic grasses and forbs should be prohibited as ecologically incompatible with good restoration. Once established, exotic species can be extremely difficult or impossible to remove. Seeding should be conducted with certified or weed free seeds to reduce the risk of contamination by invasive species or varieties. In general, it is ecologically desirable to allow native herbaceous vegetation to recover incrementally unless there is potential for serious soil erosion or the potential for establishment of invasive plants. If enhancement of herbaceous vegetation is needed, especially for road closures and recovery, using locally sourced native seeds or transplanting individuals from nearby areas into treatments is ecologically desirable. Restoration treatments should also routinely incorporate early actions to control the establishment and spread of aggressive exotics that can be expected from restoration-related site disturbance. Best Management Practices would be adhered to, including washing of equipment prior to entering treatment areas. Only native seed would be used for rehabilitation activities. (Soil and Water Resources Specialist Report).

19. **Foster regional heterogeneity.** Biological communities vary at local, landscape, and regional scales, and so should restoration efforts. Ecological restoration should also incorporate the natural variability of disturbance regimes across heterogeneous landscapes. Heterogeneity should be fostered in planning and implementing ecological restoration and all spatial scales, including within and between stands, and across landscape and regional scales (EA, Chapter 3, Vegetation and Wildlife Specialist reports—specifically the analysis at the Ecosystem Management Area scale and associated Cibola National Forest and National Grasslands Land Management Plan direction).

20. **Protect sensitive communities.** Certain ecological communities embedded within ponderosa pine or other types of forests and some riparian areas, could be adversely affected by on-site prescribed burning or mechanical thinning. Restoration efforts should protect these and other rare or sensitive habitats, which are often hotspots of biological diversity,
particularly those that are declining in abundance and quality in the region (EA, Chapter 3 Wildlife Specialists report).

21. **Plan for restoration using a landscape perspective that recognizes cumulative effects.** Forest restoration projects should be linked to landscape assessments that identify historical range of variation (reference condition), current condition, restoration targets, and cumulative effects of management. Ecosystems are hierarchical; changing conditions at one level arise from processes occurring at lower levels and are constrained, in turn, by higher levels. The landscape perspective captures these complex relationships by linking resources and processes to the larger forest ecosystem. Forest restoration projects should incorporate plans for long-term maintenance of ecological processes (EA, Chapter 2 and 3, specifically the Purpose and Need and Proposed Action which includes maintenance as monitoring data show that desired conditions are surpassing thresholds).

22. **Manage grazing.** Grass, forbs, and shrub understories are essential to plant and animal diversity and soil stability. Robust understories are also necessary to restore natural fire regimes and to limit excessive tree seedling establishment. Where possible, livestock grazing after treatment should be deferred until the herbaceous layer has established its current potential structure, composition, and function. *(Range Management Specialist Report)*

23. **Establish monitoring and research programs and implement adaptive management.** Well-designed monitoring, research, and documentation are essential to evaluate and adapt ongoing restoration efforts. Monitoring programs must be in place prior to treatment and must evaluate responses of key ecosystem components and processes at multiple scales. Use research and monitoring results from a variety of sources to adjust and develop future restoration treatments. When possible, restoration projects should be set up as experiments with replicates and controls to test alternative hypotheses. The locations and prescriptions for all restoration treatments should be archived in a geographic information system (GIS), so that land managers and researchers have access to site-specific records of restoration treatments. Monitoring would occur during all phases of project implementation. In addition the Cibola NF&NG will actively seek out partners with an interest in restoration to assist with monitoring. The Zuni Mountain CFLRP has built in monitoring requirements, and the Forest has an agreement with the Forest stewards Guild to perform post treatment monitoring.

24. Exercise caution and use site-specific knowledge in restoring or managing piñon-juniper ecosystems and other woodlands and savannas. These systems are diverse and complex. Knowledge of local reference structure, composition, processes, and disturbance regimes is lacking or uncertain for many piñon-juniper ecosystem types. Given the diversity, variability, and complexity of piñon-juniper systems, identification of local reference conditions is critical to the development of restoration objectives. Exercise caution and use best available science and site-specific knowledge in planning and implementing ecological restoration projects. Active management may be appropriate to mitigate soil erosion, community wildland fire hazard, or degraded hydrologic function in cases where historical ecological dynamics are insufficiently understood to justify ecological restoration. Piñon-juniper sites may be particularly susceptible to ecological damage from treatments; for example, soil erosion and invasion by invasive plants. *The varied specialist reports and analyses are based on site specific inventory information and were used as a basis to restore...*
ecological integrity and function. Desired conditions for are aligned with TEUI interpretations (EA, Desired Condition, Proposed Action, Chapter 3).

2.5 Comparison of Alternatives

Table 2.5.1 summarizes the differences among the alternatives and compares each of the alternatives against resource indicators that meet the project’s purpose and need, and would move the project toward desired conditions.

Table 2.5.1. Comparison of Alternatives

<table>
<thead>
<tr>
<th>Resource Indicator</th>
<th>Alternative A No Action</th>
<th>Alternative B Proposed Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Thinning with Prescribed Burning</td>
<td>0</td>
<td>31,430 acres</td>
</tr>
<tr>
<td>Low Thinning and No Prescribed Burning</td>
<td>0</td>
<td>23,000 acres</td>
</tr>
<tr>
<td>Low Thinning with Prescribed Burning</td>
<td>0</td>
<td>3,000 acres</td>
</tr>
<tr>
<td>Mechanical thinning, Mastication with Prescribed Burning</td>
<td>0</td>
<td>14,900 acres</td>
</tr>
<tr>
<td>Grassland/Shrubland Restoration</td>
<td>0</td>
<td>8,200 acres</td>
</tr>
<tr>
<td>Dwarf Mistletoe Focus (included in acres above)</td>
<td>0</td>
<td>5,900 acres</td>
</tr>
<tr>
<td>Prescribe Burning Only</td>
<td>0</td>
<td>8,500 acres</td>
</tr>
<tr>
<td>Riparian area improvement</td>
<td>0</td>
<td>250 acres</td>
</tr>
<tr>
<td>Spring, Aspen and Willow Protection</td>
<td>0</td>
<td>300 acres</td>
</tr>
<tr>
<td>Mexican Spotted Owl Habitat Treatments</td>
<td>0</td>
<td>3,700 acres</td>
</tr>
<tr>
<td>Northern Goshawk Habitat Treatments</td>
<td>0</td>
<td>4,210 acres</td>
</tr>
<tr>
<td>Unauthorized Road Closure/Rehabilitation</td>
<td>0</td>
<td>≈ 200 miles</td>
</tr>
</tbody>
</table>
3 Environmental Consequences

This section summarizes the physical, biological, and social environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. Complete specialist reports are in the project record.

3.1 Vegetation

Affected Environment

Forest vegetation in the Puerco project area is highly departed from desired conditions, lacking multi-storied structure and age classes, spatial arrangement, and are very dense as measured by basal area, trees per acre and percent canopy cover (Table 3.1.1). Because of the existing conditions most forest and woodlands in the project area are prone to uncharacteristic disturbances such as active crown fire behavior, insects and disease, and climate change.

Table 3.1.1. Average Existing Forest Conditions

<table>
<thead>
<tr>
<th>Existing Vegetation Cover Type</th>
<th>Basal Area/Acre (ft²)</th>
<th>Trees per Acre</th>
<th>Trees per Acre (5“+)</th>
<th>Trees per Acre (18“+)</th>
<th>Average Diameter (QMD 5“+)</th>
<th>Canopy Cover (%)</th>
<th>Crowning Index (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Conifer</td>
<td>138</td>
<td>2,900</td>
<td>227</td>
<td>7</td>
<td>9.6</td>
<td>59</td>
<td>26</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>119</td>
<td>1,503</td>
<td>167</td>
<td>9</td>
<td>11.4</td>
<td>44</td>
<td>36</td>
</tr>
<tr>
<td>Ponderosa Pine-Gambel oak</td>
<td>127</td>
<td>1,513</td>
<td>167</td>
<td>10</td>
<td>10.7</td>
<td>45</td>
<td>38</td>
</tr>
<tr>
<td>Pinyon-juniper</td>
<td>116</td>
<td>1,103</td>
<td>152</td>
<td>10</td>
<td>11.2</td>
<td>41</td>
<td>27</td>
</tr>
<tr>
<td>Rocky Mtn. Juniper</td>
<td>127</td>
<td>1,932</td>
<td>171</td>
<td>9</td>
<td>11.0</td>
<td>45</td>
<td>51</td>
</tr>
<tr>
<td>Deciduous Oak</td>
<td>121</td>
<td>2,428</td>
<td>162</td>
<td>6</td>
<td>10.0</td>
<td>47</td>
<td>59</td>
</tr>
</tbody>
</table>

Forest structure is predominantly even-aged, with only 1-2 distinct canopy layers (age classes) consisting of young and mid-age trees (5-18” diameter). Seedlings/saplings and mature/old trees are deficient across the landscape. Historically occurring openings and canopy gaps have filled in with trees that make crown fires more likely.

Dwarf mistletoe occurs at levels that exceed 20% or more of the host trees infected on approximately 5,900 acres of ponderosa pine and mixed conifer forests. These acres may be suitable for more intensive even-aged management treatments designed to improve forest health and resiliency.

\[13\] Quadratic Mean Diameter (QMD) is the diameter of the tree of average per tree basal area, which is considered more appropriate than arithmetic mean for characterizing a group of measured trees.

\[14\] Crowning Index is the open wind speed at which fully active crown fire is possible.
Several different fire regimes are represented across the project area, ranging from frequent low-intensity fires that historically occurred in ponderosa pine and dry mixed conifer (Fire Regime I: 0-35 year frequency) to mixed severity and stand replacing fires that occurred in pinyon-juniper woodlands Fire Regime III-V: 35-100+ year frequency). Currently, across much of the project area, fuel loading and tree densities are such that mortality would be high in the event of a wildfire burning under undesirable conditions. The average crowning index across the project area is 35 miles per hour, which is fairly typical on spring day in the Zuni Mountains. In the grass and shrublands of the Puerco project, fire has been excluded and conifers have encroached into these naturally open areas, decreasing their size and function.

Quaking aspen in the Puerco project area does not occur in large pure stands, and is dying or rapidly declining due to the combined effects of conifer encroachment, browsing, insects, disease, and lack of fire disturbance. Aspen and willows provide habitat for songbirds and small mammals, as well as soil and stream bank stability, and are also declining in health, vigor, and number in the project area.

**Old Growth**

Old growth resources were analyzed at multiple scales, the first being the midscale “Zuni Mountain Collaborative Forest Landscape Restoration Project (CFLRP)” Ecosystem Management Area (EMA) which includes a majority National Forest System (NFS) land in the Zuni Mountains (Figure 3.1.1); one scale above, which includes the Zuni Mountain CFLRP Ecosystem Management Area plus National Forest System lands west of the hogback and CFLRP footprint; and, at one scale below, at the Puerco Landscape Restoration Project level. Analysis maps are available in project record.

GIS analysis was used to incorporate a variety of resource information including common stand exam data, mid-scale vegetation data, local knowledge and a review of past disturbances relating to past vegetation management, insect/disease and fire activities. Existing old growth structural conditions, as defined on page 65-66 of the LRMP, are not well represented in any of the scales being analyzed, but those areas that most closely meet desired old growth attributes of tree size and density were identified to be managed as developing old growth.

Allocation of at least 20%, by forested ecosystem management area, of old growth has been completed (LRMP, page 65). Sites with the most potential to reach old growth status in the earliest timeframe have been allocated for each representative forest type in the project area, and will be developed to improve or maintain old growth characteristics such as age, size, and structural components.

**EMA Scale** - The Zuni Mountain CFLRP Ecosystem Management Area is characterized by a long history of anthropogenic disturbances, with the earliest evidence of general pre-contact activity in the Zuni Mountains dating to the Archaic Period (8000 BC – AD 400). The period of
the steam railroad logging in the Zuni Mountains of western New Mexico was not much over thirty years (1890-1920). Once all the trees were gone, the lumbermen closed their mills, pulled up their railroad tracks, and moved on to greener forests (Kosik 2017). The result of past railroad logging is that most of the accessible large and old trees were harvested, leaving a current deficit in trees and stands of trees that qualify as old growth today.

Other than the Sedgewick and most recent Diener Canyon and Bluewater Fires, prescribed and wildfire activity has been minimal across the Zuni Mountains.

Tables 3.1.2 – 3.1.4 show the allocation of forest types included in this project to be managed for old growth characteristics within the Zuni Mountain CFLRP Ecosystem Management Area. Included are “de facto” old growth areas (LRMP, page 55) such as Mexican Spotted and goshawk nesting areas.
Table 3.1.2. Old Growth Allocation within the Zuni Mountain CFLRP EMA

<table>
<thead>
<tr>
<th>Desired Vegetation</th>
<th>Total Acres</th>
<th>Target O.G.</th>
<th>Total O.G. Designated</th>
<th>% O.G. Designated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Conifer</td>
<td>6,439</td>
<td>1,288</td>
<td>2,581</td>
<td>40%</td>
</tr>
<tr>
<td>Pine-oak</td>
<td>15,033</td>
<td>3,007</td>
<td>3,437</td>
<td>23%</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>93,012</td>
<td>18,602</td>
<td>18,233</td>
<td>20%</td>
</tr>
<tr>
<td>Pinyon-juniper</td>
<td>21,595</td>
<td>4,319</td>
<td>5,074</td>
<td>23%</td>
</tr>
<tr>
<td>PIPO/P-J Mix</td>
<td>13,403</td>
<td>2,681</td>
<td>2,968</td>
<td>22%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>149,482</strong></td>
<td><strong>29,896</strong></td>
<td><strong>32,293</strong></td>
<td><strong>22%</strong></td>
</tr>
</tbody>
</table>

One scale above - The Zuni Mountain CFLRP Ecosystem Management Area plus NFS lands west of the Hogback and CFLRP footprint to comprise a scale above that initial area. Historic disturbances within the area west of the Hogback are more limited than in the Zuni Mountain CFLRP ecosystem area due to lack of access and lack of historic fire activity.

Table 3.1.3 displays the combined old growth allocated acres by forest type for both the Zuni Mountain CFLRP Ecosystem Management Area plus NFS lands west of the Hogback and CFLRP footprint.

Table 3.1.3. Old Growth Allocation within the Zuni Mountain CFLRP Ecosystem Management Area plus National Forest System lands west of the hogback and CFLRP footprint

<table>
<thead>
<tr>
<th>Desired Vegetation</th>
<th>Total Acres</th>
<th>Target O.G.</th>
<th>Total O.G. Designated</th>
<th>% O.G. Designated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Conifer</td>
<td>6,439</td>
<td>1,288</td>
<td>2,581</td>
<td>40%</td>
</tr>
<tr>
<td>Pine-oak</td>
<td>15,039</td>
<td>3,072</td>
<td>3,495</td>
<td>23%</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>93,022</td>
<td>18,602</td>
<td>18,235</td>
<td>20%</td>
</tr>
<tr>
<td>Pinyon-juniper</td>
<td>22,750</td>
<td>4,550</td>
<td>5,380</td>
<td>24%</td>
</tr>
<tr>
<td>PIPO/P-J Mix</td>
<td>16,373</td>
<td>3,275</td>
<td>3,329</td>
<td>20%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>153,943</strong></td>
<td><strong>30,789</strong></td>
<td><strong>33,020</strong></td>
<td><strong>21%</strong></td>
</tr>
</tbody>
</table>

One scale below - The Puerco Project area comprises the scale below the initially described Zuni Mountain CFLRP Ecosystem Management Area. This project area represents the western portion of the Zuni Mountain CFLRP Ecosystem Management Area that would be the continuation of forest restoration efforts initiated by the Bluewater Ecosystem Restoration Project. Table 3.1.4 shows those areas selected for allocation towards old growth by forest type within the Puerco CFLRP.

Table 3.1.4. Old Growth Allocation within the Puerco Collaborative Landscape Restoration Project

<table>
<thead>
<tr>
<th>Desired Vegetation</th>
<th>Total Acres</th>
<th>Target O.G.</th>
<th>Total O.G. Designated</th>
<th>% O.G. Designated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Conifer</td>
<td>776</td>
<td>155</td>
<td>231</td>
<td>30%</td>
</tr>
</tbody>
</table>

~68~
### Northern Goshawk Habitat

Distribution of habitat structures (LRMP, page 71-7) for the Northern Goshawk are analyzed at the Zuni Mountain CFLRP Ecosystem Management Area scale, the Puerco Landscape Restoration Project scale and site (stand) scale.

The majority of the Puerco Collaborative Landscape Restoration Project area is classified as ponderosa pine and pinyon-juniper forest types. Forest plan guidelines for the distribution of vegetation structural stages for ponderosa pine, mixed conifer and spruce-fir forests is 10 percent grass/forb/shrub (VSS1), 10 percent seedling-sapling (VSS2), 20 percent young forest (VSS3), 20 percent mid-aged forest (VSS4), 20 percent mature forest (VSS5), 20 percent old forest (VSS6). NOTE: The specified percentages are a guide and actual percentages are expected to vary + or - up to three percent.

The distribution of VSS, tree density, and tree age are a product of site quality in the ecosystem management area. Use site quality to guide in the distribution of VSS, tree density and tree ages.

Forest plan guidelines for the woodland forest type within landscapes outside goshawk post-fledging family areas are; “Manage for uneven age conditions to sustain a mosaic of vegetation densities (overstory and understory), age classes, and species composition well distributed across the landscape. Provide for reserve trees, snags, and down woody debris.” Guidelines for woodland forest type within PFA and nesting areas are to “maintain existing canopy cover levels. (LRMP, page 71-8).”

There are no Vegetation Structural Stage (VSS) distribution guidelines for the woodland stands like there are for ponderosa pine, mixed conifer and spruce-fir forest types. Therefore, no VSS analysis will be displayed for the woodland type. Data supporting this analysis is from stand examinations completed from 2013-2015, the Forest Vegetation Simulator, and Field Sampled Vegetation (FSVeg) Spatial Data Analyzer. Tables 3.1.5 –and 3.1.6 display the distribution of ponderosa pine forest type at each Vegetation Structural Stage (VSS) at three levels of analysis. Because of on-going restoration treatments in the Bluewater Project, it is assumed that trends shown from modeling the proposed action (one scale below) will progress along a similar trajectory at the EMA and one scale above levels.

### Desired Vegetation

<table>
<thead>
<tr>
<th>Desired Vegetation</th>
<th>Total Acres</th>
<th>Target O.G.</th>
<th>Total O.G. Designated</th>
<th>% O.G. Designated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pine-oak</td>
<td>15,033</td>
<td>3,007</td>
<td>3,437</td>
<td>23%</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>24,969</td>
<td>4,994</td>
<td>5,590</td>
<td>22%</td>
</tr>
<tr>
<td>Pinyon-juniper</td>
<td>18,544</td>
<td>3,709</td>
<td>4,750</td>
<td>26%</td>
</tr>
<tr>
<td>PIPO/P-J Mix</td>
<td>13,403</td>
<td>2,681</td>
<td>2,968</td>
<td>22%</td>
</tr>
<tr>
<td></td>
<td><strong>72,725</strong></td>
<td><strong>14,545</strong></td>
<td><strong>16,976</strong></td>
<td><strong>23%</strong></td>
</tr>
</tbody>
</table>
Table 3.1.5. Vegetative Structural Stage Analysis – One Scale below EMA (Puerco Project Area)

<table>
<thead>
<tr>
<th>Scale</th>
<th>VSS 1&amp;2 (0-4.9 inchdbh)</th>
<th>VSS 3 (5-11.9 inchdbh)</th>
<th>VSS 4 (12-17.9 inchdbh)</th>
<th>VSS 5 (18-23.9 inchdbh)</th>
<th>VSS 6 (24 inch+ dbh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired Distribution</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Existing Condition</td>
<td>3%</td>
<td>49%</td>
<td>31%</td>
<td>15%</td>
<td>2%</td>
</tr>
<tr>
<td>Post Treatment</td>
<td>2%</td>
<td>40%</td>
<td>41%</td>
<td>13%</td>
<td>4%</td>
</tr>
<tr>
<td>30 Years Post Treatment</td>
<td>4%</td>
<td>16%</td>
<td>45%</td>
<td>26%</td>
<td>9%</td>
</tr>
</tbody>
</table>

The existing condition in Puerco the Project represents a bell-shaped curve, with the majority of basal area currently in the mid-aged stages (5-18” dbh), overwhelming representative of even-aged conditions. Post treatment conditions reflect the focus on targeting mid-aged trees as the percentage of VSS3 is reduced. The amount of basal area represented by trees 12” dbh and greater increases from 47 to 58%. Thirty years after implementing the proposed action, the amount of basal area in trees 18”+ dbh has doubled, and trees that were previously VSS3 have grown into VSS4 due to reduced competition.

Table 3.1.6. Vegetative Structural Stage Analysis – EMA Scale & One Scale Above

<table>
<thead>
<tr>
<th>Scale</th>
<th>VSS 1&amp;2 (0-4.9” dbh)</th>
<th>VSS 3 (5-11.9” dbh)</th>
<th>VSS 4 (12-17.9” dbh)</th>
<th>VSS 5 (18-23.9” dbh)</th>
<th>VSS 6 (24”+ dbh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired Distribution</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Existing Condition</td>
<td>3%</td>
<td>49%</td>
<td>31%</td>
<td>15%</td>
<td>2%</td>
</tr>
<tr>
<td>Post Treatment</td>
<td>static</td>
<td>decreasing</td>
<td>increasing</td>
<td>decreasing</td>
<td>increasing</td>
</tr>
<tr>
<td>30 Years Post Treatment</td>
<td>increasing</td>
<td>decreasing</td>
<td>increasing</td>
<td>increasing</td>
<td>increasing</td>
</tr>
</tbody>
</table>

Modeling shows little to no gain in trees less than 5” dbh (VSS1&2) because regeneration was not input into the model. Natural regeneration of ponderosa pine in the southwest is episodic, depending upon individual site conditions and a combination of good cone crops followed by a wet spring to encourage germination. Observations from the adjacent Bluewater Project show that natural regeneration of ponderosa pine is occurring in stands that have been harvested in the past 3-10 years using the same uneven-aged silvicultural system as proposed in the Puerco Project. It is expected that after 30 years there will have been several pulses of natural regeneration and seedlings will have established and grown into young trees, thus balancing out the VSS distribution.

Green House Gases (GHG) emissions and carbon sequestration are a consideration in any vegetation manipulation project. Forests play a major role in the carbon cycle. The carbon stored
in live biomass, dead plant material, and soil represents the balance between carbon dioxide absorbed from the atmosphere and its release through respiration, decomposition, and burning.

Environmental Consequences

Alternative A – No Action

The No Action alternative would result in custodial management (no treatment) of existing forest vegetation conditions. The forest ecosystem would remain susceptible to the adverse effects of uncharacteristic wildfire and insect/disease outbreak with increasing risk of these disturbances over time as densities increase, tree growth and resiliency declines.

Fuel conditions (quantities and distribution) would remain relatively unchanged across the landscape over the short term. Competition induced mortality will slowly begin to increase leading to additional fuels accumulating on the forest floor. This, plus high tree densities, continuous canopy cover and ladder fuels would favor active crown fire and uncharacteristic fire events that would adversely affect forest vegetation and species composition (i.e. – conversion to shrub brush fields).

Stand structure (the horizontal and vertical distribution of forest components including the height, diameter, crown layers, and numbers of trees, shrubs, snags and down woody debris) would remain relatively unchanged in the short term. Vertical structure would remain predominantly even-aged (1-2 canopy layers) and horizontal structure would remain continuous with few openings to break up the otherwise continuous canopy. Ladder fuels would remain favoring movement of surface fires into tree canopies.

The current stand density index (SDI) for ponderosa pine is 287, which is 64% of maximum (SDIMax) indicating high competition among trees and density related mortality. After 30 years with no action, the SDI increases to 330, which is 73% of SDIMax. Forest vegetation would continue to grow but at reduced rates due to unnaturally high tree densities across the landscape, which is a result of overcrowding and competition for limited water, sunlight and soil nutrients. Trees, both on an individual and landscape basis, would continue to be stressed and more susceptible to drought or insect and disease attack due to the unnaturally high level of competition.

Table 3.1.7. Puerco Forest Conditions – No Action 30 Years Later

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>BA/Acre (Ft²)</th>
<th>Canopy Cover (%)</th>
<th>Trees per Acre</th>
<th>Trees per Acre (5&quot;+)</th>
<th>Trees per Acre (18&quot;+)</th>
<th>Average Diameter (QMD 5&quot;)</th>
<th>DMR</th>
<th>Crowning Index (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Conifer</td>
<td>181</td>
<td>66</td>
<td>1,842</td>
<td>212</td>
<td>11</td>
<td>11</td>
<td>0.26</td>
<td>28</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>150</td>
<td>49</td>
<td>959</td>
<td>156</td>
<td>16</td>
<td>13</td>
<td>0.24</td>
<td>37</td>
</tr>
<tr>
<td>Ponderosa Pine - Oak</td>
<td>161</td>
<td>53</td>
<td>1,081</td>
<td>230</td>
<td>14</td>
<td>11</td>
<td>0.18</td>
<td>37</td>
</tr>
</tbody>
</table>
3. Environmental Consequences

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>BA/Acre (Ft²)</th>
<th>Canopy Cover (%)</th>
<th>Trees per Acre</th>
<th>Trees per Acre (5''+)</th>
<th>Trees per Acre (18''+)</th>
<th>Average Diameter (QMD 5''+)</th>
<th>DMR</th>
<th>Crowning Index (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocky Mtn. Juniper</td>
<td>165</td>
<td>55</td>
<td>1,079</td>
<td>207</td>
<td>13</td>
<td>12</td>
<td>0.02</td>
<td>44</td>
</tr>
<tr>
<td>P-J Woodland</td>
<td>148</td>
<td>47</td>
<td>539</td>
<td>185</td>
<td>15</td>
<td>12</td>
<td>0.83</td>
<td>24</td>
</tr>
<tr>
<td>Deciduous Oak Woodland</td>
<td>164</td>
<td>59</td>
<td>1,471</td>
<td>297</td>
<td>9</td>
<td>9</td>
<td>0.06</td>
<td>51</td>
</tr>
<tr>
<td>Misc. Hardwoods</td>
<td>192</td>
<td>83</td>
<td>924</td>
<td>538</td>
<td>11</td>
<td>8</td>
<td>0.0002</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>153</td>
<td>50</td>
<td>857</td>
<td>190</td>
<td>15</td>
<td>12.2</td>
<td>0.42</td>
<td>32</td>
</tr>
</tbody>
</table>

Under the No Action alternative, basal area and canopy cover increase by about 30% from 117 to 153 ft² per acre and 39% to 50% respectively over the Proposed Action. Dramatic increases in stand density and basal area over the past century represent an increased susceptibility for bark beetle epidemics and stand-replacing wildfire (Margaret M. Moore, et al. 2004), and conditions would continue on this unsustainable trajectory under No Action. Research indicates that risk of Mountain Pine beetle attack in Ponderosa pine increases from a level of low to moderate when residual basal areas exceed 100 ft²/ac (Munson and Anhold. 2000). The same concept would apply in the Pinyon-Juniper woodland in relation to the pinyon Ips beetle and density-related impacts.

The number of trees per acre greater than 5” diameter increases by 43% under No Action compared to the Proposed Action, but the number of trees greater than 18” only increase by 1 tree per acre. This further illustrates that under No Action, forests become increasing overcrowded, under greater competitive stress and more susceptible to disturbances such as insects, disease, and wildfire. Forests at this density level (153 ft² of basal area per acre and 857 trees per acre) would experience increased tree mortality and fuel loading.

Currently undesirable structural conditions within Northern Goshawk foraging, PFA and nesting habitats and MSO Restricted Habitats would remain essentially unchanged and would remain so for an indefinite period of time until disturbed by natural factors (wildfire or insect/disease outbreak). In the event of such disturbances, such key habitat would be at risk. The average dwarf mistletoe rating increases after 30 years under No Action, but decreases under the preferred alternative. The crowning index shows that with No Action it would only take 32 mph winds to carry a fire up into the canopy after 30 years of No Action, continuing the risk of an uncharacteristic crown fire that could devastate habitat.

Development of old growth conditions would continue at their current rate. In the absence of major stand disturbing events, tree densities and canopy cover would remain at uncharacteristically high levels, more prone to disturbance agents such as insects, disease, and wildfires. Tree diameters would continue to increase slightly, but remain largely stagnant due to extreme competition. Standing and down dead trees would likely increase as density related mortality becomes more evident.
Invasive plant species would continue to be identified and mapped through random surveys in the area. The increase in size and density of invasive plants would continue to crowd out native plant communities. Areas along roadways, riparian areas and developed recreation sites and disturbed sites would be most vulnerable to invasive species colonization, and these areas would be impacted earliest and most seriously.

The grass/forb/shrub component would continue to lack in diversity, vigor and abundance.

Recruitment and enhancement of old growth at all scales would continue to occur, although at the current, slower pace; in addition, such areas would be susceptible to uncharacteristic wildfire and/or insect/disease outbreaks.

Green House Gases (GHG) emissions and carbon sequestration levels would continue at current levels.

**Alternative B**
The Proposed Action effectively provides for more sustainable and resilient forest conditions from the perspective of reducing the likelihood of both uncharacteristic wildfire and insect/disease outbreak. Reducing tree densities, ladder fuels, and fuel loading as well as improving both vertical and horizontal structural diversity will improve resiliency to disturbances and lessen the likelihood of stand replacing wildfire.

**Table 3.1.8. Puerco Forest Conditions – Post Treatment**

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>BA/Acre (Ft²)</th>
<th>Canopy Cover (%)</th>
<th>Trees per Acre</th>
<th>Trees per Acre (5”+)</th>
<th>Trees per Acre 18”+</th>
<th>Average Diameter (QMD 5”+)</th>
<th>DMR</th>
<th>Crowning Index (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Conifer</td>
<td>87</td>
<td>39</td>
<td>1,426</td>
<td>141</td>
<td>5</td>
<td>10.8</td>
<td>0.11</td>
<td>40</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>80</td>
<td>30</td>
<td>920</td>
<td>98</td>
<td>8</td>
<td>12.3</td>
<td>0.11</td>
<td>50</td>
</tr>
<tr>
<td>Ponderosa Pine - Oak</td>
<td>95</td>
<td>34</td>
<td>1,117</td>
<td>150</td>
<td>9</td>
<td>10.8</td>
<td>0.05</td>
<td>54</td>
</tr>
<tr>
<td>Rocky Mtn Juniper</td>
<td>92</td>
<td>32</td>
<td>1,244</td>
<td>123</td>
<td>8</td>
<td>11.4</td>
<td>0.02</td>
<td>62</td>
</tr>
<tr>
<td>P-J Woodland</td>
<td>87</td>
<td>30</td>
<td>492</td>
<td>106</td>
<td>9</td>
<td>12.2</td>
<td>0.10</td>
<td>41</td>
</tr>
<tr>
<td>Deciduous Oak Woodland</td>
<td>91</td>
<td>37</td>
<td>2,351</td>
<td>173</td>
<td>6</td>
<td>9.9</td>
<td>0.59</td>
<td>40</td>
</tr>
<tr>
<td>Misc. Hardwoods</td>
<td>69</td>
<td>44</td>
<td>1,183</td>
<td>71</td>
<td>4</td>
<td>11.8</td>
<td>0.00</td>
<td>134</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>86</strong></td>
<td><strong>31</strong></td>
<td><strong>858</strong></td>
<td><strong>114</strong></td>
<td><strong>9</strong></td>
<td><strong>12</strong></td>
<td><strong>0.10</strong></td>
<td><strong>48</strong></td>
</tr>
</tbody>
</table>

Post treatment modeling shows that across the project basal area per acre would be reduced by about 30% from pretreatment levels. These totals include an average treated and untreated stands. Canopy cover is reduced from 43 to 31%, reducing the risk of crown fire. This is further supported by the increase in the crowning index, which would jump from 35 to 46 miles per hour – the wind speed required to carry a fire through the forest canopy. The trees per acre 5” dbh and larger would be reduced from 166 to 144, while the number of 18”+ dbh tress per acre would
remain the same. This demonstrates the objective of targeting overstocked mid-aged trees in the 5-18” diameter classes.

Under Alternative B, total trees per acre would be reduced from an average of 1,399 to 858, the majority of which are Gambel oak less than 5” diameter. The number of remaining conifers in the overstory would be approximately 100 trees per acre. Implementing follow up prescribed burning would reduce the amount oak stems per acre. The quadratic mean diameter across the project area would increase by about one inch, from 11.2 to 11.9”. Dwarf mistletoe, while not eliminated, would be reduced by about 50% across the project area. Areas specifically targeted for more intensive sanitation treatments of mistletoe would only retain visible infection on trees 24” dbh and larger and those that have old growth characteristic.

### Table 3.1.9. Puerco Forest Conditions – 30 Years Post Treatment

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>BA/Acre (Ft²)</th>
<th>Canopy Cover (%)</th>
<th>Trees per Acre</th>
<th>Trees per Acre (5”+)</th>
<th>Trees per Acre (18”+)</th>
<th>Average Diameter (QMD 5”+)</th>
<th>DMR</th>
<th>Crowning Index (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Conifer</td>
<td>135</td>
<td>50</td>
<td>1,150</td>
<td>182</td>
<td>10</td>
<td>12.4</td>
<td>0.00</td>
<td>33</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>110</td>
<td>38</td>
<td>696</td>
<td>104</td>
<td>14</td>
<td>11.6</td>
<td>0.17</td>
<td>43</td>
</tr>
<tr>
<td>Ponderosa Pine - Oak</td>
<td>120</td>
<td>41</td>
<td>941</td>
<td>154</td>
<td>13</td>
<td>14.1</td>
<td>0.17</td>
<td>46</td>
</tr>
<tr>
<td>Rocky Mtn. Juniper</td>
<td>130</td>
<td>44</td>
<td>933</td>
<td>162</td>
<td>13</td>
<td>12.1</td>
<td>0.14</td>
<td>49</td>
</tr>
<tr>
<td>P-J Woodland</td>
<td>118</td>
<td>37</td>
<td>391</td>
<td>137</td>
<td>15</td>
<td>12.0</td>
<td>0.04</td>
<td>32</td>
</tr>
<tr>
<td>Deciduous Oak Woodland</td>
<td>142</td>
<td>53</td>
<td>1,565</td>
<td>238</td>
<td>10</td>
<td>12.6</td>
<td>0.17</td>
<td>66</td>
</tr>
<tr>
<td>Misc. Hardwoods</td>
<td>130</td>
<td>70</td>
<td>878</td>
<td>282</td>
<td>9</td>
<td>9.9</td>
<td>0.04</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td><strong>117</strong></td>
<td><strong>39</strong></td>
<td><strong>671</strong></td>
<td><strong>133</strong></td>
<td><strong>14</strong></td>
<td><strong>12.9</strong></td>
<td><strong>0.15</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

Post treatment modeling indicates that after 30 years basal area and canopy cover return near pretreatment levels. Total trees per acre would remain at about one-half of the pretreatment level, and trees per acre less than 5” dbh would decrease from 166 to 133 trees per acre. The modeling did not simulate prescribed burning, nor did it simulate planting or natural regeneration, but it can be inferred that managed fire would further reduce overall trees per acre while preparing the seedbed for natural regeneration of desired conifers moving closer to desired uneven-aged conditions. Trees per acre greater than 18” and average diameter would also increase, improving habitat for the northern goshawks and Mexican spotted owl. The dwarf mistletoe rating and crowning index across the project area would remain at below pretreatment levels.

Key wildlife habitat objectives (enhancement and protection of Northern Goshawk foraging, PFA and nesting sites; MSO Restricted Habitat; as well as old growth) would be more readily met. Old growth recruitment/development at the project scale would be enhanced through reduction of small tree densities and resultant improvement in tree vigor, growth and multi-aged structure. Allocated old growth areas would be better protected from catastrophic wildfire and
insect/disease outbreaks through reduction of stand densities to more historic levels and breaking up the continuous canopy that is prone to crown fires.

Management objectives, including the broader scale implementation of uneven-aged management, as provided in the LRMP are more closely achieved. Desired Vegetative Structural Stage (VSS) class distribution would be improved, and moved toward more desired balances, while creating opportunities for recruitment of VSS classes 1 and 2 (seedlings and saplings 0-5” diameter) over approximately 10-20% of each of the forest type. Increased development of the mature and old (18”+ diameter) forest classes through reduced competition and increased tree vigor would occur. These structural conditions would not be completely achieved in this initial entry but would be placed on a trajectory towards meeting desired uneven-aged conditions in the future and allow greater flexibility to maintain.

The percent of maximum Stand Density Index (SDI\textsubscript{max}) level would initially be decreased by about 30% percent in the ponderosa pine forest type providing for more open forest conditions, encouragement of natural regeneration, increased tree growth/vigor and recruitment of understory grasses, forbs and shrubs. Subsequent levels would vary by forest type would generally provide for limited completion between trees and increased tree vigor and resiliency. Within the Mixed Conifer forest type, percent of maximum SDI levels would be higher but would still meet LRMP direction for MSO Restricted Habitat and provide for enhanced forest health conditions.

At the group level, canopy cover would meet the LRMP requirements within the VSS 4 through VSS 6 groups, in the ponderosa pine type and canopy cover will be maintained within PFA and nesting areas in the woodland type. Outside the Puerco Project area, canopy cover levels would remain at current levels and continue to increase over time.

The risk of pinyon Ips (Pinyon-Juniper woodland) and Mountain Pine Beetle (Ponderosa pine) attack would be minimized through lower tree densities and increased tree vigor, allowing for trees to more successfully fend off bark beetle attacks.

Reintroduction of fire either associated with mechanical treatment or not, is expected to decrease the current level of departure from the historic fire regime. Past and present research results suggest mechanical aerial fuel reduction (i.e., reduced canopy bulk density) followed by frequent prescribed fire is well suited as a management tool to restore and sustain entire watersheds and their ecological functions, particularly in pine-grassland forests (Cram et al. 2006). Additionally, they observed that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Specifically, as density and basal area decreased and mean tree diameter increased, fire severity decreased. A similar pattern was reported by McHugh and Kolb (2003) in terms of decreased tree mortality (three years following fire) as tree diameters increased from small to intermediate trees.
Mechanical thinning of overstocked trees prior to burning has been shown to improve understory response when compared to only burning. Reduced competition with remaining trees and increased light infiltration play an important role in promoting the understory (McGlone and Egan 2009). Expected effects on some of the major plant species occurring in the project area are detailed in the following paragraphs.

Mountain muhly density generally decreases from pre-fire values during the first few years after fire, but it may increase over original values thereafter. Mountain muhly usually takes at least 3 years to fully recover from fire (Gaines et al. 1958). However, after prescribed fire in central Arizona, mountain muhly had recovered pre-fire biomass within 10 months. Mountain muhly may sprout after aerial portions are burned.

Arizona fescue survives most fires. In a review, researchers indicate that Arizona fescue recovery is typically quick with summer monsoon moisture that follows dry-season surface fires in ponderosa pine forests of Arizona and New Mexico. Arizona fescue production and abundance may even be greater on burned than unburned sites following surface or low-severity fires (Sackett et al. 1996). Severe fires, however, can reduce Arizona fescue abundance.

The Gambel oak component can be expected to respond vigorously though the proposed treatments. In habitat types where Gambel oak is a significant component, “Gambel oak…can resprout prolifically” (Plant Associations of AZ and NM, Volume 1: Forests, pg. 229). More importantly, existing large oaks (5”+ diameter) will be maintained and featured by thinning surrounding trees to reduce competition and increase growth and vigor. Abella and Fulé (2008) found that oak survival was diameter specific 5 years after fall or spring prescribed burning. Survival of oaks greater than 6 inches (15 cm) in diameter exceeded 66 percent at both sites, while survival was low (11 to 20 percent) for small stems less than 2 inches (5 cm) in diameter. Survival may vary depending on operational aspects of burns, such as burn timing or whether oak clumps are deliberately lit. Nonetheless, these data support the findings of Fulé and others that large oaks can be maintained during burns and are consistent with oak’s persistence in frequent-fire pre-settlement forests (Abella and Fulé 2008).

The proposal to burn natural and activity created woody material (slash), either through prescribed or pile burning, within the project area would directly release carbon dioxide during the burning operations. This would contribute to increasing the atmospheric greenhouse gas concentration. However, restoration (or maintenance) of the desired conditions would result in a lower risk of uncharacteristically severe wildfire for those treated acres. This reduced risk has a two-fold effect on GHG emissions or the carbon cycle:

1. There is a direct beneficial effect on climate change of decreased GHG emissions from these acres because the risk of acres being burned by uncharacteristically severe wildfires would be reduced, and
2. There is an indirect beneficial effect by treating these acres because live stands of trees would retain higher capacity to sequester carbon dioxide compared to stands killed by uncharacteristically severe wildfires, especially if not immediately reforested.

It would be difficult to determine the significance of effects of one project on greenhouse gases directly, and therefore climate change indirectly, as there are currently no Federal statutes, regulatory standards, or policy direction on the significance of such effects. Until meaningful, accepted thresholds are adopted against which to weigh any project-related GHG emissions, it would not be possible to determine whether a specific project would have a significant effect under this factor.

### Cumulative Effects

Cumulative Effects for the proposed Puerco Collaborative Forest Landscape Restoration Project to vegetation includes past timber sales, timber stand improvement thinning, prescribed burning, wild and domestic grazing, and riparian improvement projects. The geographic setting for the cumulative effects analysis consists of the Puerco project analysis area. The timeframe for past actions is 30 years and 10 years for future and foreseeable projects. These timeframes were chosen because harvested sites have normally grown back to pre-treatment conditions within 30 years, and planning beyond 10 years is speculative. Current vegetation conditions (the affected environment) in the Puerco Collaborative Landscape Restoration area are a reflection of past and present actions, including suppression of naturally occurring fires.

### Table 3.1.6. List of Past Timber Harvest & Related Actions occurring within the Puerco Analysis Area, 1987-present

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Year Completed</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree Planting – East of Tampico Spring</td>
<td>1987</td>
<td>64</td>
</tr>
<tr>
<td>Commercial Thin – Road 496A, base of McKenzie Ridge</td>
<td>1991</td>
<td>83</td>
</tr>
<tr>
<td>Commercial Thin – Smith Canyon</td>
<td>1991</td>
<td>131</td>
</tr>
<tr>
<td>Commercial Thin – McGaffey Lookout</td>
<td>1991</td>
<td>56</td>
</tr>
<tr>
<td>Group Selection Harvest – Fourmile Canyon</td>
<td>1991</td>
<td>121</td>
</tr>
<tr>
<td>Precommercial Thin – Basgal Tank, Road 164</td>
<td>1993</td>
<td>252</td>
</tr>
<tr>
<td>Six Mile Timber Sale</td>
<td>1994</td>
<td>786</td>
</tr>
<tr>
<td>Sanitation Harvest – Road 496</td>
<td>1994</td>
<td>156</td>
</tr>
<tr>
<td>Commercial Thin – Natural Lake</td>
<td>1994</td>
<td>9</td>
</tr>
<tr>
<td>Polich Road Timber Sale</td>
<td>1997</td>
<td>3</td>
</tr>
<tr>
<td>Tree Planting – Meadow between Basgal &amp; Polich Places</td>
<td>1997</td>
<td>40</td>
</tr>
<tr>
<td>Precommercial Thin – 164M Road</td>
<td>1998</td>
<td>178</td>
</tr>
<tr>
<td>Forest Road 50 Right of Way</td>
<td>1999</td>
<td>51</td>
</tr>
<tr>
<td>Jamestown Thin and Pile</td>
<td>2005</td>
<td>250</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td></td>
<td><strong>2,180</strong></td>
</tr>
</tbody>
</table>
Table 3.1.7. Past Wildfire and Prescribed Burns, Within the Puerco Analysis Area, 1987-present

<table>
<thead>
<tr>
<th>Fire</th>
<th>Year</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast Burn – McGaffey Lake</td>
<td>1995</td>
<td>304</td>
</tr>
<tr>
<td>McGaffey</td>
<td>1996</td>
<td>25</td>
</tr>
<tr>
<td>Bear</td>
<td>1999</td>
<td>12</td>
</tr>
<tr>
<td>Fort Wingate</td>
<td>2005</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total Acres</strong></td>
<td></td>
<td><strong>346</strong></td>
</tr>
</tbody>
</table>

**Present Actions**

Present actions that are occurring within the analysis area include cattle grazing, developed and dispersed recreation, road maintenance, fire suppression, permitted hunting, prescribed burning, and special uses. Specific projects and on-going activities are listed within Table 3.8.

Table 3.1.8. List of Present Actions Occurring Within the Puerco Analysis Area

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Type of Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berger, Brennen, Cottonwood/Las Tuces, Dan Off, Dent/Dan Valley, Prewitt/6A, Stinking Springs, and Wingate Allotments</td>
<td>Cattle grazing, permit administration</td>
</tr>
<tr>
<td>Hunting/Fishing</td>
<td>McGaffey Lake, under permits issued by Arizona Game and Fish</td>
</tr>
<tr>
<td>Developed &amp; Dispersed Recreation</td>
<td>Quaking Aspen and McGaffey/Oso Page Campgrounds, McGaffey/McKenzie Picnic Site, Hilsos and Strawberry Canyon Trailheads, project area (dispersed).</td>
</tr>
<tr>
<td>Annual Road Maintenance</td>
<td>Road grading and maintenance on County Road 50, NM State Hwy 400, and approved Travel Management Decision routes</td>
</tr>
</tbody>
</table>

The Cumulative Effect of vegetation treatments from the adjacent Bluewater Forest Restoration Project will combine to produce a mosaic of different forest stand conditions that will provide resiliency to disturbances, such as wildfire and insect and disease outbreaks. Implementation of the Proposed Action would increase the heterogeneity of the project area and create vegetative conditions that are more resilient to the frequency, extent and severity of disturbances and climate variability, while the No Action Alternative will not meet the purpose and need of the project.

### 3.2 Fuels and Fire Behavior

**Affected Environment**

Historically, fire naturally burned throughout the project area relatively frequently, usually within a six year mean interval (Baisan, 1997). These high frequency and mixed severity fires minimized the regeneration of tree and shrub species, leaving a mosaic pattern of tree densities in the pinyon/juniper (P/J) woodlands while in the ponderosa stands an open grassy park-like
landscape with large fire resistant trees was typical. This natural process of forest self-
management was changed in the 18th century.

Management practices from the 18th century such as grazing, fire suppression, and timber
harvesting led to significant impacts on the vegetation and altered the natural fire regime within
the project area. Much of the pine forest in the project area was harvested as evidenced by
remnant stumps. This created openings which allowed dense seedling establishment during wet
years and no frequent fires to limit the stocking numbers. These events have now produced
unnaturally dense stands of suppressed young trees. The historic practices of grazing, fire
suppression and timber harvesting have led to the existing conditions of accumulated heavy fuel,
and dense forests.

Since the early 1900s, wildfire activity has increased in the Southwest and recent fires have
burned at intensities and size rarely seen in the past. This is evidenced in the fire behavior
exhibited by the Sedgwick fire in 2004 totaling 8,400 on Mt Taylor RD and the Trigo fire in 2008
totaling 13,709 acres on the Mountainair RD. Also, New Mexico’s largest fire, the Los Concha’s
fire near Los Alamos in 2011, totaled 150,000 acres. And Arizona’s largest wildfire, the Wallow
fire near Alpine in 2011 totaling 538,049 acres. All 4 of these fires were human caused and
destroyed homes.

Fire season in New Mexico usually occurs from early April to late July in most years. It is
characterized by low humidity, strong winds and unstable atmosphere. Dry lightning storms are a
common occurrence on hot afternoons. Predominate winds are normally from the west-southwest
but can change to almost any direction with passing weather cells. Weather records indicate that
winds ranging from 8 to 30 mph are typical during the spring and early summer. Based on data
over multi-year period and over the 6 months when fire weather is most extreme (March 1st thru
August 31st), winds blew predominantly from the south and southwest as opposed to the west.
Winds of this speed coupled with low relative humidity and the current fuel conditions can create
an environment that supports extreme fire behavior.

Winds coming from the south and southwest would increase the risk of smoke across I-40 and
into the local communities of Continental divide, Thoreau, Ft Wingate along with Jamestown
that had a past WUI treatment in 2004 approximately 250 acre were thinned and pile burned.
Traditionally 60% to 75% percent of the rainfall on the districts occurs July through September
when monsoonal moisture generates in the Pacific Ocean follows a thermal trough into the
Southwest. The least amount of rainfall occurs from May into early-July when a drier continental
air mass resides over the Southwest. This is also the time-frame in which the project area
receives its highest visitation.

In addition to fuels and weather, topography such as slope and aspect also influence fire
behavior. Slope affects fire spread and intensity. Fire normally burns faster and hotter upslope
than down slope or on level ground. Slopes within the Puerco Landscape project area represent a
wide range of conditions, ranging between 0 (flat) and 40+ percent. Aspect affects fire spread and intensity based on the direction the slope is facing and the overall vegetation and soil moisture. A south-facing slope is hotter and dryer than a north-facing slope. On a south-facing slope fuels tend to be small and drier and the average relative humidity tends to be lower. Since the project area lies on the west side of the Continental Divide its weather patterns are slightly different than the east side trending wetter however with changing weather patterns fire behavior would be similar and due to sub drainages and intersecting ridges, all aspects are present.

The Puerco Landscape analysis area has 3 primary Management Areas (MA): pinion /juniper MA13/14, ponderosa pine MA8 and Mixed Conifer MA 10 District fire personnel and contractors conducted fuel transects throughout the project area to gather an overall baseline of tons per acre fuel loading. The findings are that some mortality is occurring due to trees stressed from competition and drought therefore, they are more susceptible to loss from insects and disease. As trees die and fall over, surface fuel loads increase. In these semi-arid systems where rates of biotic accumulation exceed the normal rate of decay fire plays a critical role in recycling biomass (Baisan and Swetnam 1995).

The desired future condition would allow fire to play its natural role in the environment, and be maintained in a manner to alleviate resistance to control. Desired future conditions would mimic natural ecosystem traits, having a diverse mosaic of fuels that are arranged in a fashion not subject to uncharacteristic wildfire.

**Pinyon-Juniper Woodland Type**

The Pinyon-Juniper Woodland type occupies approximately 41,000 acres of the analysis area. This forest type is typically a mix of pinyon pine and one-seed/Rocky Mountain juniper with scattered ponderosa pine, alligator juniper and gamble oak. The dominant habitat type is Pinyon pine/Blue grama.

There is a high confidence that tree density and canopy coverage have increased in many or most persistent woodlands during the 20th century although the precise magnitude of increase, causes, and geographic applicability are not adequately known. Some of these woodlands are sufficiently open to subdue a running crown fire but dense patches do exist which could sustain this type of fire behavior.

Fuel Model 6 best represents the existing condition of the p/j woodland type. In a FM 6 fires carry through the shrub layer where the foliage is more flammable than fuel model 5, but this requires moderate winds, greater than 8 mi/h (13 km/h) at mid-flame height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrubs are older, but not as tall as shrub types of model 4, nor do they contain as much fuel as model 4. A broad range of shrub conditions is covered by this model.
**Ponderosa Pine Forest Type**

The Ponderosa pine forest type occupies approximately 34,000 acres of the analysis area. Typically this is the “dry” end of the ponderosa pine type and has scattered pinyon pine and one-seed/alligator juniper as well as gamble/wavy leaf oak. The dominant habitat type is Ponderosa pine/Gamble Oak.

Ponderosa pine in the Southwest experienced low-intensity fires every 5 to 20 years (Covington and Moore 1994). The mature pine was able to withstand low to moderate intensity fires due to their thick bark (Pollet and Omi 2000). These events have now produced unnaturally dense stands of suppressed young trees. This condition threatens any remaining old growth trees through competition and by fueling increasingly extensive crown fires due to vertical continuity of the stand (Covington and Moore 1994, Omi and Martinson 2002). There is a lack of herbaceous understory but plenty of dead pine needles which are a recipe for a stand replacement wildfire under high risk weather conditions. Crown fires in the ponderosa pine type are absent in the historic, local, and regional fire scar records (Touchan and Swetnam 1991), indicating that current stand conditions are an aberration attributable to the three practices mentioned.

Fuel Model (FM) Timber Understory (TL8) best represents the ponderosa pine forest type. The primary carrier of fire in TL8 is moderate load long-needle pine litter, may include small amount of herbaceous load. Spread rate is moderate; flame length low.
Figure 3.2.2. Even-aged Ponderosa Pine Stand, Note dense tree stocking and lack of herbaceous understory

**Mixed Conifer Forest Type**
The mixed Conifer forest occupies approximately 156 acres of the analysis area. Overall this forest type is just slightly departed from its natural range of variability. Most areas are primarily even aged and lack structural diversity. From a fire risk perspective, this forest type poses no real concern.

**Fire Regime Condition Class**
To represent the vegetation and fuel loading departure from a historical state, three Condition Classes are used as a qualitative measure. The project area consists of Condition Class 2 and 3, moderate to significantly detached from the historical condition.

*Condition Class 1* areas are generally within or near the historical range and do *not* predispose the system to risk of loss of key ecosystem components. Vegetation groups are intact and functioning within the natural range of variability.

*Condition Class 2* areas develop as one or more fire return intervals are missed resulting in continued growth of under-story and species reproduction. Vegetation composition and structure have *moderate* departure from the natural range of variability and are predisposed to risk or loss
of key ecosystem components. Fires will burn with greater intensity making them difficult to suppress and will result in changes in biodiversity, soil productivity, and water quality.

*Condition Class 3* can be described as **significant** departure from the natural range of variability and predispose the system to a high risk of losing key ecosystem components. Large scale insect damage and disease are usually present, and may become catastrophic while increasing available fuels. Extreme fire behavior is typical with this departure state, and usually will result in a complete stand replacement occurrence.

Condition Class describes the overall vegetative condition of the ecosystem comparing the current condition to historical condition. In addition to describing the condition class, fire regimes categorize major fuel types and the natural fire return interval.

**Fire Regime**

Five primary fire regime groups have been developed by Hardy et al. (2001) and Schmidt et al. (2002). These are coarse scale and simplified categories that help in understanding the ecological fundamentals of the biotic systems that occur on this landscape, and its previous relationship with fire as a process which acted on them at different frequencies and resulting severities for thousands of years.

Potential vegetative groups have been mapped for the Cibola National Forest and are assimilated with fire regimes. The pure Ponderosa Pine forest type group is most closely represented by Fire Regime III. The remaining Ponderosa Pine acres are a mix of Fire Regime I and II. The Hot Dry Shrub-lands and Woodlands including P/J are represented by Fire Regime II. Finally, the shrub group including Gambel oak is also represented by Fire Regime II.

**Fire Regime I**: This system includes the lower and mid-elevation forested plant associations, Ponderosa Pine, and Douglas-Fir. These regimes historically had a high fire return interval (0-35 years) preventing high fuel loadings and produced limited layers within the system. The net result was more frequent and less severe fire occurrence.

**Fire Regime II**: This system is also in the lower to mid elevation range; however it includes grassland plant associations. These regimes have a high fire return interval (0-35 years) with a mix of low and high severity fires. This system includes P/J, mountain mahogany, and other dry mountain shrub species.

**Fire Regime III**: This system consists of forest plant associations located at mid elevation. Species found there are consistent with higher moisture availability such as Douglas fir, higher elevation bunch type grasses and forbs. The fire return interval is 35 to 100+ years with a mix in fire severity. Stand replacement fire may occur but are usually rare events. This regime is typically a heterogeneous landscape.
Fire Regime IV: This system is characterized by forested species at mid to high elevation. Spruce, and sub-alpine fir plant associations are included within this group. This regime is generally considered as having a fire free period of 100+ years. This usually results in a stand replacement, high intensity fire occurrence.

Fire Regime V: This is a high elevation system, and the plant associations depend upon high local moisture availability. Due to the very long fire return interval in excess of 200 years, this regime is generally considered fire free. Rock, lack of fuels and other combinations of the physiographic setting typically inhibit propagation of fire.

The following table displays the fire regimes and existing condition class within the Puerco Landscape Project Area.

<table>
<thead>
<tr>
<th>Fire Regime Group</th>
<th>Historic Fire Return Interval</th>
<th>Condition Class</th>
<th>Approximate Percentage within project area</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0 - 35 years</td>
<td>2</td>
<td>5 %</td>
</tr>
<tr>
<td>I</td>
<td>0 – 35 years</td>
<td>3</td>
<td>3 %</td>
</tr>
<tr>
<td>II</td>
<td>0 - 35 years</td>
<td>2</td>
<td>7 %</td>
</tr>
<tr>
<td>II</td>
<td>0 - 35 years</td>
<td>3</td>
<td>75 %</td>
</tr>
<tr>
<td>III,IV</td>
<td>35 - 100+ years</td>
<td>Any</td>
<td>10 %</td>
</tr>
</tbody>
</table>

Crown Base Height & Crown Bulk Density

Crown base height (CBH) and crown bulk density (CBD) influence fire behavior, and can be directly managed by thinning or similar forest treatments (Graham and others 1999).

*Crown base height* is the measurement in feet from the ground to the base of the crown. Often ladder fuels play an important role to establishing a crown fire. Ladder fuels are vegetation arrangements that allow fire to climb up vegetation into the crowns of the over story. Thinning from below and prescribed burning often result in higher crown base heights thus reducing the potential for crown fire initiation. The Project area has numerous pole size trees and areas with abundant regeneration that contributes to heavy concentrations of ladder fuels, thus the risk of a crown fire is high. Using the modeling program, BEHAVE, managers can view the possibility of a fire transitioning from the ground to the crowns called transition ratio.

The transition ratio is the surface fire line intensity divided by the critical surface intensity. If the transition ratio is greater than 1 or equal to, then the surface fire intensity is sufficient for a crown fire. This is important in analysis to show the potential for a crown fire.

*Crown Bulk Density* is an indicator of the incidence of interlocking crowns which can tells us how a crown fire can spread. CBD is the primary controlling factor of crown fire behavior and it
depends on both species composition and stand density (Graham and others 1999). CBD is measured in lb. per ft. cubed and is the amount of mass in the canopy of a stand. In general, the lower the CBD, the higher the wind speed has to be to sustain a crown fire. CBD’s of 0.0104 lb./ft^3 and above are considered high. Most of the stands within the project area fall within this spectrum.

**Environmental Consequences**

It is important to note that fire is boundary-less by nature. There are many elements, some of them discussed within this report, that drive fire growth and spread potential. It is therefore understood that cumulative effects, on site-land management practices, and off-site land management practices are all co-related and overall risk is shared.

Components of fire risk are weather, fuels, and human influences. Fire risk is the potential for a fire to ignite given certain parameters and conditions. Fires start as the result of human activity or naturally by lightning. Lightning caused fires will be looked at on a case by case basis with the core team to see if it’s in an area of the project that can be managed for multiple objectives. This would be dependent on multiple things including current weather, logging operations amount of slash, cattle and range concerns, timing of wildlife, fuels moistures and time of year.

Human caused fires account for a low percentage of statistical fires within and directly outside the project area. This will increase due to the implementation of the Zuni Mountain Trail Partnership which is identifying 52 miles of mountain bike and /equestrian trails within the project area thus increasing Human presence and risk of wildfires. If a fire does ignite, there is a high possibility of losing all or most vegetation leaving the land vulnerable to flooding within the watershed. Adverse impacts to water quality would also occur. The soil damage will be detrimental and there is potential for a long-term loss of wildlife habitat. Several communities are in alignment with the local wind pattern, and could be greatly affected by smoke and or impacted by fire.

All forest types were analyzed using baseline weather parameters. Also referencing McGaffey and Bluewater Ridge Remote Automated Weather Station (RAWS). Along with site data and best science practices. The analysis was conducted with three different weather scenarios, Low, Moderate, and High. Base line temperatures and wind speeds were used along with changing fuel moistures in reference to different time of year to show breaking points for crown fire runs.

**Table 3.2.2. Fire Attributes Under 3 Weather Scenarios**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Low Conditions</th>
<th>Moderate Conditions</th>
<th>High Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-hour fuel moisture %</td>
<td>9</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>10-hour fuel moisture %</td>
<td>11</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>100-hour fuel moisture %</td>
<td>13</td>
<td>10</td>
<td>7</td>
</tr>
</tbody>
</table>
The Behave Plus program was used to simulate and model potential fire effects in the project area. Several fuel models were selected to best represent pretreatment (existing condition) and potential post treatment stand characteristics. Pretreatment and post treatment were calculated for the stand types and compared. Post treatment fuel models were selected that differ from the pretreatment models to include a reduced fuel loading. A reduction in all of the primary categories (rate of spread, flame length, BTU outputs, and scorch height) was observed in the majority of the scenarios that we modeled. For the action alternative the introduction of grass under the canopies and temporary openings increased the rate of spread in some cases, but the intensities and transition ratios decreased below 1. A transition ratio of 1 or above is indicative of conditions that would support a crown fire. As the transition ratio decreases, the crown fire risk also decreases. This is an important value when evaluating fuel treatment effectiveness.

For Ponderosa Pine we used a fuel model TL8, or long needle pine stand, to analyze the existing condition. In the Low scenario we had a high rate of spread and close to the limit on Flame length for initial attack resources to be able to contain but it stayed as a surface fire. The Moderate scenario had a high rate of spread and flame lengths were too high for Initial attack resources to contain we would have to have heavy equipment and air resources brought in but also stayed as surface fire. The High scenario would transition into a running crown fire that could not be contained until transitioned into different fuel type or ran out of fuel. The Ponderosa stands were analyzed for restoration parameters for post treatment scenarios. In both scenarios, a moderate intensity prescribed burn was simulated following the mechanical treatment. In the ponderosa pine scenario the remaining groups were modeled with a fuel model TL4 small downed logs, which best represents post logging operation, and has a lower rate of spread than a TL8 Model, along with lower fire line intensities and heat per unit areas. This leads to much less resistance to control (easier to suppress) for ground resources engaged in fire suppression activities. That modeling also showed similar decreases in the key areas contributing to increased resistance to control as well as crown fire transition ratio.

Pinyon Juniper was modeled with a fuel model 6, moderate to high load dry climate shrub for the existing condition. This model is a shrub model but best represents the characteristics of Pinion Juniper in size and continuity. The PJ stands in all three pretreatment scenarios would transition into a torching crown fire with high transition ratios mainly due to the crown Base height being so low and crown bulk densities being so high. A moderate intensity prescribed burn was simulated following the mechanical treatment. In these scenarios a Fuel Model 8 was used this being a short needled litter. Fire would stay on the surface mainly due to the Crown bulk
densities being so low along with fire line intensities and heat per unit area being drastically reduced along with the transition ratio. This would give resources a low resistance of control.

**Alternative A – No Action**

The No Action alternative would result in no treatment of the existing unhealthy forest vegetation conditions. The forest ecosystem would remain susceptible to the adverse effects of uncharacteristic wildfires consistent with increased population, public use, increased fuel loading, and would be vulnerable to insect/disease outbreaks.

Forest vegetation would continue to grow but at reduced rates due to high tree densities, overcrowding and competition for limited nutrients, water and sunlight. Trees, both on an individual and landscape basis, would continue to be stressed and more susceptible to drought and insect and disease attack. Higher rates of mortality resulting from these causes could be expected. The dramatic increases in stand density and BA over the last 80-90 years represent an increased susceptibility for bark beetle epidemics and stand-replacing wildfire (Margaret M. Moore, et al. 2004, pg 1).

Stand structure (the horizontal and vertical distribution of forest components including the height, diameter, crown layers, and stems of trees, shrubs, snags and down woody debris) would remain homogenous and uniform.

Recruitment and enhancement of old growth at all scales would continue to occur, although at the current, slower pace; in addition, such areas would be susceptible to uncharacteristic wildfire and/or insect/disease outbreaks.

Stand diversity would remain low and competition for water, nutrients and space would remain high. All developments and resource values in this project area could be lost in a single burning period. From a fire/fuels prospective this alternative is the least desirable.

<table>
<thead>
<tr>
<th>Ponderosa Pine, FM TL8</th>
<th>Low Conditions</th>
<th>Moderate Conditions</th>
<th>High Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Spread (chains/hr)</td>
<td>6.3</td>
<td>7.8</td>
<td>10.3</td>
</tr>
<tr>
<td>Heat per Unit Area (Btu/ft²)</td>
<td>627</td>
<td>705</td>
<td>832</td>
</tr>
<tr>
<td>Fireline Intensity (Btu/ft/second)</td>
<td>72</td>
<td>100</td>
<td>157</td>
</tr>
<tr>
<td>Flame Length (ft.)</td>
<td>3.2</td>
<td>3.8</td>
<td>4.6</td>
</tr>
<tr>
<td>Transition Ratio</td>
<td>0.60</td>
<td>0.84</td>
<td>1.31</td>
</tr>
</tbody>
</table>
Fuel Model TL8- The primary carrier of fire in TL8 is Moderate load long-needle Pine Litter, may include small amount of herbaceous load. Spread rate is moderate; flame length low.

Pinyon-Juniper, FM 6

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Low Conditions</th>
<th>Moderate Conditions</th>
<th>High Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Spread (chains/hr)</td>
<td>3.1</td>
<td>3.7</td>
<td>5.0</td>
</tr>
<tr>
<td>Heat per Unit Area (Blu/ft²)</td>
<td>427</td>
<td>467</td>
<td>562</td>
</tr>
<tr>
<td>Fireline Intensity (Blu/ft/second)</td>
<td>24</td>
<td>32</td>
<td>51</td>
</tr>
<tr>
<td>Flame Length (ft.)</td>
<td>1.9</td>
<td>2.2</td>
<td>2.8</td>
</tr>
<tr>
<td>Transition Ratio</td>
<td>2.93</td>
<td>3.89</td>
<td>6.29</td>
</tr>
</tbody>
</table>

Pinyon Juniper was modeled with a fuel model 6, moderate to high load dry climate shrub for the existing condition. This model is a shrub model but best represents the characteristics of Pinion Juniper in size and continuity. The PJ stands in all three pretreatment scenarios would transition into a torching crown fire with high transition ratios mainly due to the crown Base height being so low and crown bulk densities being so high. Fuel Model 6- Fires carry through the shrub layer where the foliage is more flammable than fuel Model 5, but this requires moderate winds, greater than 8 mi/h (13 km/h) at mid flame Height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrubs are older, but not as tall as shrub types of a fuel model 4, nor do they contain as much fuel as Fuel Model 4. A broad range of shrub conditions is covered by this model. Even hardwood slash that has cured can be considered. Pinyon-juniper shrub-lands may be represented but may over-predict rate of spread except at high winds, like 20 mi/h (32 km/h) at the 20-foot level.

**Alternative B**

This action alternative is based on an ecosystem restoration prescription and would have; fewer trees especially small diameter trees that act as ladder fuels and increase the risk of torching, and an open canopy with lower crown bulk density which reduces the risk of sustained crown fire. The ecosystem should be resilient to natural disturbance events including fire, drought, disease, and insect infestations. Measurements such as CBH, CBD, and tons per acre will be used to monitor future conditions of the stand. Treatments such as prescribed burning will be used to maintain the desired conditions based on the measurement pre mentioned. Coupled together these guides and tools will help alleviate undesirable conditions that are present in the Puerco project area currently.

This alternative would create a stand structure reducing the potential for crown fire, although the potential for fine fuels such as grasses increases. Fine fuels could create an environment where
ground fire moves faster, but fires would demonstrate low to moderate fire behavior with low resistance to control. This condition would be the case in the majority of the meadows and temporary openings. These areas would serve as randomly placed fuel breaks throughout the project area. Wildfires within the Puerco project area would be more likely to be contained before they enter private land where we can utilize these fuel breaks.

Crown fires entering the Puerco project area from either private land or National Forest lands could potentially go back to a ground fire giving emergency personnel a chance to safely contain the fire. This would be a direct result from the reduction in canopy bulk density, increase in canopy base height, and creation of the temporary openings. Maintenance of the Puerco project area through selected removal of understory and low intensity prescribed fire would help ensure the effectiveness of this project.

Alternative B would be expected to help protect important values such as private land and current enter structure with recreation sites. In order to protect these values, firefighters must be able to remove the fuel and contain the fire. The shorter the fires duration, the less the potential exists for adverse weather changes or extreme fire behavior that makes conditions less safe for firefighters. There is less exposure to elements such as smoke and terrain. Firefighters can more safely extinguish a fire if it stays small, has lower intensities, low spotting potential, and low resistance to control. Action alternatives will reduce the canopy bulk density and ladder fuels effectively reducing the potential for crown fires creating a safer area for firefighters.

The decision process has many variables, and consideration of all elements must be weighed. Demand for the use of the project areas has changed through the centuries and the greatest unknown factor involves human activities and influences. Substantial evidence does not exist to determine the end risk of the alternative to be selected.

**Ponderosa Pine, TL 4**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Low Conditions</th>
<th>Moderate Conditions</th>
<th>High Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Spread (chains/hr)</td>
<td>0.8</td>
<td>0.9</td>
<td>1.2</td>
</tr>
<tr>
<td>Heat per Unit Area (Btu/ft²)</td>
<td>218</td>
<td>236</td>
<td>280</td>
</tr>
<tr>
<td>Fireline Intensity (Btu/ft/second)</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Flame Length (ft.)</td>
<td>.8</td>
<td>.9</td>
<td>1</td>
</tr>
<tr>
<td>Transition Ratio</td>
<td>0.03</td>
<td>0.03</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Fuel Model TL4- The primary carrier of fire in TL4 is moderate load of fine litter and coarse fuels. Includes small diameter downed logs. Spread rate is low; flame length low. May include small amount of herbaceous load. Spread rate is moderate; flame length low.
Fuel Model 8- Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidity’s, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand.

**Effects Common to Both Alternatives**
With the population increase anticipated to continue, it can be expected that the use of the project area will increase at an equal rate. Consideration of increased risk could be managed under the Cibola Fire Management Plan which would restrict or close these areas under extreme fire conditions. Public access into areas currently prohibited or limited under previous decisions would continue as designated.

Managed roads and trails could be effectively utilized for fire-line construction during an emergency or during fuel treatment projects. During fuel treatments, there is increased human activity and equipment that could start fires. However, that can be mitigated by starting the project during favorable weather conditions and limiting it to certain times in the year. An increase of fine fuels (grass) 0-2 tons per acre, can be expected. As stated earlier in this report, grass will reduce the fire intensities and contribute to an overall lower resistance to control.

**Cumulative Effects**
For this project, the cumulative affects area was considered to be the project area and ongoing or reasonably foreseeable actions that could affect fire and fuels.

Fuel treatment on federal land, specifically Jamestown WUI Fuel Break has reduced the fuel loading on adjacent lands bordering the project area. Prescribed fire was introduced after the fuel wood had been removed.
Implementation of ecosystem restoration projects need to consider the intended recreation usage of the area. A symbiotic relationship exists regarding road and trails. One of the unintended results of fire-line construction or creation of fuel-breaks often result in increased traffic and user created routes that require mitigation or obliteration.

Conversely, valued and managed recreational routes are usually located geographically and topographically so that they allow easy compartmentalization of areas without having to construct new fire-line. Under Alternative A, the overall fuel load in the project area will not be reduced and resources in the area will continue to be at risk for intense, difficult to control fires. Under Alternative B, the proposed activities will be instrumental in fuel reduction and progressing the project area toward Condition Class 1 (low risk of losing key ecosystem characteristics due to wildland fire).

**Air Resources**

The affected environment within and surrounding the project area meets air quality standards for the six criteria pollutants, so is not listed as a “non-attainment” area (USEPA 2012). As defined by the Clean Air Act, a non-attainment area is one that does not meet the standards for one or more of the six criteria pollutants. Air quality in the area is considered to be very good, typically well below standards set by EPA and NMED to protect human health and the environment. The area meets all air quality standards and there are no nonattainment areas nearby.

Elevated PM$_{2.5}$ concentrations can be attributed to both prescribed fires and wildfires, such as those that have occurred in the area over the last several years. Communities closest to the fire typically experience the greatest impacts. Wildfires often have greater impacts than prescribed fire, both in terms of concentrations and duration of impacts of PM$_{2.5}$ concentrations. While generally, the area has very good air quality in terms on particle pollution, there have been localized incidences of unhealthy air quality from associated from both wildfire and prescribed fire in the past several years.

Ozone is a secondary pollutant that forms as a result of chemical reactions in the atmosphere when the primary pollutants of nitrogen oxides (NOx) and Volatile Organic Compounds (VOC) are exposed to sunlight. The precursors to ozone are generally produced as emissions from combustion of fossil fuels. Sources in this area include refineries near the Continental Divide along I40, engine exhaust from oil and gas development, and mobile sources including cars, trucks and recreational vehicles. Smoke from wildland and prescribed fire does contain precursors for ozone, and fire smoke has been known to contribute to increased ozone concentrations under certain conditions (Jaffe 2012).

Visibility relates to conditions that allow humans to see and appreciate the inherent beauty of the landscape features, and these conditions can be greatly impacted by particular matter and gasses that are in smoke or dust. Visibility and other air quality standards are most stringent within
designated Class 1 areas. The closest Class I area is the Petrified Forest National Park, located to the west, upwind of the project area.

Summary of environmental impacts by alternative

The primary environmental impacts to air quality analyzed in this assessment are emissions from prescribed fire. To distinguish between alternatives, the maximum acres of the project area that could have prescribed fire applied are listed for each alternative. The main differences between alternatives relevant to this assessment are: the number of acres that could have prescribed fire: whether the acres have been harvested prior to using prescribed fire or not; and the type of vegetation on each acre treated by prescribed fire. For this assessment, approximately 57,875 acres are proposed for treatment with prescribed fire in the action alternative. Of these acres, 85% are proposed to be treated by mechanical methods prior to prescribe burning. On average, 10% or more of the total acres could be treated each year with prescribed fire, about 5,790 acres. In contrast, wildfire’s total acres and related emissions could exceed that of the action alternatives. A wildfire would burn without the benefit of planning and meeting conditions more favorable to protecting sensitive receptors. The proposed alternative is expected to reduce the intensity of wildfire should it occur in the project area.

Table 3.2.3. Vegetation Type and Acres of Prescribed Fire

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Mechanical with Prescribed Fire</th>
<th>Prescribed Fire Only</th>
<th>Total Treatments with Prescribed Fire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Mixed Conifer</td>
<td>263</td>
<td>212</td>
<td>475</td>
</tr>
<tr>
<td>Ponderosa Pine</td>
<td>19,417</td>
<td>3,494</td>
<td>22,911</td>
</tr>
<tr>
<td>Ponderosa Pine-Gambel Oak</td>
<td>10,904</td>
<td>3,083</td>
<td>13,987</td>
</tr>
<tr>
<td>Pinyon-juniper Woodland</td>
<td>875</td>
<td>390</td>
<td>1,265</td>
</tr>
<tr>
<td>Ponderosa Pine/P-J Transition</td>
<td>10,209</td>
<td>1,319</td>
<td>11,528</td>
</tr>
<tr>
<td>Grassland/Shrubland</td>
<td>7,670</td>
<td>39</td>
<td>7,709</td>
</tr>
<tr>
<td>All Vegetation Types</td>
<td>49,338</td>
<td>8,537</td>
<td>57,875</td>
</tr>
</tbody>
</table>

Cumulative Effects

The analysis area for considering cumulative smoke related effects are the airsheds that intersect the project area. The relatively short term duration of smoke emissions from this project would not affect long term air quality in the area, and may mitigate the effects on air quality from a wildfire.

Cumulative effects include those from past, ongoing and reasonably foreseeable future activities that combine with effects of the proposed project in contributing to the total particulate matter, carbon dioxide, and ozone load in the same airshed. Generally, the cumulative effects analysis area lacks large industry capable of contributing significant PM or carbon dioxide. While the other potential sources of these pollutants cannot be accurately quantified, they are as follows:

- Use of fireplaces and wood stoves contributes PM and CO₂ mostly from November-April.
3. Environmental Consequences

- Dust from unpaved roads does not typically travel very far or contribute large amounts of PM.
- Industry emissions are a negligible contribution.
- Prescribed burning by agencies and private landowners are a common contribution of PM and CO₂.
- Wildfires usually occur annually and contribute relatively large amount of PM and CO₂.

Thus, emissions from prescribed burning activities outside of the project area, but within or near the same airshed, in addition to emissions from the various other sources, and the existing PM and CO₂ in the air from past activities, would increase the amount of pollutants that would be distributed to areas downwind. Of these sources of PM and CO₂, prescribed burning and fireplace smoke are the most common and would be the primary contributors to cumulative air quality effects. Fall and winter burning of slash piles in the project area and in the surrounding forests would contribute incrementally to the cumulative smoke effects from residential use of wood stoves and fireplaces. Cumulative effects from prescribed burning would be mitigated through coordination with other prescribed fire projects and NMED, so that multiple prescribed burns do not affect the same airshed at the same time, if they were determined to cumulatively result in significant impacts.

Fine particulate emissions from the proposed action combined with other sources would add to the regional haze that results when there are multiple sources of emissions during the same time period. During temperature inversions, the haze becomes concentrated near the surface. Proposed actions would contribute an insignificant amount to the regional haze and overall air pollution load within this airshed, in part due to the timing, coordination and monitoring, low emissions concentrations, and other mitigation measures previously described. Although burning could occur any time throughout the year, a higher percentage of the broadcast prescribed burning would likely occur in the spring or fall rather than during the winter when residents use wood-burning stoves/fireplaces and there are more air inversions. Piles burned during the winter months would involve timing restrictions to allow for adequate smoke dispersal. To further reduce cumulative effects to air quality, prescribed burning would be coordinated between Federal land managers and the State regulatory agency so as not to overwhelm the air resource. The State would regulate and decide if and when burn permits are issued to the Forest Service and others in order to avoid cumulative effects that might exceed air quality standards. Thus overall, the cumulative increase in emissions from this project is not expected to be significant enough to approach concentrations that would exceed State or Federal air quality standards.

**Conclusion about effects**

Emissions on the Cibola National Forest and National Grasslands are regulated by the New Mexico Environment Department, Air Quality Bureau. All prescribed burns would comply with New Mexico’s Smoke Management Program. Prescribed burning would be restricted on days with less than good ventilation conditions and emission reduction techniques (ERTs) would be required. As a result, the effects to air quality would be minimized due to the reduction of emission produced. In addition, due to the potential to have significant health impacts to communities downwind and down drainage from prescribed fire, communication and coordination would be required prior to the implementation of any prescribed fire project.

No smoke would be generated from thinning or wood and slash removal; however, there would be other minor impacts to air quality by these activities, such as fugitive dust and exhaust from vehicles, heavy equipment, and chain saws. The levels of exhaust are anticipated to fall well
below EPA emission standards. Road dust would be higher than current conditions unless they are conducted while the ground is frozen or the road is moist. Constructing, maintaining, and decommissioning roads would also stir up dust; however, this kind of dust settles fairly quickly, can be mitigated with dust abatement techniques, and is limited spatially.

Based on typical daytime winds in the area, smoke would likely move toward the northeast and would likely dissipate during the periods of active burning. During the daytime burns, the amount of smoke generated would tend to be greatest for a few hours in the late afternoon when the fire is hottest. However, people in the surrounding areas would likely see smoke in the air. Based on past prescribed burns in the same area, it could be expected that individual projects under each alternative have the potential to cause short term impacts in communities downwind of the projects. These impacts decrease the further away from the project area a community is located.

Emission reduction techniques would be used to reduce the actual amount of emissions produced from fire, where appropriate, to aid in the maintenance of air quality. For broadcast burning, the following techniques could be used:

- Burning could occur with higher fuel moistures in the larger fuels so that they are not readily consumed. Based on estimates by research compiled by the Western Regional Air Partnership (WRAP 2018) this could reduce emissions by 43%.
- A backing fire could likely be utilized for significant portions of the burn area. WRAP (2018) estimates shows that this can reduce emissions by up to 45%.
- Aerial Ignitions could also be employed which WRAP (2018) estimates show can reduce emissions by 10%, due to the efficiency in the burn.

Mechanical treatments, thinning, and harvesting can reduce the amount of fuels available to be burned, which in turn can lead to lower emissions, when biomass is removed. Mechanical treatments, thinning, and harvesting can also lead to higher emissions, when those areas are subsequently burned after treatment due to the higher amount of fuel available after these types of treatments. Non-burning alternatives would achieve fuels treatments while mimicking prescribed burning efforts. The following methods could be used to achieve this goal for both alternatives:

- Cut material could be piled to allow for most complete consumption of particulate matter.
- Material could be hauled offsite and utilized for woody products to reduce the total volume of material burned.

**Climate and Climate Change**

The project area is located in Cibola and McKinley Counties, New Mexico. In the area covered by this analysis, precipitation seasonality varies due to the influence of the Arizona monsoon (a.k.a., the southwest monsoon). Areas affected by the southwest monsoon receive greater amounts of summer precipitation from moist air masses derived from the Gulf of Mexico and Gulf of California. Most of the annual precipitation comes in the form of rain originating from convective thunderstorms during the months of July through September. Higher elevations of the analysis area may also receive some cool season moisture in the form of snow. In addition to temporal variability of precipitation, spatial variability of precipitation is also a characteristic within the analysis area. Topography and storm type are two factors that control the spatial
variability of precipitation. At the local scale, precipitation tends to increase with elevation due to the effects of orographic lifting. Summer precipitation tends to have more spatial variability than winter frontal storms.

Data from the nearest weather station (Bluewater Ridge) show that the mean maximum January temperature is approximately 42 degrees F, the mean maximum July temperature is approximately 82 degrees F, and total annual precipitation is approximately 15 inches (RAWS USA Climate Archive). Precipitation patterns vary over the course of the year, with the largest peak in precipitation typically occurring in the summer along with the North American Monsoon. The project area is also characterized by a high degree of interannual variability of precipitation; a number of annual to multiyear droughts and wet periods are documented in the climate record (Rother & Grissino-Mayer 2014)

Droughts are common in New Mexico due to the overall low amount of annual precipitation and the previously described spatial and temporal variability of that precipitation. Regional precipitation patterns are regulated by global scale fluctuations in ocean surface temperatures. Over the long term, the Pacific Decadal Oscillation (PDO) tends to influence the precipitation regime in this part of New Mexico. Studies of 20th century precipitation patterns show that there have been three distinct precipitation regimes. The first was a relatively wet period from 1905 to 1941. Next was a period of dry from 1942 through 1977. This was followed by a period of wet from 1978 through 1998. The years since 1998 have marked a shift back to a dry period and suggest that we could be in for another 1-3 decades of drier than average conditions. This information has important implications on ecosystem management due to the influence of precipitation on disturbance regimes and the capacity of ecosystems to resist or recover from those disturbances.

Globally, the Earth’s surface temperature has increased by about 1.2 °F to 1.4°F since 1900, with most of the warming occurring in recent decades. Anthropogenic gases, particularly CO2, are enhancing the natural greenhouse effect, and likely contributing to an increase in these global average temperatures and related climate changes (EPA 2010). CO2 and other pollutants enter the atmosphere through the burning of the fossils fuels (oil, natural gas, and coal) that we depend on to meet our daily energy needs.

The potential effects of climate change on the environment would vary spatially. A study done by the Agency Technical Work Group (2005), in accordance with Executive Order 05-033, projects major environmental implications for the State of New Mexico from a changing climate. The agency has predicted some of the following environmental consequences in New Mexico if temperatures continue to rise at the current, “business-as-usual” rate:

- Average air temperature substantially warmer by 6°F–12°F
- Greater warming for winter, nighttime minimum temperatures, and higher elevations
- More episodes of extreme heat
- Fewer episodes of extreme cold
- Longer frost-free period
- Changes in average precipitation are uncertain, precipitation could increase or decrease
- More extreme events (torrential rain, severe droughts)
- Continuation of historical patterns of wet and dry cycles, including likely recurrence of multi-year drought
- Winter rain instead of snow at all but highest elevations

**Impact of Climate Change on Fire Frequency and Severity**

Climate change has played an extensive role in altering fire occurrence and severity by influencing the vegetative cover and available burnable fuel across the western landscape. In the past few years, fires have grown to record sizes, are burning earlier and longer, and are burning hotter and more intensely than they have in the past (Westerling et al. 2006). According to the National Interagency Fire Center, occurrence of uncharacteristic wildfires greatly increased over the last 20 years. Westerling et al. (2006) claim that a study of large (>1,000-acre) wildfires throughout the western United States from 1970 to 2003 saw a pronounced increase in frequency of fire since the mid-1980s. Fires from 1987 to 2003 were four times more frequent than the 1970–1986 average. After 1987 the length of the fire season was also observed to increase by 78 days.

Changes in relative humidity have been blamed for much of the changes as increased drying over much of the southwest has led to an increase in days with high fire danger (Brown et al. 2004). Advanced computer models are now making national scale simulations of ecosystems providing predictions of how fire regimes would change in the twentieth century (Neilson 2004). Predictions are that western grasslands would undergo increased expansion of woody vegetation such as piñon-juniper associated with increased precipitation occurring during typical wet seasons. Summer months are predicted to be hotter and longer, which would also contribute to increased fire risk (Neilson 2004). Under greater climatic extremes widely predicted throughout the U.S., fire behavior is expected to become more erratic, with longer flame lengths, increased torching and crowning, and more rapid runs and blow-ups associated with extremely dry conditions (Brown et al. 2004).

In a General Accounting Office report on climate change and federal lands, natural resource experts from numerous federal and state agencies and leading academic experts predict that climate change would cause forest fires to grow in size and severity (General Accounting Office 2007). This in turn would impact the safety of communities located not just in the WUIs but in even larger areas as a result of impaired air quality resulting from vast smoke production. The cost of fire suppression and the expense of fire preparedness is likely to increase in parallel with
increasingly larger fires. Experts warn that Southwest fire and fuels management strategies and policies need to address these risks now in order to prepare for these changing regimes, while also accommodating complex changing ecosystems subject to growing human stresses (Brown et al. 2004).

Since Southwestern forest environments and ecological processes are influenced by climate, we need to be prepared to learn and understand changes in climate and ecosystem processes and function, and to employ adaptive management strategies to accommodate such changes over time. Although fire suppression is still aggressively practiced, fire management techniques are continually adapting and improving. Due to scattered human developments and values throughout the WUI, suppression would always have to be a priority in those areas. However, combining prescribed fire with effective fuels management and restoration techniques would help re-establish natural fire regimes and reduce the potential for uncharacteristic wildfires associated with our changing climate.

### 3.3 Soil

**Affected Environment**

Soil conditions in the project area were assessed using the Cibola Terrestrial Ecological Unit Inventory (TEUI) (Strenger et al. 2007) and field observations. The survey consisted of a soil survey and site characteristics (climate, geology, slope, aspect, surface components, and vegetation) mapped using established protocols. TEU is used to provide the initial ecological base for developing ecosystem management plans at the Forest or project level because it provides information about what a site’s potential natural is, including vegetation, canopy cover, and surface components such as bare ground. This data includes plant composition for tree, shrubs, forbs, and graminoids (grass, sedge, etc.), including canopy for each type. While the TEU data generally describes a desired condition that is likely to occur on a site, variations are possible. Field observations taken in 2012-2017 were used to verify data at locations across the project area.

Interpretations have been developed using appropriate attributes from the TEU data to assist in analysis. Soil condition and erosion hazard rating are of particular use to determine project activities. Soil condition is used to assess where restoration activities are needed to improve soil conditions. Active rills and gullies, pedestaling, exposed roots, lack of top soil (A horizon) have been observed in the project area. Bare ground and lack of woody material and litter often contribute to less than satisfactory soil conditions in the project area.

Table 3.3.1 summarizes TEU map units in the vegetation treatment areas and their related soil condition and erosion hazard ratings of the most limiting component within the TEU unit. Figure 1 is a map of the TEU map units in the project area.
Table 3.3.1. TE Units in the Puerco Analysis Area

<table>
<thead>
<tr>
<th>Map Unit</th>
<th>Acres</th>
<th>Percent</th>
<th>Erosion</th>
<th>Condition</th>
<th>Potential Natural Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1,764</td>
<td>2.18</td>
<td>Moderate</td>
<td>Impaired</td>
<td>Shrub Meadow – rubber rabbitbrush</td>
</tr>
<tr>
<td>2</td>
<td>22</td>
<td>0.03</td>
<td>Moderate</td>
<td>Impaired</td>
<td>Shrub Meadow – rubber rabbitbrush</td>
</tr>
<tr>
<td>10</td>
<td>807</td>
<td>1.00</td>
<td>Severe</td>
<td>Unsatisfactory</td>
<td>Shrub Meadow - winterfat</td>
</tr>
<tr>
<td>11</td>
<td>2,109</td>
<td>2.60</td>
<td>Moderate</td>
<td>Impaired</td>
<td>Shrub Meadow - sage</td>
</tr>
<tr>
<td>31</td>
<td>3,869</td>
<td>4.78</td>
<td>Moderate</td>
<td>Impaired</td>
<td>Shrub Meadow – rubber rabbitbrush and snakeweed</td>
</tr>
<tr>
<td>33</td>
<td>2,548</td>
<td>3.15</td>
<td>Slight</td>
<td>Impaired</td>
<td>Ponderosa pine 25% Oak 15% Juniper 6%</td>
</tr>
<tr>
<td>153</td>
<td>5,586</td>
<td>6.90</td>
<td>Slight</td>
<td>Impaired</td>
<td>Ponderosa pine 25% PJ 25%</td>
</tr>
<tr>
<td>154</td>
<td>7,056</td>
<td>8.71</td>
<td>Moderate</td>
<td>Impaired</td>
<td>Ponderosa pine 15% PJ 17%</td>
</tr>
<tr>
<td>155</td>
<td>845</td>
<td>1.04</td>
<td>Severe</td>
<td>Unsatisfactory</td>
<td>Ponderosa pine 15-30% Oak 5% Juniper 6%</td>
</tr>
<tr>
<td>156</td>
<td>3,703</td>
<td>4.57</td>
<td>Slight</td>
<td>Impaired</td>
<td>Ponderosa pine 25% Oak 2% Juniper 3%</td>
</tr>
<tr>
<td>157</td>
<td>6,888</td>
<td>8.51</td>
<td>Slight</td>
<td>Impaired</td>
<td>Ponderosa pine 15% Juniper 2% Oak - trace</td>
</tr>
<tr>
<td>158</td>
<td>2,940</td>
<td>3.63</td>
<td>Moderate</td>
<td>Impaired</td>
<td>Ponderosa pine 20% Juniper 2% Oak - trace</td>
</tr>
<tr>
<td>159</td>
<td>612</td>
<td>0.76</td>
<td>Moderate</td>
<td>Impaired</td>
<td>Ponderosa pine 20% Juniper 2% Oak – 5%</td>
</tr>
<tr>
<td>166</td>
<td>8</td>
<td>0.01</td>
<td>Severe</td>
<td>Satisfactory</td>
<td>Ponderosa pine 10% Juniper 8%</td>
</tr>
<tr>
<td>184</td>
<td>542</td>
<td>0.67</td>
<td>Severe</td>
<td>Satisfactory</td>
<td>Pinon 10% Ponderosa pine 2% Douglas fir 5% Juniper 2%</td>
</tr>
<tr>
<td>185</td>
<td>10,187</td>
<td>12.58</td>
<td>Severe</td>
<td>Unsatisfactory</td>
<td>Ponderosa pine 10% Juniper 5-15%</td>
</tr>
<tr>
<td>189</td>
<td>8,855</td>
<td>10.94</td>
<td>Slight</td>
<td>Impaired</td>
<td>Ponderosa pine 25% Juniper 1% Oak - trace</td>
</tr>
<tr>
<td>190</td>
<td>3,028</td>
<td>3.74</td>
<td>Slight</td>
<td>Impaired</td>
<td>Ponderosa pine 40% Juniper 2% Oak – trace</td>
</tr>
<tr>
<td>Map Unit</td>
<td>Acres</td>
<td>Percent</td>
<td>Erosion</td>
<td>Condition</td>
<td>Potential Natural Vegetation</td>
</tr>
<tr>
<td>----------</td>
<td>-------</td>
<td>---------</td>
<td>---------</td>
<td>-----------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>191</td>
<td>68</td>
<td>0.08</td>
<td>Severe</td>
<td>Satisfactory</td>
<td>Douglas fir 20%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ponderosa pine 15%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oak - trace</td>
</tr>
<tr>
<td>192</td>
<td>50</td>
<td>0.06</td>
<td>Severe</td>
<td>Satisfactory</td>
<td>Douglas fir 55%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ponderosa pine 5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Juniper 1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oak - trace</td>
</tr>
<tr>
<td>193</td>
<td>1,340</td>
<td>1.65</td>
<td>Slight</td>
<td>Impaired</td>
<td>Ponderosa pine 10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pinon 5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Juniper 5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oak - trace</td>
</tr>
<tr>
<td>194</td>
<td>1,048</td>
<td>1.29</td>
<td>Moderate</td>
<td>Impaired</td>
<td>Ponderosa pine 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pinon 8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Juniper 23%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oak - trace</td>
</tr>
<tr>
<td>197</td>
<td>136</td>
<td>0.17</td>
<td>Moderate</td>
<td>Satisfactory</td>
<td>Douglas fir 65%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ponderosa pine 5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Juniper 1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oak – trace</td>
</tr>
<tr>
<td>198</td>
<td>7,929</td>
<td>9.79</td>
<td>Severe</td>
<td>Unsatisfactory</td>
<td>Pinon 5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Juniper 15%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fragrant ash</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oak</td>
</tr>
<tr>
<td>255</td>
<td>1,097</td>
<td>1.36</td>
<td>Severe</td>
<td>Unsatisfactory</td>
<td>Douglas fir 15%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ponderosa pine 5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Juniper 2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oak - trace</td>
</tr>
<tr>
<td>274</td>
<td>1,636</td>
<td>2.02</td>
<td>Severe</td>
<td>Unsatisfactory</td>
<td>Ponderosa pine 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pinon 3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Juniper 6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oak - trace</td>
</tr>
<tr>
<td>275</td>
<td>4,452</td>
<td>5.50</td>
<td>Moderate</td>
<td>Impaired</td>
<td>Ponderosa pine 20%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pinon 5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Juniper 5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oak - trace</td>
</tr>
<tr>
<td>301</td>
<td>1,098</td>
<td>1.36</td>
<td>Slight</td>
<td>Impaired</td>
<td>Ponderosa pine 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Juniper – trace</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oak - trace</td>
</tr>
<tr>
<td>311</td>
<td>96</td>
<td>0.12</td>
<td>Slight</td>
<td>Impaired</td>
<td>Ponderosa pine 15%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Juniper 2%</td>
</tr>
<tr>
<td>312</td>
<td>657</td>
<td>0.81</td>
<td>Moderate</td>
<td>Impaired</td>
<td>Ponderosa pine 30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Juniper 1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oak - trace</td>
</tr>
</tbody>
</table>

Soil Condition ratings are tied to a given soil type found within the Terrestrial Ecological Units (Strenger, et. al. 2007)). Table 1 lists the soil condition within the project area as indicated.
through the TEU inventory. Figure 2 is a map of soil condition classes within the project area. Soils were classified into three condition groups; Satisfactory, Impaired, and Unsatisfactory.

- **Satisfactory** – Soil function is being maintained and is operating as expected.
- **Impaired** – Ability of the soil to function properly has been limited or it has less resistance to the forces of degradation. Changes in management or mitigation measures may be appropriate.
- **Unsatisfactory** – Loss or degradation of vital soil functions have occurred resulting in the inability to maintain resource values, sustain outputs and recover from impacts. Soils rated in this category are candidates for improved management or active restoration designed to recover soil functions.

Soil condition is an evaluation of soil quality based on the interrelationship between soil hydrology, soil stability, and nutrient cycling. Soil hydrology is assessed using compaction. Compaction occurs on and adjacent to roads, trails, and recreation areas in the project area. Compaction reduces the ability of the soil to absorb, store, and transmit water. Soil stability is assessed through the erosion hazard rating and existing conditions on the ground. Nutrient cycling is assessed through levels of woody material which exist since wood is an important factor in maintaining soil organic matter. Soil condition integrates these three factors categories to come up with a soil condition rating. Soil condition ratings for this project area were determined using guidelines found in the Technical Guidance document (USDA 2013).

Table 3.3.2 lists the soil condition ratings in the project area and treatment area. Figure 3.3.1 shows locations of soil condition categories. Impaired and unsatisfactory soil conditions occur across most of the project area.

<table>
<thead>
<tr>
<th>Soil condition</th>
<th>% of Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfactory</td>
<td>1.1</td>
</tr>
<tr>
<td>Impaired</td>
<td>68.8</td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td>30.1</td>
</tr>
</tbody>
</table>

Where soils are currently impaired or unsatisfactory, bare soil resulting in high erosion rates and lack of woody material on the ground are the main causes. High erosion rates are related to the lack of ground cover, litter, and woody material in addition to compacted surfaces related to roads and trails. In the pinon-juniper forest type, the loss of biotic crusts is widespread and bare soil is a higher percentage of the surface than is natural. Where wooden material is lacking, historic use and past management practices are the main causes. In particular, large woody material greater than 16 inches in diameter is lacking in many areas, including wood that is in an advanced state of decay. This type of wood provides nutrients to the soil and habitat for soil biota.
The erosion hazard interpretation determined from the TEU data provides important information that helps determine the treatment methods that consider soil stability. Erosion hazard is based on the potential for soil loss from complete removal of vegetation and litter (USDA 1986). A severe rating indicates areas where mitigations are unlikely to prevent losses in soil productivity. Soils rated as moderate must be mitigated to prevent losses in soil productivity. Soils rated with a slight rating usually stabilize under natural conditions once the disturbance is removed.

**Environmental Consequences**

The analysis area for soil condition is the analysis area boundary. This is because it is the soils within this area have the potential to be directly and indirectly affected by the proposed activities. The measures for soil condition are acres of disturbance from vegetation management activities, and the heat per unit area and transition ratio, as modeled at the surface, listed in Table 3.3.3. The heat per unit area at the surface provides information about the heat the soil would be subject to during a wildfire under the modeled scenarios of the alternatives. The transition ratio is an indicator of the susceptibility for crown fire. Crown fire is associated with severe wildfires that are very hard to control with high intensity. Severe wildfires result in greater amounts of damaged soil. The amount of woody material on the ground is a useful measure since lack of woody material has been observed and measured across the project area. Soil disturbance is an indicator where the soil is disturbed, resulting in soil loss and erosion. Soil disturbance could
occur from vegetation management activities, restoration activities, range projects, and road work. Range projects and road work are occurring within areas where soil disturbance is already occurring, so these effects will not be carried through the analysis. The time period for soil disturbance related to vegetative treatments, restoring unauthorized roads, and restoration projects is 10 years since this time period allows time for a trend related to soil changes to be observed.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Direct and Indirect Effects</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation Treatments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand thinning</td>
<td>Compaction</td>
<td>Acres disturbed by motorized vehicles</td>
</tr>
<tr>
<td>Mastication</td>
<td>Erosion</td>
<td>Acres of slash piles</td>
</tr>
<tr>
<td>Mechanical thinning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removal of wood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slash piles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorized equipment use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woody material added</td>
<td>Improve soil condition</td>
<td>Acres with woody material increased</td>
</tr>
<tr>
<td></td>
<td>Improve ground cover</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improve nutrient status</td>
<td></td>
</tr>
<tr>
<td>Road Projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decommission unauthorized</td>
<td>Close to motorized access</td>
<td>Acres of decommissioned roads</td>
</tr>
<tr>
<td></td>
<td>Stabilize</td>
<td></td>
</tr>
<tr>
<td>Fire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescribed fire</td>
<td>Soil heating</td>
<td>Modeled heat per unit area</td>
</tr>
<tr>
<td>Pile burning</td>
<td>Loss of surface litter, vegetation</td>
<td>Transition ratio</td>
</tr>
<tr>
<td></td>
<td>Improve fire condition</td>
<td></td>
</tr>
<tr>
<td>Water resource improvements</td>
<td>Improve ground cover</td>
<td>Acres of water resource improvements</td>
</tr>
<tr>
<td>Springs, stream, riparian restoration</td>
<td>Improve nutrient status</td>
<td></td>
</tr>
<tr>
<td>Headcut treatments</td>
<td>Decrease compaction</td>
<td></td>
</tr>
<tr>
<td>Fence riparian areas</td>
<td>Reduce erosion</td>
<td></td>
</tr>
</tbody>
</table>

Treatment types for vegetative treatments take into consideration slope, distance to road, erosion hazard rating, soil condition, and type of vegetation. These factors were used to determine cutting method, removal of wood (if any), slash disposal, and fire options. In this way, mitigation measure are part of the project design to prevent effects to soil resources.

**Alternative A – No Action**

Under the No Action Alternative none of the proposed activities would occur. There would be no direct effects on soil resources, such as ground disturbance or loss of tree cover. Locations where erosion is occurring such as roads and trails, both designated and user-created, will continue to contribute to soil loss. Areas where soil condition is less than satisfactory due to lack of woody material will remain in this condition. Recruitment of large woody material is likely to occur as trees die. Where riparian areas and springs are functioning at less than proper functioning
condition, these conditions would continue to occur without the proposed restoration activities working to improve these features.

The greatest effect of no action is the effects of uncharacteristic wildfire, an indirect effect. As discussed in the Fuels Report, under this alternative, the forest ecosystem would remain susceptible to the adverse effects of uncharacteristic wildfires without improved control options as provided by the action alternatives. Wildfires would be harder to control and burn hotter as indicated by the heat per unit area at the surface and transition ratio. Currently, the modeled surface heating in the high weather conditions varies from 837 Btu/ft² in the ponderosa pine type, and 562 Btu/ft² in the PJ. These heating levels could lead to temperatures well above the values where organic matter is destroyed, amino acids are lost, and nitrogen is volatilized (Hungerford et al 1990). In both vegetation types, there is a susceptibility to crown fire as indicated by the modeled transition ratios of 6.29 in the PJ type and 1.31 in the ponderosa pine type. Potential fire related effects include soil hydrophobicity, altered infiltration, increased runoff, sedimentation and erosion. Nutrient cycling is also changed by heating of both organic and inorganic compounds. The effect would be dependent on fire behavior, but soils are likely to be heated changing the physical and biotic characteristics of the soil. With high burn severity, soils may also become water repellent which increases runoff during storm events because water is not able to infiltrate.

There would be no direct effects on soil resources, such as ground disturbance or loss of tree cover. Locations where erosion is occurring such as roads and trails, both designated and user-created, will continue to contribute to soil loss. Areas where soil condition is less than satisfactory due to lack of woody material will remain in this condition. However, natural recruitment of woody material is likely to occur as trees die, thereby contributing to down woody material and improved ground cover.

**Alternative B**

**Vegetation Treatments**

Under this alternative, the activities of removing trees, adding woody material to the ground, prescribed fire including the potential for pile burning and driving on soils to remove wood products, could lead to direct effects to soil resources. These direct effects include compaction, bare ground, and loss of soil productivity. Creating the proposed openings could result in soil disturbance from mechanized equipment, removal of trees, mastication, and prescribed fire. Removing trees and soil disturbance exposes soil to precipitation events leading to erosion and sediment transport. In addition, there are changes in microclimate site occur when canopy and ground cover are disturbed or removed.

Soil disturbance would be reduced or prevented in some areas through design features and best management practices (BMPs) as described in Chapter 2 and Appendix D. The development of
treatment types utilized information about soil conditions to determine proposed activities as shown in Table 2.2.1 (refer to table in chapter 2).

By considering soil characteristics, project design features protect soil productivity by avoiding and reducing impacts to sensitive soils and improving soil characteristics. Where soil condition is unsatisfactory, soil disturbing activities are not proposed, except for prescribed fire. Woody material may be added in these areas if it is lacking through hand treatment methods. Woody material in all size and decay classes improves soil condition where lacking. This wood provides protection to soil during rainfall, provides nutrients and microclimate, supporting soil processes. Where slopes are greater than 40%, motorized vehicles would not be allowed. Field observations reveal that motorized personal fuelwood collecting disturbs a large percentage of the area. As a result, personal fuelwood collecting is proposed for areas where soil condition is satisfactory and erosion hazard is slight to moderate. Masticated material is generally left in the openings and may be burned in later years. The depth of masticated material would not exceed 4 inches and would be discontinuous. Down woody material would be retained and/or appropriate levels would be restored after proposed activities to ensure appropriate levels to maintain soil quality are present. In areas with impaired or unsatisfactory soils, woody material will be left to improve soils since woody material on the ground is lacking in most areas. These activities would work to improve soils on 62,331 acres.

Driving on soils and the use and maintenance of roads related to the proposed action would cause compaction and increased sediment yields in these areas. Compaction quickly occurs during the first few passes across soil, and in the P-J zone cryptogamic crusts are destroyed. Existing roads are already compacted, however when masticators or other equipment is used off road to remove trees, compaction occurs quickly. Motorized vehicles also compact soils. This effect could occur in treatment types 1, 2 and 3 (see Table 2.2.3. Proposed Vegetation Treatments and Treatment Types, page 42) from access by motorized vehicles, including masticators. As a result, about 15% of these areas could have visible tire tracks and compacted surfaces (Cline, et al 2010). A similar assumption is made for personal fuelwood use collection since these areas are designed to be close to existing roads, thereby reducing the need for off road motorized access.

Therefore, for the purposes of analysis, it is assumed that the 15% of treatment types 1, 2, and 3 could be subject to ground disturbance when mastication or mechanized fellers are used. As a result, up to 6,949 acres could have impacts from motorized uses on them, including large equipment such as masticators, mechanized fellers, pickups, or ATVs. These area will be restored after activities where soil does not readily recover on its own. Restoration activities could include adding wood, seeding, mulching, erosion control, and other practices that stabilize and restore soil productivity.

Research suggests that thinning can increase nitrogen transformations into available nitrogen (Kaye and Hart 1998) but that repeated prescribed burning for maintenance may result in
increased nitrogen mobility (Wright and Hart 1997), leading to nitrogen losses from soils. Results from research on mastication and soil suggest that masticated material can reduce soil temperatures and increase soil moisture (Owen et al 2009). Over time, mastication may negatively affect nitrogen dynamics (Gottfried and Overby 2011). The same study showed that pile burning increases soil temperatures, reduces soil moisture, changes soil structure, and causes nitrogen to be leached away. Because of these effects, areas proposed for mastication will have limits on the amount and spatial distribution of masticated material. Limits on piles and specifications for their construction are also part of the mitigations to protect soil.

Pile burning would only be used when wood loads are too great to be treated any other way. Piles are proposed as a possible treatment method for slash in treatment types 1, 2, 3, and 5 (see Table 2.2.3., page 42) except where soils are in unsatisfactory condition or have severe erosion hazard potential. Piles would not exceed 10 feet by 10 feet and up to 30 piles per acre. Additional mitigations are listed in the BMP appendix. This could result in 327 acres of soils impacted below these piles. If pile burning occurs several best management practices would be used to mitigate the effects to soil such as burning piles in the winter as described in the BMP appendix. Despite mitigations, management actions are like to be needed to restore the soil below piles. These actions include seeding, mulching, and erosion control.

The indirect effect of improving controllability of uncharacteristic wildfire behavior as a result of the proposed vegetative treatment is a benefit to soil resources. Thinning activities are a preferable alternative to wildfire, resulting in less impact to watersheds (Ffolliott, et al 2011 and Dore et al 2010). The fuels report lists the results of fire behavior model, BEHAVE Plus, for this alternative. This model shows that when weather conditions are severe the model results for heat per unit area at the surface are reduced in the ponderosa pine and piñon-juniper types. In addition, the proposed treatment reduce the transition ratio to less than 1, meaning the risk of crown fire become unlikely.

**Road and Unauthorized Route Treatments**

The proposal includes up to 200 miles of closing and restoring unauthorized routes within the project area. Through these actions, soil compaction and erosion would be decreased. Assuming an influence area of 21 feet, this would result in 509 acres of improved soil condition.

**Watershed Improvements**

Watershed improvements of various types are proposed which could result in improvements to soil condition. These include spring restoration, riparian fencing, gully treatments, and road drainage improvements. These activities would allow for soil functions to improve, including reduced compaction, increased vegetation, and less erosion. Riparian and water resource feature restoration activities would implement projects identified in Figure 3.3.2 In addition, other area within the project boundary could be restored as identified on the ground.
These activities include instream structures such as porous rock dams, the use of rock and wood for stabilization of headcuts and other eroding areas, plug and pond methods to direct runoff and stabilize channels and other appropriate methods. These additional activities would disturb soil in the short term across several locations and different timing. Stabilization of these soils would occur quickly as they are located in areas with sources of moisture for revegetation. Additional mitigations would be used to further ensure stabilization such as filter cloth, water bars, and other measures. Overall, watershed improvements are proposed on 250 acres of riparian area and 121 acres of eroding areas, head cuts, and other areas needing stabilization and restoration activities. As a result, 371 acres of soil would be improved.
Table 3.3.4. Summary of Measures of Project Effects for Soil Resources

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Potential Acres of soil disturbance</th>
<th>Potential Acres of soil improvement</th>
<th>Transition Ratio - risk of crown fire likely if &gt;1</th>
<th>Heat per Unit Area - Btu</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Motorized Burn piles</td>
<td>Water resource improvements</td>
<td>Road rehabilitation2</td>
<td>Vegetation treatments</td>
</tr>
<tr>
<td>Alt. A</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Alt. B</td>
<td>6,949</td>
<td>327</td>
<td>371</td>
<td>509</td>
</tr>
</tbody>
</table>

1 Based on high weather conditions as indicated in the Fuels report
2 Based on an influence width of 21 feet (WIT 2017)

Summary of Soil Effects

Overall the effect of the proposed action on soil resources would be to improve soil function on 63,221 acres through increasing ground cover, restoring unauthorized routes, and implementing water resource improvements. Soil functions would be decreased on 7,276 acres by compaction, loss of vegetation, and erosion. These areas would experience recovery over time. In addition, monitoring would occur to identify areas where additional mitigations are needed to restore soil function. This is especially true for areas under burn piles.

Cumulative Effects

Cumulative effects generally refer to impacts that are additive or interactive (synergistic) in nature and result from multiple activities over time, including the project being assessed. The US Council on Environmental Quality defines cumulative effects as "the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions."

Actions occurring within the Cibola National Forest that could potentially combine with the effects of the proposed action and result in environmental impacts include vegetation treatment, thinning, prescribed fires, road management, recreation, and wildlife habitat improvements. Road maintenance has a beneficial effect on watershed and soil condition as it improves road drainage and reduces erosion and sedimentation in the long-term. Increased recreation activity is expected due to the increase in trail miles for mountain biking, horses, and hiking. New development is ongoing on private land within the project area as well.

The cumulative effect of interest for soils is soil condition. The analysis area is the project area within a ten year timeframe. This is because ten years is long enough for effects to soil from the proposed activities to become apparent. The project area was selected since this project is designed to improve landscape condition. Project activities are expected to improve soil condition on over 63,211 acres soils in the treatment area and decrease condition on 7,276 acres. This makes an important gain in this area on improving soil condition for this landscape.
The cumulative effect of interest for water resources is watershed condition as described in the WCF (USDA 2011). The cumulative effects boundaries for this project are the eleven 12 digit HUCs, sub-watersheds, listed in Table 3.4.1. Beyond this scale, any effects of the proposed action will become indistinguishable from background levels. Cumulative effects will be bound temporally 10 years in the past to 10 year in the future. The no action alternative has the most potential for changing watershed condition, due to the susceptibility for large wildfires. A large wildfire has the potential to change watershed condition to ‘poor’ on any of the 6th code watersheds in the project area. Implementing one of the action alternatives could provide control opportunities, thereby reducing the size and severity of potential wildfires. However, due to the small amount of treatment proposed and localized control opportunities that would be created, the proposed action would not reduce this risk enough to make a change in the potential for changing the overall watershed condition class.

### 3.4 Water Resources

**Affected Environment**

A systematic method of delineating watershed boundaries and giving them a number code was developed by the USGS (Seaber, Kapinos, & Knapp, 1987). The number code is called the hydrologic unit code (HUC). Each two digits refer to successively smaller watershed delineations within the previous two digits of the HUC. The analysis area is situated in eleven 12 digit watersheds, called Sub-Watersheds. Table 3.4.1 lists the 12 digit Sub-Watersheds where the analysis area is located, and percent of analysis area within each watershed.

<table>
<thead>
<tr>
<th>HUC</th>
<th>Sub-Watershed</th>
<th>Acres of Analysis Area in Sub-Watershed</th>
<th>Percent</th>
<th>Watershed condition Rating (FS lands only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150200040103</td>
<td>Cebolla Creek</td>
<td>8,522</td>
<td>24.0</td>
<td>Functioning at Risk</td>
</tr>
<tr>
<td>150200060102</td>
<td>Fourmile Canyon-South Fork Puerco River</td>
<td>7,344</td>
<td>23.1</td>
<td>Functioning Properly</td>
</tr>
<tr>
<td>150200060401</td>
<td>Headwaters Bread Springs Wash</td>
<td>949</td>
<td>4.4</td>
<td>Not Rated</td>
</tr>
<tr>
<td>130202070202</td>
<td>Headwaters Cottonwood Creek</td>
<td>23,081</td>
<td>64.7</td>
<td>Functioning at Risk</td>
</tr>
<tr>
<td>150200040203</td>
<td>Middle Rio Nutria</td>
<td>10,341</td>
<td>26.0</td>
<td>Functioning at Risk</td>
</tr>
<tr>
<td>150200060103</td>
<td>Milk Ranch Canyon</td>
<td>12,380</td>
<td>65.1</td>
<td>Functioning at Risk</td>
</tr>
<tr>
<td>150200060104</td>
<td>Milk Ranch Canyon-South Fork Puerco River</td>
<td>13,871</td>
<td>39.7</td>
<td>Functioning Properly</td>
</tr>
<tr>
<td>150200060501</td>
<td>Skeets Arroyo-Whitewater Arroyo</td>
<td>2,370</td>
<td>7.2</td>
<td>Functioning Properly</td>
</tr>
<tr>
<td>150200060101</td>
<td>Smith Canyon-South Fork Puerco River</td>
<td>16,272</td>
<td>43.1</td>
<td>Functioning Properly</td>
</tr>
<tr>
<td>150200040202</td>
<td>Stinking Spring</td>
<td>3,426</td>
<td>22.0</td>
<td>Functioning Properly</td>
</tr>
</tbody>
</table>
Watershed condition was assessed at the 12 digit Sub-Watershed scale using the Watershed Condition Framework process (USDA 2011). The Sub-Watershed, Headwaters Bread Springs Wash, was not rated since less than 10% of their area is located on Cibola National Forest system lands. Watershed condition is the state of a watershed based upon physical and biological characteristics affecting hydrologic and soil functions. Twelve indicators were used to assess watershed condition. Fire condition and roads and trail indicators are rated as poor for all watersheds. Aquatic habitat is rated as poor in the Upper and Middle Rio Nutria watersheds. Both of these watersheds support the Zuni Bluehead Sucker, a recently listed fish. Soil condition rated from fair to poor in all of the rated watersheds. The indicators, forest cover, forest health, terrestrial invasive species, and water quality are rated as good for the rated watersheds. These indicators help to show which components of the watersheds could use restoration.

Water resource features include the streams, springs, and riparian areas that occur within project area. Stream and spring information is from the National Hydrography Data (NHD) maintained by USGS. The riparian data is from the RMAP (Regional Riparian Mapping Project) data layer created by the Forest Service. The GIS datasets are still being verified and updated as new information becomes available. Figure 3.4.1 shows the locations of the water resource features within the project watersheds. Wetlands in project area include the small perennial portions of streams, intermittent streams, springs, and riparian areas. There are 335.3 miles of mapped ephemeral streams and 45.0 miles of mapped intermittent streams within the project area. There 259 acres of mapped riparian and 19 springs in the project area.
Streams
There are three types of stream based on the persistence of stream flow. Perennial stream flow year round except during periods of exceptional drought. There are currently no mapped perennial streams within the project area. There are areas of perennial waters, associated with springs and an area where an uncapped artesian well flows freely into a channel on the east side of the project area. The majority of the streams are ephemeral which means they only flow in direct response to snow melt or rainfall. Some streams are intermittent which means they flow part of the time beyond snow melt or rainfall events but not all years. Intermittent streams and perennial streams support riparian areas by storing water beyond since the presence of water supports riparian vegetation. Ephemeral and intermittent streams have important values even though they do not flow continuously (Levick et al 2007).
Springs

There are 19 springs identified for inventory within the project area, listed in Table 3.4.2. Of these springs, 17 of these have been inventoried. Four of the springs were wet when visited. Isotope data from these springs has identified snow pack as the dominant recharge source for water flowing from these springs. Many of these springs have infrastructure associated with developments. Several of the developments are no longer functional and the springs are dry. Data from inventoried springs with water has shown that snow pack is an important recharge source for springs in the Zuni Mountains. Agua Remora, the spring which supports the Zuni Bluehead Sucker is monitored continuously for water quality and water level. Projects are proposed to address improving the condition of these sites.

Table 3.4.2. Springs in the Puerco Project Area

<table>
<thead>
<tr>
<th>Spring Name</th>
<th>Inventory</th>
<th>Visited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brennan Spring</td>
<td>Dry</td>
<td>2015</td>
</tr>
<tr>
<td>Grasshopper Spring</td>
<td>Wet</td>
<td>2015</td>
</tr>
<tr>
<td>Gravel Pit Spring</td>
<td>Dry</td>
<td>2015</td>
</tr>
<tr>
<td>Little Bear Spring</td>
<td>Dry</td>
<td>2012</td>
</tr>
<tr>
<td>Milk Ranch Spring</td>
<td>Dry</td>
<td>2015</td>
</tr>
<tr>
<td>Reseed Seep</td>
<td>Dry</td>
<td>2012</td>
</tr>
<tr>
<td>Santa Fe Spring</td>
<td>Dry</td>
<td>2015</td>
</tr>
<tr>
<td>Sheep Lab Spring</td>
<td>Dry</td>
<td>2015</td>
</tr>
<tr>
<td>Shuster Spring</td>
<td>Dry</td>
<td>2015</td>
</tr>
<tr>
<td>Sixmile Spring</td>
<td>Wet</td>
<td>2012</td>
</tr>
<tr>
<td>Stinking Spring</td>
<td>Dry</td>
<td>2015</td>
</tr>
<tr>
<td>Tampico Spring</td>
<td>Dry</td>
<td>2015</td>
</tr>
<tr>
<td>Turkey Springs</td>
<td>Dry</td>
<td>2015</td>
</tr>
<tr>
<td>166N1</td>
<td>Dry</td>
<td>2012</td>
</tr>
<tr>
<td>166N2</td>
<td>Wet</td>
<td>2012</td>
</tr>
<tr>
<td>Agua Remora</td>
<td>Wet</td>
<td>2015</td>
</tr>
<tr>
<td>Rim Site (Unnamed)</td>
<td>Dry</td>
<td>2012</td>
</tr>
<tr>
<td>Unnamed Spring</td>
<td>Not Visited</td>
<td>n/a</td>
</tr>
<tr>
<td>Unnamed Spring</td>
<td>Not Visited</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Water Quality

A review of the 2016-2018 State of New Mexico’s Clean Water Act §303(d)/§305(b) Integrated Report (NMED 2016) indicates there is one 12 digit sub-watersheds in the project area with a stream listed as impaired. Agua Medio-Bluewater Creek (HUC=130202070201) is the headwater watershed of Bluewater Creek. Bluewater Creek is listed as not supporting the designated use of a coldwater fishery due to temperature. Probable sources were listed as forest roads, silviculture harvesting, loss of riparian habitat, and streambank modification/destabilization.
There is water quality data available in the area of Agua Remora, a spring where the Zuni Bluehead Sucker fish survives. This data shows that spring flows generally supports water quality of sufficient quality to support the fish, but temperatures and dissolved oxygen can vary to levels which result in at risk conditions for the fish during the summer months. One monitored pool which does not receive spring flows does not support the fish due to low oxygen levels. In addition, these pools are at risk for drying up during droughts. In addition, the dependence of these spring flows on snow packs for recharge places them at risk as snow packs diminish in the Zuni Mountains.

There is no water quality data available for the ephemeral and intermittent streams in project area.

Water quality criteria for ephemeral and intermittent waters in New Mexico are linked to the designated uses of livestock watering, wildlife habitat, aquatic life and secondary contact. Criteria for secondary contact in these waters are limited to an E.coli bacteria standard. It is unknown whether or not this standard is met in ephemeral and intermittent water in the analysis area. It is likely that on Forest Service lands, this criterion is met due to limited sources of bacteria in the watershed since there are no livestock grazing or septic systems. Recreation use in areas without sanitary facilities does have the potential to increase these levels locally and for short periods of time. However, most recreation areas in the Puerco project area have sanitary facilities and camping activities are dispersed and water flow is intermittent to ephemeral, therefore it is unlikely there is a measurable effect from these uses.

**Riparian**

There are 259 acres of mapped riparian areas within the Puerco project area. Most of this riparian is herbaceous in wet meadows. Soil condition in many of these meadow areas is impaired or unsatisfactory due to lack of ground cover and bare ground. No formal proper functioning condition assessments have been made in the project area.

**Environmental Consequences**

The analysis area is the water resource features in the project area. This includes the springs, stream channels, riparian areas, and project watersheds within the project area. Measures to assess effects to water resources were developed for each topic. The measures for water resources are listed in Table 3.4.3. A discussion of these measures is listed below.

The water resource features within the project area include stream channels, springs, and riparian areas. The effects to water resource features is assessed using the measures shown in Table 3.4.3. While prescribed mitigations as described in the BMP appendix will protect these features, the effectiveness of mitigations and project design features are not 100%. As a result, some effects are likely to occur in these areas within the analysis timeframe of 10 years. The timeframe for analysis is ten years since effects could be observable within this timeframe.
The analysis area for water quality is the surface waters within the project area. This includes the seasonal waters in the intermittent and ephemeral streams. The water quality components most likely to be affected by the proposed activities are sediment, and dissolved nutrients such as nitrogen. Ecosystems accumulate and cycle large quantities of nutrients. Fire and loss of vegetation can disrupt this cycle and cause nutrient leaching, volatilization, and transformation (Elliot et al 2010). Wildfire release more nitrogen into surfaces waters than prescribed fire (Stednick 2000). If vegetation is quickly reestablished, nutrient exports are short-lived and usually do not represent a threat to water quality (Elliot et al 2010). Because of this, nitrogen effects are not carried through the analysis.

Sediment is discussed in each alternative since sediment would be mobilized during proposed activities despite mitigations. Increased site disturbance will result in increased soil erosion and subsequent sediment production (Elliot et al 2010) to a stream channel or other water resource feature. Stream channels adjust to increased sediment loads. Fine sediment in channel bottoms, can cause changes to micro-invertebrates and changes in stream type. Roads and motor vehicle use are the source of much of the sediment related to harvest activities (Elliot et al 2010). Increased traffic on roads related to tree removal activities leads to increased erosion and sediment from these roads and adjacent areas.

The prescribed management zone for these features (perennial waters, springs, riparian areas) is at least 300 feet, so where implemented properly, this prescribed BMP combined with other operational BMPs as described in the appendix will protect these features. BMP monitoring across the Cibola National Forest has shown that where implemented, BMPs such as these are effective in protecting water quality and healthy stream conditions. Three hundred feet was chosen since several sources including modeling based on Forest specific parameters (WEPP) indicate that 100m (303 feet) is generally effective in controlling sediment (Belt et al 1992). Therefore, identifying those activities which are within 300 feet of riparian areas, streams, and springs is a way to identify areas which are could contribute to sediment and other impacts to these features. However, because mitigation effectiveness is not 100%, the measures for sediment are acres treated with mechanized and/or motorized methods and miles of roads and/or routes proposed for decommissioning within 300 feet of water resource features.

Removing vegetation has the potential to increase water yields, change the timing of flow, and increase floods within a watershed (Elliot et al 2010). However, negligible water yield potential for piñon-juniper vegetation type has been reported (Zou, et al 2010). In the ponderosa pine vegetation type, there is the potential for some response, mostly from the redistribution of snow cover on north facing slopes (Baker, 1986). However, when precipitation is low as in the project area, water yield increases are less likely to occur, even in the ponderosa pine zone (Hibbert 1983, Bosch and Hewlett 1982, Brown et al 2005, and Zou et al 2010). Hibbert (1983) found that when precipitation is less than 18 inches and evapotranspiration exceeds precipitation, it is timber harvest is unlikely to reduce transpiration and observe measureable increases in water.
yield from vegetation treatments. This effect is not carried through the analysis because changes in water quantity are not likely to be observable given the scale of treatment across 12 sub-watersheds, rate of treatment activities (3000 acres/year), and amount of basal area removed across each sub-watershed.

**Alternative A – No Action**

There would be no direct effects on water resources or watersheds from the No Action Alternative. This is because there would be no activities occurring that would cause ground disturbance to water resource features or loss of vegetative cover. There would be indirect effects from the no action alternative, largely due to the continued risk of uncharacteristic wildfire and related effects. Restoration work would not occur as part of this proposal, so there would be no accelerated recovery of riparian areas or stream channels in the analysis area.

Riparian and other water features proposed for improvement through the proposed activities would not be implemented as part of this decision, should a no action alternative be selected. Because of this natural processes would slowly work to improve riparian condition without the benefit of accelerated recovery as a result of proposed riparian project. The condition of water resources features would remain as described in the affected environment section. This includes the riparian areas and intermittent and ephemeral channels in the project area. As described in the Fire/Fuels report, under this alternative, existing forest conditions could lead to uncharacteristic wildfire with susceptibility to crown fire and high surface heating across large portions of the project area, as evidenced from recent wildfires in the area. Wildfire removes vegetation and causes bare soil, leading increased erosion, sedimentation, and runoff (USDA Forest Service 2010). As a result, channels adjust, water quality changes, depending on the severity and extent of the fire.

If a wildfire were to occur within the project area it could have adverse effects on the riparian areas. A wildfire affects riparian areas both directly and indirectly. The direct effects consist mainly of consumption (removal) of the vegetation that intercepts precipitation, and the partial consumption of the underlying litter layer. The indirect affect to riparian areas it decreases watershed stability, and in steep erodible topography, debris flows are likely (USDA, 2005). However, depending on the severity, recovery of vegetation can be rapid within a couple years to pre-fire conditions in some environments; it is dependent on the combined disturbance of both the fire and the flooding. Should this happen most of these effects would decrease to undetectable levels within 10 years as revegetation occurs and water resources features such as channels and spring recover.

Water quality in the project area would remain much the same, with the continued susceptibility to uncharacteristic wildfire and sediment yield related to roads and trails. Measureable changes related to wildfire would increase sediment and flow for about five - ten years, then return to background levels.
Change to water yields in the project watersheds as a result of the no action alternative depends on whether or not a wildfire occurs within the timeframe of analysis – 10 years. There would be no change in water yield due to the proposed vegetative treatments. However, as mentioned in the Fuels report, the susceptibility for high heat per unit area values is greatest under this no action alternative for ponderosa pine and mixed conifer vegetation types. Control opportunities for fighting wildfire would not be created under this alternative, leading to less control opportunities which could lead to extensive wildfire that burns large percentages of watersheds. Wildfire removes vegetation and causes bare soil, leading increased erosion, sedimentation, and runoff (Elliot et al 2010). Runoff from wildfire areas would also increase depending on the amount of fire within each watershed. Should this happen most of these effects would decrease to undetectable levels within 10 years as revegetation occurs.

This alternative provides the least direct impact to water resources, but has the greatest potential indirect effects due to increased risk to wildfire and reduced control opportunities.

Table 3.4.3. Measures used to Assess Effects on Water Resources by Alternative

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Riparian</td>
<td>Acres of mapped riparian area within vegetative treatments with motorized activity</td>
<td>0.0</td>
<td>201.2</td>
<td>--</td>
</tr>
<tr>
<td>Riparian</td>
<td>Acres of riparian fenced</td>
<td>0.0</td>
<td>--</td>
<td>259</td>
</tr>
<tr>
<td>Streams and water quality</td>
<td>Miles of mapped stream channels (intermittent/ephemeral) within 300 feet of vegetative treatments proposed for treatment with motorized methods intermittent</td>
<td>0.0</td>
<td>38.5</td>
<td>--</td>
</tr>
<tr>
<td>Streams and water quality</td>
<td>ephemeral</td>
<td>0.0</td>
<td>271.5</td>
<td>--</td>
</tr>
<tr>
<td>Streams and water quality</td>
<td>Miles of stream within 300 feet of decommissioned routes intermittent</td>
<td>0.0</td>
<td>--</td>
<td>9.5</td>
</tr>
<tr>
<td>Streams and water quality</td>
<td>ephemeral</td>
<td>0.0</td>
<td>--</td>
<td>57.5</td>
</tr>
<tr>
<td>Springs</td>
<td>Number of springs with restorative work</td>
<td>0</td>
<td>--</td>
<td>19</td>
</tr>
<tr>
<td>Watershed condition</td>
<td>Acres restored water resource improvements</td>
<td>0.0</td>
<td>--</td>
<td>169.0</td>
</tr>
</tbody>
</table>
Alternative B

Vegetative Treatments

Direct effects to water resources features related to the proposed action include the removal of trees, compaction and disturbance from motorized and mechanized equipment and vehicles, prescribed fire, hand piling, and burning piles.

Within the proposed analysis area, there are 259 acres of riparian areas and 335.3 miles of ephemeral streams and 45.0 miles of intermittent.

While these features will be protected through the use of project design features and mitigation, it is expected there will be some short term impacts to these features. The impacts will be prevented and mitigated through the use of design features and Best Management Practices as described in the appendix. For example, stream channels in the project area would not be used as pathways for motorized vehicles. Trees within and adjacent to channels and riparian areas would be retained, except for selected removal determine to be beneficial. Some stream channels contain stringers of ponderosa pine as described in the vegetation report. These areas would be retained as groups of trees. Openings would not be created where stream channels are present or on concave slopes. These practices are described in appendix B, Best Management Practices, based on soil and water conservation practices described in FSH 2509.22 (USDA 1990).

Potential effects to water resource features are measured by the presence of these features in the treatment area since mitigations are not 100% effective and adaptive in nature. There is a process for assessing mitigations, also known as Best Management Practices (BMPs) which monitors the use of these practices. The implementation and effectiveness of BMPs is tracked to ensure these practices are reducing effects to water resources (USDA 2012). The use of BMPs which includes project design features and mitigations is detailed in Appendix D.

Ground disturbing activities have the potential to mobilize sediment into adjacent water resources features. Water resource features including riparian areas will have a designated management zone with widths that vary according to the type of water resource features. For riparian areas and perennial streams, this buffer is 300 foot. Within this zone, mechanized and motorized activities would not be allowed, but chainsaws may be used. By implementing this buffer, there would be little direct or indirect effects on water quality from the proposed activities. Ephemeral and intermittent waters would largely remain as described in the affected environment section. There may be some increased sedimentation during runoff events from soil disturbance within the project area. The prescribed buffers are expected to reduce the overland component of sediment. Other practices, such as water bars, restrictions on motorized use, and location of hand piles are expected to further reduce the input of sediment to these features. Concentrated surface runoff which has the potential to breach the prescribed buffers would be reduced by these practices.
It is unlikely that there will be changes in water yield could occur in the project watersheds due to the removal of vegetation and ground disturbance in project area. To check the potential for this, the percent proposed for treatment in each project watershed was calculated using an assumption of 50% for removal. As mentioned previously, when at least 20% of the forest cover in a watershed is removed; base flows can increase in locations with favorable characteristics (Brown et al 2005). Favorable characteristics in the project area generally do not exist in the piñon-juniper vegetation type but may occur occasionally in the higher elevation vegetation types when snow can accumulate. Water yield potential has been linked to vegetation type in several research papers (Zou et al 2010, Baker 1986, and Brown et al 2005). This link is related to the precipitation within the vegetation types with very little potential in the piñon juniper types. Where there is snow accumulation, as in the ponderosa pine, there is a greater potential for water yield increases related to vegetation treatments.

**Riparian, Spring, and Stream Restoration**

Riparian restoration activities would implement projects within the project area to improve riparian, stream, and spring locations. These activities include gully treatments, riparian area improvement such as headcut treatments, plug and pond methods, induced meandering, removal of non-native invasive plants, removal of old non-functional structures and fencing, erosion control, riparian plantings, and other measures as identified in the field. These activities would work to stabilize soils, improve channel function, reconnect floodplains to channels, and restore riparian and spring areas. This work is expected to improve the proper functioning condition (PFC) of riparian areas in the Puerco project area.

**Cumulative Effects**

Cumulative effects generally refer to impacts that are additive or interactive (synergistic) in nature and result from multiple activities over time, including the project being assessed. The US Council on Environmental Quality defines cumulative effects as "the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions."

Actions occurring within the Cibola National Forest that could potentially combine with the effects of the proposed action and result in environmental impacts include vegetation treatment, thinning, prescribed fires, road management, recreation, and wildlife habitat improvements. Road maintenance has a beneficial effect on watershed and soil condition as it improves road drainage and reduces erosion and sedimentation in the long-term. Increased recreation activity is expected due to the increase in trail miles for mountain biking, horses, and hiking. New development is ongoing on private land within the project area as well.

The cumulative effect of interest for soils is soil condition. The analysis area is the project area within a ten year timeframe. This is because ten years is long enough for effects to soil from the
proposed activities to become apparent. The project area was selected since this project is
designed to improve landscape condition. Project activities are expected to improve soil
condition on over 63,211 acres soils in the treatment area and decrease condition on 7,276 acres.
This makes an important gain in this area on improving soil condition for this landscape.

The cumulative effect of interest for water resources is watershed condition as described in the
WCF (USDA 2011). The cumulative effects boundaries for this project are the six 12 digit
HUCs, sub-watersheds, listed in Table 3.4.1. Beyond this scale, any effects of the proposed
action will become indistinguishable from background levels. Cumulative effects will be bound
temporally 10 years in the past to 10 year in the future. The no action alternative has the most
potential for changing watershed condition, due to the susceptibility for large wildfires. A large
wildfire has the potential to change watershed condition to ‘poor’ on any of the 6th code
watersheds in the project area. Implementing one of the action alternatives could provide control
opportunities, thereby reducing the size and severity of potential wildfires. However, due to the
small amount of treatment proposed and localized control opportunities that would be created,
the proposed action would not reduce this risk enough to make a change in the potential for
changing the overall watershed condition class.

3.5 Wildlife
The affected environment and environmental consequences each contain these four sections:

1. Threatened and Endangered Species
2. Sensitive Wildlife Species
3. Management Indicator Species
4. High Priority Migratory Birds

Affected Environment

Terrestrial Wildlife, Fish and Rare Plant
The following Threatened, Endangered, and Sensitive species (TES), as displayed in table
(3.5.1), have the potential to occur within the analysis area of the Puerco Landscape Restoration
project on the Mt. Taylor Ranger District of the Cibola National Forest and National Grasslands
(CIF).

Listed Species were identified using the U.S. Fish and Wildlife Service’s (FWS) Information,
Planning and Consultation (IPAC) System. Species identified as Sensitive are listed on the U.S.
Forest Service, Southwestern Region’s Regional Forester’s Sensitive Species list. (USDA 2013).
A list of other species considered but not evaluated further due to lack of habitat – within the
analysis area is displayed in Table (3.5.2). Table (3.5.3) is the Critical Habitat area within the
project area.
### Table 3.5.1. Potential TES Species in the Puerco Project Area

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexican spotted owl</td>
<td>Strix occidentalis lucida</td>
<td>Threatened</td>
</tr>
<tr>
<td>Zuni Flea bane</td>
<td>Erigeron rhizomatus</td>
<td>Threatened</td>
</tr>
<tr>
<td>Zuni bluehead sucker</td>
<td>Catostomus discobolus yarrow</td>
<td>Endangered</td>
</tr>
<tr>
<td>Southwestern willow flycatcher</td>
<td>Empidonax trailii extimus</td>
<td>Endangered</td>
</tr>
<tr>
<td>Mexican wolf</td>
<td>Canis lupus baileyi</td>
<td>Non-essential population, candidate</td>
</tr>
<tr>
<td>Spotted Bat*</td>
<td>Euderma maculatum</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Gunnion’s prairie dog</td>
<td>Cynomys gunnisoni</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Pale Townsend’s big-eared bat</td>
<td>Corynorhinus townsendii (pallescens)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Northern goshawk</td>
<td>Accipiter gentilis</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Northern leopard frog</td>
<td>Rana pipiens</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Villous groundcover milkvetch</td>
<td>Astragalus humistratus var. crispulus</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Sivinski’s fleabane</td>
<td>Erigeron sivinskii</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Zuni milkvetch</td>
<td>Astragalus accumbens</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Arizona leatherflower Clustered leatherflower</td>
<td>Clematis hirsutissima var. hirsutissima</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Chaco milkvetch</td>
<td>Astragalus micromerius</td>
<td>Sensitive</td>
</tr>
</tbody>
</table>

### Table 3.5.2. Species Considered but Not Evaluated

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pecos sunflower</td>
<td>Helianthus paradoxus</td>
<td>Threatened – Does not occur within the project area.</td>
</tr>
<tr>
<td>Cebolleta southern pocket gopher</td>
<td>Thomomys bottae paguatae</td>
<td>Sensitive – Does not occur within the project area.</td>
</tr>
<tr>
<td>Western yellow-billed cuckoo</td>
<td>Coccyzus americanus occidentalis</td>
<td>Proposed – Does not occur within the project area.</td>
</tr>
<tr>
<td>American peregrine falcon</td>
<td>Falco peregrinus (anatum)</td>
<td>Sensitive – No suitable habitat within the project area.</td>
</tr>
<tr>
<td>Rio Grande chub</td>
<td>Gila pandora</td>
<td>Sensitive – No suitable habitat within the project area. Not know to occur within the project boundary.</td>
</tr>
<tr>
<td>Rio Grande sucker</td>
<td>Catostomus plebeius</td>
<td>Sensitive – No suitable habitat within the project area. No known to occur within project boundary.</td>
</tr>
<tr>
<td>Bald eagle</td>
<td>Haliaetus leucocephalus</td>
<td>Sensitive – No suitable nesting habitat within the project area.</td>
</tr>
<tr>
<td>Dumont’s Fairy shrimp</td>
<td>Streptocephalus henridumontis</td>
<td>Sensitive</td>
</tr>
</tbody>
</table>
Table 3.5.3. Critical Habitat

<table>
<thead>
<tr>
<th>Species</th>
<th>Critical Habitat Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexican spotted owl</td>
<td>Yes</td>
</tr>
<tr>
<td>Zuni Bluehead Sucker</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Affected Habitat**

**Mexican Spotted Owl**

In general Mexican spotted owl habitat consists of dense multistory stands of mixed conifer with a component of large trees, often old remnant trees in younger stands or mature or over mature stands. Spotted owls also prefer shaded, cool, moist canyon sites and mountain slopes with rock outcrops, cliffs, talus, and standing dead and down woody material. Forests used for roosting and nesting often contain mature or old-growth stands with complex structure. Forests used by spotted owls are typically uneven-aged, are multistoried, and have high canopy cover. In these areas, nest trees are typically large (average diameter of nest trees is 24 inches), although owls roost in both large and small trees (USDI 1995). The Mexican Spotted Owl Recovery Plan has three levels of protection codified. These categories were added to the CIF Land and Resource Management Plan (LRMP) as a Plan Amendment in 1996, and are summarized below.

Surveys were conducted on the Mt. Taylor Ranger District for the Mexican spotted owl (MSO) beginning in the early 1990’s. PAC monitoring occurred in the project area annually during the breeding seasons from 2005 to 2014 (no surveys were conducted in 2011, 2015 and 2016; CIF unpublished data), according to FWS protocol. In 2013 and 2014 surveys in the Foster PAC elicited responses and a breeding pair of owls with fledglings were subsequently located. In 2017 surveys were conducted within the project area outside of existing PACs, but with suitable owl nesting/foraging habitat. There are two new locations where a pair of owls were discovered during nesting season. Two new PACs have been proposed, and will be sent to USFWS for approval. McGaffey PAC and Smith Canyon PAC. There are a total of 7 PACs within the project boundary which include Hogback PAC, Aqua Remora PAC, Six Mile PAC, Foster PAC, and Milk ranch PAC. Foster PAC did have a pair of breeding owls in the 2017 season. Approximately 4,500 acres of habitat is occupied with Mexican spotted owls within the project boundary.

**Protected Activity Centers**

PACs encompass a minimum of 600 acres surrounding known owl nest/roost sites. There are currently a total of seven PACs within the project boundary. With a total of approximately 6,000 acres. Management recommendations are most conservative within PACs, but by no means advocate a “hands-off” approach. The FWS recognizes situations exist where management is needed to sustain or enhance desired conditions for the owl, including fire-risk reduction, as well as monitoring owl response.
Recovery Habitat

This habitat is primarily ponderosa pine-Gambel oak, mixed-conifer, and riparian forest that either currently is, or has the potential for becoming nesting and roosting habitat, or does or could provide foraging, dispersal, or wintering habitats. There is approximately 15,800 acres within the project boundary. Nesting habitat typically occurs either in well-structured forests with high canopy cover, large trees, and other late seral characteristics, or in steep and narrow rocky canyons formed by parallel cliffs with numerous caves and/or ledges within specific geologic formations. Forested protected and restricted habitat management should vary by forest type and Recovery Unit. This habitat should be managed to replace habitat lost due to disturbance (e.g., fire) or senescence and to provide additional habitat to facilitate recovery of the owl. The remainder of forested habitat should be managed for other needs (such as foraging, dispersing, or wintering) provided that key habitat elements are retained across the landscape.

Other forest and woodland types

Other forest and woodland types consist of habitats such as ponderosa pine forest, spruce-fir forest, and pinyon-juniper woodland. There is approximately 56,900 acres within the project boundary. No specific management is suggested for these habitat types, recognizing that the current emphasis for sustainable and resilient forests should be compatible with the needs of the owl.

Table 3.5.4. Acres of MSO Habitat Types

<table>
<thead>
<tr>
<th>Mexican Spotted Owl Habitat Type</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protected Activity Centers (PACs)</td>
<td>~6,100 acres</td>
</tr>
<tr>
<td>Critical Habitat</td>
<td>~17,000 acres</td>
</tr>
<tr>
<td>Protected and Restricted Habitat</td>
<td>~11,400 acres</td>
</tr>
</tbody>
</table>

Zuni Flea Bane

The Zuni fleabane occurs on nearly barren detrital clay hillsides with soils derived from shales of the Chinle or Baca formations (often seleniferous). It most often occurs on north or east-facing slopes in open pinyon-juniper woodlands at 7,300-8,000 feet in elevation. The Zuni fleabane is an herbaceous perennial with creeping rhizomes. This fleabane flowers May and June. This is a very distinct species of *Erigeron*. Surveys have been done in the past and are documented on the forest.

There are two known areas within the project boundary of Zuni Flea bane, they are on the north end of the project area in the Chinle formation.

Zuni Bluehead Sucker

This sucker inhabits a variety of lotic habitats, featuring laminar to slightly turbulent flows. In general, the available habitat is limited, most of it in New Mexico being in headwater areas

~ 121 ~
above various diversions and impoundments. The streams presently occupied in that area are 1.2-3.0 m wide and typically very shallow, except for a few pools that may be 0.6-0.9 m deep. Portions of some of the occupied streams are temporary, containing water only seasonally or in wet years. There is a population present within the project boundary, and it is fed by the Aqua Remora spring. There is a pipe fence surrounding the spring and pools where the species is known to occur. There is a second population to the north about one mile, but is on private land.

There are four watersheds 6th code HUCS that will be focused on for Zuni blue head sucker and Critical habitat currently occur in the Upper Rio Nutria, and Zuni Bluehead sucker Critical habitat is within in the Upper Rio Nutria, Cebolla Creek, and Middle Rio Nutria. See Critical habitat section below for more detail.

Using the Watershed Condition Classification document, and the Assessment report of Ecological/Social/Economic Conditions, Trends and Risks to Sustainability, Cibola National Forest Mountain Ranger Districts the four watershed were determine to have the following information.

<table>
<thead>
<tr>
<th>Watershed Name</th>
<th>Watershed Condition Rate</th>
<th>Perennial streams abundance</th>
<th>Groundwater/Springs abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Rio Nutria 150200040201</td>
<td>Fair</td>
<td>None</td>
<td>Representative-high</td>
</tr>
<tr>
<td>Middle Rio Nutria 150200040203</td>
<td>Fair</td>
<td>None</td>
<td>Representative-low</td>
</tr>
<tr>
<td>Cebolla Creek 150200040103</td>
<td>Fair</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

All four of the watersheds are rated fair for watershed condition, which means they are functioning at risk. The watershed supports medium to small blocks of contiguous habitat. Some high-quality aquatic habitat is available, but stream channel conditions show signs of being degraded. (USDA July 2011. Watershed Condition Classification technical guide.)

**Southwestern Willow Flycatcher**

In general the southwestern willow flycatcher prefers moist, shrubby areas, often with standing or running water. In the southwest they occur in riparian forests with or without shrubs (Sedgwick 2000). In the desert southwest, only southwestern willow flycatchers breed along wooded desert streams (Sedgwick 2000). Currently, just under a mile of willow habitat exists along Bluewater creek from Andrew’s Cabin to FR 178. This stretch of riparian habitat is protected with cattle exposures and road closures (Schwarz, 2008).

Surveys have been conducted by the Cibola National Forest in the Bluewater Creek territory since 1993 based on a single southwestern willow flycatcher detected there in the mid 1990’s. No southwestern willow flycatchers have been found since 1994 (Schwarz, 2008), and none have been found within the project boundary.
**Mexican Wolf**

The Mexican wolf is the rarest subspecies of gray wolf in North America. Once common throughout portions of the southwestern United States, the Mexican wolf was all but eliminated from the wild by the 1970s. In 1977, the U.S. Fish and Wildlife Service initiated efforts to conserve the species. In 1998, Mexican wolves were released to the wild for the first time in the Blue Range Wolf Recovery Area within the Mexican Wolf Experimental Population Area. Missing from the landscape for more than 30 years, the howl of the Mexican wolf can once again be heard in the mountains of the southwestern United States. (https://www.fws.gov/southwest/es/mexicanwolf/)

Mexican gray wolves prefer mountain forests, grasslands and scrublands. They once ranged widely from central Mexico throughout the southwestern U.S. Today, the Mexican wolf has been reintroduced to the Apache National Forest in southeastern Arizona, and may move into the adjacent Gila National Forest in western New Mexico as the population expands. (http://www.defenders.org/mexican-gray-wolf/basic-facts)

**Critical Habitat**

**Mexican Spotted Owl**

The project area contains about 17,752 acres of Critical Habitat for MSO, along with 7 PACs or nesting territories which consists of approximately 4,200 acres within the project boundary. There are two PACs within the critical habitat boundary. The project area lies within the Colorado Plateau Recovery Unit (RU). According to the Mexican Spotted Owl Recovery Plan, the greatest threats to recovery in the RU are catastrophic fire, some forms of timber harvest and fuel wood harvest. Management guidelines for the Mexican spotted owl are specified in the LRMP (Amendment No. 7, pages 71 – 71-5). Figure 3.5.1 below shows where critical habitat is located within project boundary.
Critical Habitat Primary constituent elements

Primary constituent elements related to forest structure: (1) a range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different age of trees, 30% to 45% of which are large trees with a trunk diameter of 12 inches or more when measured at 4.5 feet from the ground; (2) a shade canopy created by the tree branches covering 40% or more of the ground; and (3) large dead trees (snags) with a trunk diameter of at least 12 inches when measured at 4.5 feet from the ground.

Primary constituent elements related to maintenance of adequate prey species: (1) high volumes of fallen trees and other woody debris; (2) a wide range of tree and plant species, including hardwoods; and (3) adequate levels of residual plant cover to maintain fruits, seeds, and allow plant regeneration.

The forest habitat attributes listed above usually are present with increasing forest age, but their occurrence may vary by location, past forest management practices or natural disturbance events, forest type, productivity, and plant succession. These characteristics may also be observed in younger stands, especially when the stands contain remnant large trees or patches of large trees from earlier stands. Certain forest management practices may also enhance tree growth and mature stand characteristics where the older, larger trees are allowed to persist.
Zuni Bluehead sucker
This sucker inhabits a variety of lotic habitats, featuring laminar to slightly turbulent flows. In general, the available habitat is limited, most of it in New Mexico being in headwater areas above various diversions and impoundments. The streams presently occupied in that area are 1.2-3.0 m wide and typically very shallow, except for a few pools that may be 0.6-0.9 m deep. There is a single location within the project area that is occupied by Zuni bluehead suckers, and that is within Aqua Remora Spring area. Less than half a mile of critical habitat within the Forest Service lands has individual Zuni bluehead suckers present. The other populations are on private land. Portions of some of the occupied streams are temporary, containing water only seasonally or in wet years (NMDGF 2013 and 2004). Figure 3.5.2 displays Zuni bluehead sucker habitat in the action area.

Figure 3.5.2. Zuni Bluehead sucker Critical Habitat within the Puerco Project boundary
### Table 3.5.6. Miles of Zuni Bluehead sucker critical habitat within project area.

<table>
<thead>
<tr>
<th>HUC 6 Watershed Name</th>
<th>Miles within the project boundary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Rio Nutria, and Cebolla Creek, and Middle Rio Nutria</td>
<td>34 miles of stream</td>
</tr>
<tr>
<td>Project Boundary</td>
<td>9.7 miles</td>
</tr>
</tbody>
</table>

### Sensitive Species

The Forest Service has developed policy requirements for the designation of sensitive plant and animal species (Forest Service Manual (FSM) 2670; Supplement 2600-94-2). The Regional Forester’s Sensitive Species List contains taxa only when they meet one or more of the following three criteria: 1), the species is declining in numbers or occurrences and evidence indicates it could be proposed for federal listing as threatened or endangered if action is not taken to reverse or stop the downward trend, 2) the species habitat is declining and continued loss could result in population declines that lead to federal listing as threatened or endangered if action is not taken to reverse or stop the decline, and 3), the species’ population or habitat is stable but limited.

### Spotted Bat

The spotted bat ranges from Mexico through the western states to the southern border of British Columbia. It is found in various habitats from desert to montane coniferous stands, including open ponderosa pine, pinyon-juniper woodland, canyon bottoms, open pasture, and hayfields. Speculation has been made that captures outside coniferous forests reflect post-breeding wandering (NatureServe 2008). Many bats in New Mexico were caught over waterholes near a sandstone cliff with numerous vertical cracks (NatureServe 2008). There is approximately 51,660 acres habitat within the project area. It is unknown the exact acres of habitat occupied due to lack of survey data. Due to the lack of information, it is assumed the entire 51,660 acres is occupied.

Many bats in New Mexico were caught over waterholes near a sandstone cliff with numerous vertical cracks (NatureServe 2008). The spotted bat is a relatively specialized feeder, subsisting almost entirely on moths. It catches all its prey in the air, in contrast to some bats which glean insects from vegetation or the ground. Some moth species can hear the high-frequency echolocation calls of many bats, and take evasive action to avoid being captured. The spotted bat however, has calls of lower frequency which are outside the hearing range of most moths, allowing it to successfully capitalize on this widespread source of food (Blood 1993).
Gunnison’s prairie dog

Gunnison’s prairie dogs are usually found in areas with grassland/herbaceous and shrubland areas. High mountain valleys and plateaus at elevations of 1,830 – 3,660 meters, as well as open or slightly brushy country, sometimes with scattered junipers and pines is the preferred habitat type. There are approximately 3,359 acres of habitat within the project area. It is unknown the exact acres of habitat occupied due to lack of survey data. Due to the lack of information, it is assumed the entire 3,359 acres is occupied.

They can be found mostly in areas with high abundance of native plants. They occupy burrows usually on slopes or in hummocks. Gunnison’s prairie dogs are herbivorous (www.natureserve.org).

Pale Townsend’s big-eared bat

The pale Townsend’s big-eared bat is a western species occurring in semi-desert shrublands, piñon-juniper woodlands, and open montane forests, including spruce-fir. There is approximately 52,243 acres of habitat within the project area. It is unknown the exact acres of habitat occupied due to lack of survey data. Due to the lack of information, it is assumed the entire 52,243 acres is occupied. It is associated with caves and abandoned mines for day roosts and hibernacula, but will also use abandoned buildings and crevices on rock cliffs for refuge. Maternity sites include trees, caves or man-made structures. Births occur from May to mid-June. By the last half of July, most young of the year are able to fly. Night roosts include caves, open buildings, rock shelters, and cement culverts beneath roads, bridges and mines. They are relatively sedentary. They do not move long distances from hibernacula to summer roosts nor do they forage far from their day roosts. Their diets consist of greater than 90% moths. Threats include habitat loss, cave vandalism and disturbance by cave explorers at maternity and hibernation roosts. (BISON-M 2006).

Individuals or small groups (3-5 individuals) of bats may day roost in hollow and creviced trees and snags for a limited time. The most significant roosts are those with large congregations of bats, summer maternity roosts, and winter hibernacula. These sites are highly sensitive to disturbance and human interference. Foraging occurs after dark in a variety of habitats including, open areas as well as forested areas. The bat forages within tree canopies and gleans insects from vegetation. This bat can forage up to 8 miles from day roosts, but tends to forage within a few miles of colonial roosts. These bats hibernate in caves and abandoned mines. They are extremely sensitive to disturbance at their roosting sites and have suffered severe population declines throughout much of the U.S.

Northern Goshawk

Throughout the southwestern U.S. nests are primarily found in ponderosa pine forest. Other forest types used by goshawks include Douglas fir, various pines, and aspen. There is approximately 41,592 acres of suitable habitat within the project area. Surveys have taken place on and off for the last several years, but the most recent surveys have been in 2013, 2014, 2017.
and 2018. There are four PFAs within the project area, which consists of approximately 2,400 acres goshawks have been known to occupy. Three alternate PFAs have also been establish in stands where habitat is suitable, but no birds have been found within these areas. Forests stands containing nests are often small, approximately 10-100 hectares. Territories may contain 1-5 alternate nest areas. Although goshawks prefer certain nest habitat structures, habitat characteristics in nest areas vary from territory to territory, depending on availability.

Nests are typically in mature to old-growth forests composed primarily of large trees, with (60%-90%) canopy closure, near the bottom of moderate hill slopes, with sparse ground cover. Closed stands may reduce predation and, along with north slopes, provide relatively cool environments. Nest habitat is single to multistoried, depending on forest type. Water is usually found near the nesting area, consisting of anything from a forest pond or ephemeral stream to a major river or large lake, but these water sources are not a habitat requirement.

Goshawks hunt in diverse habitats ranging from open-sage to dense forests, including riparian areas. Foraging individuals travel through the forest in a series of short flights, punctuated with brief periods of prey searching from elevated hunting perches. Goshawk behavior and morphology are adapted for hunting in moderately dense mature forests where prey species are most vulnerable. In some habitats, nest site preference increased with increasing canopy closure and some populations forage in open habitats.

**Northern leopard frog**
This leopard frog ranges in a wide variety of habitats (springs, marshes, wet meadows, riparian areas, vegetated irrigation canals, ponds, and reservoirs) but require a high degree of vegetative cover for concealment (NatureServe Explore 2006, BISON-M 2006). There are 259 acres of riparian habitat and 19 springs within the project area. It is unknown the exact acres of habitat occupied due to lack of survey data. Due to the lack of information, it is assumed the entire 259 acres is occupied. In New Mexico they are known from about 3,600-10,000 feet and breed in ponds or lake edges with fairly, dense aquatic emergent vegetation from April-July and September –October (Degenhardt et al 1996). They attach their eggs to submerged vegetation well below the surface, in water 0.5 meter deep or more (NatureServe Explore 2006). Over-wintering habitats are larger lakes and streams that do not freeze completely during winter (NatureServe Explore 2006). The leopard frog feed on various insects and spiders (Degenhardt et al 1996).

**American peregrine falcon**
Suitable habitat for the peregrine falcon includes; various open habitats from grassland to forested areas in association with suitable nesting cliffs (NatureServe Explorer 2008). The falcon often nests on ledges or holes on the face of rocky cliffs or crags. Ideal locations include undisturbed areas with a wide view, near water, and close to plentiful prey. There are no know areas of occupied habitat for peregrine falcon within the project area. There are two know sites
that are outside of the project area, and these areas are over 20 miles away. There are no know peregrine sites within the project area. Foraging habitats of woodlands, open grasslands, and bodies of water are generally associated with the nesting territory. Falcons are known to forage over large areas, often ten to fifteen miles from the eyrie. Probably the greatest threat to Peregrines breeding in New Mexico is human disturbance. Falcons in this state typically occupy fairly remote locations for breeding, and are not sensitized to human activity. Even fairly low levels of human disturbance may sometimes cause nest and territory abandonment (White et al. 2002).

**Villous groundcover milkvetch**

This plant prefers sandy soils of volcanic origin on slopes, benches, and ledges in xeric pine forest; from 7,250-8,150 feet in elevation. (NMRPTC 1999). There are approximately 40,750 acres of ponderosa and ponderosa pine oak habitat, but it is unknown the number of habitat occupied. Due to the lack of information, it is assumed the entire 40,750 acres is occupied.

**Sivinski’s fleabane**

This species is found in chinle shale in pinon-juniper woodland and Great Basin desert scrub; from 6,100-7,400 feet in elevation. (NMRPTC 1999). There are approximately 25,701 acres of pinon juniper habitat, but it is unknown the number of habitat occupied. Due to the lack of information, it is assumed the entire 25,701 acres is occupied.
**Zuni milkvetch**

Found in gravelly clay banks and knolls, in dry, alkaline soils derived from sandstone, in piñon-juniper woodlands; 1,890-2,410 m (6,200-7,900 ft.). In the Zuni Mountains, this plant is associated with *Erigeron rhizomatus*, another endemic plant. (NMRPTC 1999). There are approximately 25,701 acres of pinon juniper habitat, but it is unknown the number of habitat occupied. Due to the lack of information, it is assumed the entire 25,701 acres is occupied.

**Arizona leatherflower Clustered leatherflower**

It flowers in spring and summer. Moist mountain meadows, prairies, and open woods and thickets; 700-3300 m; Ariz., Colo., Idaho, Mont., N.Mex., Oreg., Utah, Wash., Wyo. (NMRPTC 1999). There are approximately 7407 acres of grasslands/shrublands, but it is unknown the number of habitat occupied. Due to the lack of information, it is assumed the entire 7,407 acres is occupied.

**Chaco milkvetch**

Found on gypseous or limy sandstones in piñon-juniper woodland or Great Basin desert scrub; 2,000-2,250 m (6,600-7,300 ft.). This diminutive endemic is usually associated with outcrops of sandstone that are blended with Todilto gypsum or limestone. It has a fairly wide range, but is sporadically distributed in isolated populations (NMRPTC 1999). There are approximately 25,701 acres of pinon juniper habitat, but it is unknown the number of habitat occupied. Due to the lack of information, it is assumed the entire 25,701 acres is occupied.

**Management Indicator Species**

The Forest Service is charged with managing all renewable resources, including wildlife, on National Forest lands. This obligation was enacted by Congress and set forth in the National Forest Management Act (NFMA) of 1976. As a federal law, the NFMA is the primary statute governing the administration of National Forests. The Forest Service first promulgated regulations implementing NFMA in September, 1979, and subsequently revised them in 1982 (known as the 1982 Rule). The 1976 legislation requires the Secretary of Agriculture to assess forest lands, and develop and implement a land and resource management plan for each unit of the National Forest System. These management plans, commonly known as forest plans, guide management activities on each National Forest. Therefore, site-specific projects proposed on national forests must comply with the applicable forest plan or the plan must be amended.

The 1982 regulations require forest plans to manage fish and wildlife habitat so viable populations of existing native and desired nonnative vertebrate species are maintained in the planning area (i.e., each individual National Forest). Under the 1982 regulations, a viable population is regarded as one that has the estimated numbers and distribution of reproductive individuals to insure its continued existence, is well distributed in the planning area, and that habitat must be well distributed so that those individuals can interact with others in the planning area.
Because it is impossible to address the thousands of species that occur on National Forests, the use of Management Indicator Species (MIS) serves as a barometer for more than the selected species and a surrogate for addressing other species’ ecological needs. As directed by NFMA and the 1982 Rule, each forest plan identifies and selects certain vertebrate, invertebrate, or plant species present in each National Forest as MIS because their population changes are believed to indicate the effects of management activities (36 CFR 219.19(a)(1)).

Additionally, the 1982 regulations require that population trends of the management indicator species will be monitored and relationships to habitat changes determined (36 CFR 219.19(a)(6)). Forest Service Manual (FSM) 2621.1 defines management indicators as plant and animal species, communities or special habitats, selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent (FSM 2620.5). Therefore, important characteristics of MIS are that they have narrow habitat associations, representing ecosystem components important to multiple species, and are capable of being effectively monitored.

Under the 1982 Rule, Forest Service officials have broad discretion to select MIS. The deciding official, using information provided by an interdisciplinary planning team, determines whether the population changes of certain species are believed to indicate the effects of management activities. The 1982 Rule specifies that species are to be selected from various categories where appropriate, indicating there is no requirement that all categories of species or habitats be represented. For additional information see the 2014 Forest-wide MIS Report to be located in the project record and which is incorporated by reference.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Habitat Indicator or Listing Rationale</th>
<th>Habitat Description</th>
<th>Habitat Present in Project Area?</th>
<th>Analysis in Impacts Section?</th>
<th>Acres of habitat within project area &amp; percentage of change Forest wide.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elk</td>
<td>Mtn. Grassland/mixed conifer</td>
<td>Elk require some element of escape and protection. Elk use dense cover for seclusion away from disturbance, and as thermal protection. Elk consume a combination of grasses, forbs, and shrubs.</td>
<td>Yes</td>
<td>Yes</td>
<td>7,976 2.1%</td>
</tr>
<tr>
<td>Mule deer</td>
<td>Pinyon-juniper</td>
<td>Mule Deer occur in coniferous forests, desert shrubs, chaparral, grasslands with shrubs, and are often associated with early successional vegetation.</td>
<td>Yes</td>
<td>Yes</td>
<td>25,701 3.6%</td>
</tr>
<tr>
<td>House wren</td>
<td>Riparian</td>
<td>In western foothills and mountains, found in deciduous or mixed deciduous-coniferous woodlands in canyons and riparian areas, in open ponderosa pine</td>
<td>Yes</td>
<td>Yes</td>
<td>259</td>
</tr>
<tr>
<td>Common Name</td>
<td>Habitat Indicator or Listing Rationale</td>
<td>Habitat Description</td>
<td>Habitat Present in Project Area?</td>
<td>Analysis in Impacts Section?</td>
<td>Acres of habitat within project area &amp; percentage of change Forest wide.</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Juniper titmouse</td>
<td>Pinyon-juniper</td>
<td>Prefers warm, dry habitats of open woodland. Most common where juniper is dominant and where large, mature trees are present to provide natural cavities for nesting. In the Southwest, piñon-juniper woodland may be mixed with deciduous or evergreen oaks.</td>
<td>Yes</td>
<td>Yes</td>
<td>25,701 3.6%</td>
</tr>
<tr>
<td>Red-breasted nuthatch</td>
<td>Spruce-fir</td>
<td>Typically mature and diverse stands of coniferous forest, especially where spruce, fir, pine, hemlock, larch, and cedar are present, and less frequently in pure stand of pine and hemlock. May also breed in mixed woodland when strong coniferous component is associated with deciduous trees such as aspen, oak and poplar.</td>
<td>No</td>
<td>No</td>
<td>None 0%</td>
</tr>
<tr>
<td>Black bear</td>
<td>Mixed conifer</td>
<td>Black bears require some element of escape and protection. Black bears use dense cover for seclusion away from disturbance, and as thermal protection.</td>
<td>Yes</td>
<td>Yes</td>
<td>569 3.4%</td>
</tr>
<tr>
<td>Pygmy nuthatch</td>
<td>Ponderosa pine</td>
<td>Shows a strong and almost exclusive preference for long-needled pine forests. Range almost co-extensive with that of ponderosa pine, Jeffrey pine, and similar species.</td>
<td>Yes</td>
<td>Yes</td>
<td>25,959 3.6%</td>
</tr>
<tr>
<td>Hairy woodpecker</td>
<td>Mixed conifer</td>
<td>Primarily a forest bird; widely distributed in regions where mature woodlands prevalent. Also occurs in small woodlots, wooded parks, cemeteries, shaded residential areas, and other urban areas with mature shade trees, but often scarce within these habitats. In the southwest some preference for open pine forest.</td>
<td>Yes</td>
<td>Yes</td>
<td>569 0.3%</td>
</tr>
<tr>
<td>Red-naped sapsucker</td>
<td>Deciduous forest (includes mountain shrub)</td>
<td>Breeds in deciduous and mixed woodlands including aspen groves in open ponderosa pine forests, aspen-fir parklands, logged forests where deciduous groves remain, aspen groves in open rangeland, birch groves, montane coniferous forest and occasionally, subalpine forest edges and residential gardens.</td>
<td>Yes</td>
<td>Yes</td>
<td>3,359 4.6%</td>
</tr>
<tr>
<td>Merriam’s wild turkey</td>
<td>Ponderosa pine</td>
<td>Not regularly found below the piñon-juniper zone and seldom occur where this</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
### Puerco Collaborative Forest Landscape Restoration Project

#### 3. Environmental Consequences

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Habitat Indicator or Listing Rationale</th>
<th>Habitat Description</th>
<th>Habitat Present in Project Area?</th>
<th>Analysis in Impacts Section?</th>
<th>Acres of habitat within project area &amp; percentage of change Forest wide.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long billed curlew</td>
<td>Plains grassland</td>
<td>does not adjoin a higher area with ponderosa pine for nesting and brood range. Historic Merriam range includes both piñon-juniper and chaparral brush.</td>
<td>No</td>
<td>No</td>
<td>None 0%</td>
</tr>
<tr>
<td>Grasshopper sparrow</td>
<td>Plains grassland</td>
<td>Nests primarily in short grass or mixed prairie habitat with flat to rolling topography. Habitats with trees, high density shrubs and tall, dense grass generally avoided.</td>
<td>No</td>
<td>No</td>
<td>None 0%</td>
</tr>
<tr>
<td>Rio Grande turkey</td>
<td>Eastern riparian</td>
<td>Occupies semiarid areas. Mostly found in mesquite grasslands. Principal tree species, usually in more mesic sites, are live oak, pecan, American elm, cedar elm, sugar hackberry, net leaf hackberry and cottonwood.</td>
<td>No</td>
<td>No</td>
<td>None 0%</td>
</tr>
</tbody>
</table>

| Table 3.5.8. Ten MIS for the Cibola NF Mountain Districts their Habitat Type Associations, and Current Trends |
|---------------------------------------------------------------|--|--|------------------|-------------------|-----------------------------|------------------------------------------------------------------------|
| Species                  | Habitat Type          | Habitat Trend | Population Trend |
|--------------------------|-----------------------|---------------|------------------|-------------------|------------------------------------------------------------------------|
| 1. Elk (Cervus canadensis)| Mountain grassland    | Stable        | Upward           |
|                          | Mixed conifer         | Stable        |                  |
| 2. Mule Deer (Odocoileus hemionus) | Mountain shrub | Downward     | Downward         |
|                          | Piñon-juniper        | Stable        |                  |
| 3. Black bear (Ursus americanus) | Spruce-fir          | Stable        | Stable           |
|                          | Mixed conifer        | Stable        |                  |
| 4. Merriam's Turkey (Meleagris gallopavo merriami) | Ponderosa pine | Stable         | Upward           |
| 5. Red-naped Sapsucker (Sphyrapicus nuchalis) | Deciduous Forest   | Stable            | *Upward → Stable |
| 6. House Wren (Troglodytes aedon) | Riparian             | *Upward→Downward | *Stable→Downward |
3. Environmental Consequences

<table>
<thead>
<tr>
<th>Species</th>
<th>Habitat Type</th>
<th>Habitat Trend</th>
<th>Population Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Juniper Titmouse (previously Plain titmouse) <em>(Baeolophus ridgwayi)</em></td>
<td>Piñon-juniper</td>
<td>Stable</td>
<td>Downward</td>
</tr>
<tr>
<td>8. Pygmy nuthatch <em>(Sitta pygmaea)</em></td>
<td>Ponderosa pine</td>
<td>Stable</td>
<td>*Stable → Upward</td>
</tr>
<tr>
<td>9. Hairy woodpecker <em>(Picoides villosus)</em></td>
<td>Mixed conifer</td>
<td>Stable</td>
<td>*Upward → Stable</td>
</tr>
</tbody>
</table>

*indicates a change in trend from the last analysis conducted in 2014

Vegetation

The Cibola LRMP EIS (page 142) displays percentages of the 1,611,306 acres, which make up the vegetation types for the Cibola NF. The MIS analysis completed in 2014 displayed vegetation by Ecotype without the benefit of Terrestrial Ecosystem Unit Inventory (TEUI) data. More recent information using TEUI as well as Mid-Scale Vegetation Dominance Type mapping shows some similarities and some differences depending on vegetation type. In 2014 the CIBOLA NF produced the Ecological/Social/Economic Conditions, Trends, and Risks to Sustainability report which provides an Assessment of Current Status and Projected Trend for Vegetation Structure. Information from the vegetation assessment report was used to update this MIS report.

Table 3.5.9. Percentage of acres by Vegetation type

<table>
<thead>
<tr>
<th>HABITAT TYPE</th>
<th>1986 Cibola LRMP</th>
<th>2002 MIS Report</th>
<th>2005 % and TEU Data</th>
<th>2014 acres and % with TEU, RMAP and Midscale Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piñon-juniper</td>
<td>33%</td>
<td>39%</td>
<td>39%</td>
<td>702,112 ac. 44%</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>23%</td>
<td>26%</td>
<td>26%</td>
<td>454,780 ac. 28%</td>
</tr>
<tr>
<td>Mixed conifer</td>
<td>4%</td>
<td>4%</td>
<td>10%</td>
<td>187,488 ac. 12%</td>
</tr>
<tr>
<td>Mountain grassland</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>9%</td>
<td>179,444 ac. 11%</td>
</tr>
<tr>
<td>Mountain Shrub</td>
<td>7%</td>
<td>&gt;7%</td>
<td>3%</td>
<td>69,731 ac. 4%</td>
</tr>
<tr>
<td>Riparian</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
<td>7,569 ac. 1%</td>
</tr>
<tr>
<td>Deciduous forest</td>
<td>1%</td>
<td>1%</td>
<td>&lt;1%</td>
<td>2,416 ac. 0.15%</td>
</tr>
</tbody>
</table>
Increases in both ponderosa pine and piñon- juniper acres can be attributed to encroachment into areas previously typed as mountain shrub and mountain grassland due to fire suppression and drought related drying of wet meadow systems; soils normally too saturated for conifer survival. Some change during the last 15 years can also be attributed to better mapping technology including the use of GIS and the Terrestrial Ecosystem Unit Inventory method. The change in the amount of habitat classified as riparian is attributed to the Regional Riparian Mapping Project (RMAP) that better maps

**Rocky Mountain Elk**

In the Cibola Forest Land and Resource Management Plan (ALRMP) elk were selected as Management Indicator Species for the mountain grasslands and mixed conifer habitat found on the Forest. The justification for this selection reads as follows; “Elk – grazer, fairly adaptable, not representative over entire Forest, however, a good indicator of meadow types in those areas where it does appear. Easily monitored and identified. Is a species of high public interest and can be managed for.” (Process Criteria for Selection of MIS of Wildlife, Cibola NF, Black Kettle NG, Kiowa NG, Rita Blanca NG, Winter, F.A. 1981).

In the Cibola LRMP EIS, page 142, mountain grasslands were determined to cover approximately 1 percent of the total area on the Forest. Mountain grasslands are now estimated to cover 179,444 acres (11%). The most recent analysis indicates the quantity of mountain grassland acres has changed due primarily to the way grasslands are classified and some shifting upon the landscape. This habitat type is well represented and distributed across all four mountain Districts of the Cibola National Forest and the habitat trend is currently considered stable.

At the time of the Cibola LRMP analysis, mixed conifer habitat covered approximately 4 percent of the total area on the Cibola NF (Cibola ALRMP EIS, pg. 142). The most recent estimates indicate an increase in this acreage so that now about 12 percent of the Forest is considered to be mixed conifer habitat attributed to better mapping technology including the use of GIS and the Terrestrial Ecosystem Unit Survey method. Management of this habitat type will maintain a stable habitat trend. Mixed conifer is currently estimated to cover 187,488 acres on the Cibola NF.

**Mule Deer**

In the Cibola National Forest Land and Resource Management Plan (LRMP) mule deer were selected as Management Indicator Species for the mountain shrub and piñon-juniper habitat found on the Forest. The justification for this selection reads as follows; “Mule Deer – browser, adaptable, easily identified and can be monitored by known methods. Is a species of high public interest and can be managed for.” (Process Criteria for Selection of MIS of Wildlife, Cibola NF, Black Kettle NG, Kiowa NG, Rita Blanca NG, Winter, F.A.1981).
Piñon – juniper habitat covered 33 percent of the Cibola NF in 1985 and now PJ occurs on an estimated 702,112 acres representing about 44 percent of the total. Even though the amount is higher in 2014, the habitat trend for piñon-juniper habitat is stable because of the improved mapping and classification technologies. Both piñon-juniper and mountain shrub habitat types are well represented and distributed across all four mountain Districts of the CIBOLA NF.

**Juniper titmouse**

In July 1985, piñon-juniper was estimated to cover 33 percent of the Cibola NF. This habitat type is well represented and distributed across all four mountain Districts of the Cibola NF. This habitat type is now estimated to cover 702,112 acres (44 percent). Piñon-juniper habitat is considered stable on the Forest and the availability of large snags is considered adequate with low to moderate departure from reference conditions.

The juniper titmouse appears to be declining on the Cibola NF, judging by recent counts that are generally lower than average. The overall negative trend for NM, suggests a future downward trend on the Cibola National Forest.

**Black Bear**

In 1985, mixed conifer habitat covered approximately four percent of the Cibola NF (LRMP EIS, p. 142). The most recent estimates indicate that mixed conifer represents 12% of the acreage on the Forest due to improved mapping techniques, rather than an increase in the habitat type. This habitat type is well represented and distributed across all four mountain Districts. The mixed conifer habitat remains stable.

Habitat in general and spruce fir and mixed-conifer in specific, have not proven to be a limiting factor for population expansion. This leads to speculation that the assumptions made during the 1990s, although certainly valid from a public interest point of view, which led to the selection of black bear as an MIS for spruce fir and mixed-conifer conditions may not have been correct. Population levels instead appear to be determined by hunting pressure, and availability of mast as a result of weather patterns. Black bear populations appear to be stable on the Cibola National Forest.

**Pygmy nuthatch**

In 1985 ponderosa pine was estimated to cover 23 percent of the Forest. Recent calculations estimates there are 702,112 acres of ponderosa pine on the Cibola NF. Ponderosa pine habitat is considered to be stable on the Forest.

Pygmy Nuthatches are seen on the Cibola NF transects in expected numbers. The long term outlook is positive for Pygmy Nuthatch because considerable restoration is planned for ponderosa pine habitat, i.e. it is being thinned and burned allowing for the growth of fewer but larger healthier trees less susceptible to wildfire, insects and disease infestations. The availability
of large snags in ponderosa pine habitat is considered adequate with low departure from reference conditions. The population trend for pygmy nuthatch is considered stable on the Cibola NF.

**Hairy woodpecker**

In 1985 mixed conifer was estimated to cover four percent of the Forest (LRMP EIS, p. 142). Now mixed conifer represents about 12%, 187,488 acres, of the forest due to the way mixed conifer is mapped using advanced techniques. This habitat type is well represented and distributed across all four mountain Districts of the Cibola NF. Habitat trend for mixed conifer is considered stable.

For a species with low detectability like the hairy woodpecker the Cibola NF surveys are probably more accurate in assessing the local populations since the duration of the count period is longer. The hairy woodpecker is the most widespread MIS bird and one of the most abundant on the Cibola NF. Numbers however are indicating a change from an upward population trend on the Forest to a stable trend. The availability of large snags is considered adequate for this species with low departure from reference conditions.

**Merriam’s Turkey**

In 1985 ponderosa pine was estimated to cover 23 percent of the Cibola NF. Ponderosa pine now covers an estimated 454,780 acres representing about 28 percent of the total Forest acres according to current mapping indicating a stable trend for ponderosa pine habitat. Turkey roost trees and associated stands are generally protected from harvest, although some have certainly been lost to wild fires.

Most mountain ranges in New Mexico support healthy self-sustaining Merriam’s turkey populations. Harvest surveys and brood surveys have been conducted to index population trends. Harvest surveys are still performed; however, brood surveys have not been conducted since 1988. The general statewide turkey population trend between the 1920’s and the late 1950’s was steadily upward based upon hen to poult ratio collected annually. According to the EIS for the LRMP, the total turkey population for the Forest was estimated at 2,780 birds in 1985 (p. 91). The present statewide population is likely around 31,500 Merriam’s turkeys.

Since numbers are subject to fluctuation dictated by annual weather cycles, numbers within the state may tend to vary between 27,000 and 36,000. However, population numbers are expected to increase in the future indicating an upward population trend on the Cibola National Forest (NMDGF Long Range Plan for the Management of Wild Turkey in New Mexico 2001-2005).

**Red-naped Sapsucker**

At the time the CIF LRMP was signed (July 1985), deciduous forest was estimated to cover about 1 percent of the Forest. This habitat type is well represented and distributed across all four
mountain Districts of the CIF, with larger stands of aspen on the Mt. Taylor Ranger District. Currently this habitat type covers only about 2,733 acres of the Forest. The habitat trend in the deciduous forest remains stable.

Ten of the 32 BBS on the CIF have detected red-naped sapsuckers. The sites on the CIF having these sapsuckers continue to attract them year after year. Routes on the CIF exhibit a stable trend. The fact that these sapsuckers are local does make them vulnerable to habitat loss especially regarding the trend for the mixed conifer with aspen habitat type which is showing a 13% downward trend compared to reference condition for aspen/mixed deciduous (all sizes - open and closed).

**House Wren**

The CIF LRMP EIS (1985) estimated riparian habitat occurred on less than 1 percent of the Forest and Grasslands. Current mapping of this habitat type indicates there are 7,565 acres on the CIF. This habitat type is well represented and distributed across all four mountain Districts of the CIF. Although the quality of the riparian habitats has improved somewhat with the implementation of livestock and vehicle exclosures around riparian habitat, and the implementation of the Travel Management Rule which resulted in an overall reduction in the miles of motorized roads and trails in riparian habitat, riparian areas on the Cibola are expected to continue to degrade due to legacy management reasons. The effects of herbivory are being managed through wildlife and livestock management plans with levels well below what existed before the establishment of the Cibola National Forest. These lower levels have allowed some of the riparian areas to recover from past effects, where possible. Where projects have been developed to conserve or protect remaining riparian areas or to rehabilitate and restore missing riparian areas, local conditions might be expected to improve, and these areas can move closer to proper functioning condition. However, external factors such as climate change and continued drought can be assumed to continue to exert stress on these areas.

Based on this information, the habitat trend of riparian habitat is expected to decline and is in a downward trend. Although the house wren is the designated indicator for riparian areas, this designation applies primarily at lower elevation from about 7,500 feet (sometimes even lower) to about 8,500 feet. Above that, riparian structure with willow and cottonwood trees is no longer necessary.

The overall downward trend for New Mexico is deemed fairly reliable by USGS. The USGS surveys on the CIF however do not have a sufficiently long history to be reliable. CIF surveys that regularly pick up house wrens indicate a downward population.

**Migratory Birds**

*Band Tailed pigeon*
This species may be found from pinyon-juniper up through spruce/fir depending on availability of food that includes a wide variety of mast such as fruits and nuts, especially acorns and pinyon pine nuts. In August and September it often descends into the foothills to for shrub live-oak and gray oak acorns. In the Southwest, Band-tailed Pigeons inhabit montane forests dominated by pines and oaks, sometimes extending upward in elevation to timberline. Multi-layer forests with tall trees and an understory are most favored. In New Mexico, the species is most common in southern ponderosa pine and pine-oak communities (Keppie and Braun 2000).

**Black Throated gray warbler**

This species can be found in p-j with some oak understory between 7000 to 8000 feet, but can also be common in more mesic p-j with a high canopy closure. Black-throated Gray Warbler is generally associated with middle-elevation coniferous or mixed coniferous/deciduous woodland with brushy undergrowth, sometimes ranging into montane shrub associations or open forests with a mix of pines and deciduous trees (Guzy and Lowther 1997, Parmeter et al. 2002). This species tends to prefer large woodland stands, but it often uses edge habitat (Sedgwick 1987). During migration, it may occur statewide in wooded areas at lower and middle elevations (Hubbard 1978).

**Piñon Jay**

Suitable habitat within the Forest for the piñon jay includes piñon-juniper woodlands and sagebrush dominated sites. The piñon jay’s nest consists of a bowl of piñon, juniper or oak twigs. This bird is a colony nester. Pinyon Jays are predominantly associated with pinyon-juniper habitat, due to the species’ tightly co-evolved relationship with pinyon pines. In New Mexico, Pinyon Jays are associated primarily with Colorado pinyon (*Pinus edulis*). These trees rely on the jay for dispersal of their wingless seeds, and the jay has a suite of morphological and behavioral adaptations to efficiently exploit the rich food resource that pinyon seeds provide. Pinyon seed production is sporadic, and mobile flocks require large stands of mature trees spread over a wide area (Balda 2002, Yanishevsky and Petring-Rupp 1998). Despite its close association with the pinyon pine, the Pinyon Jay is an omnivore and sometimes occurs in areas dominated by ponderosa pine, sagebrush, or chapparal vegetation (Balda 2002).

**Virginia’s Warbler**

The Virginia’s warbler prefers generally arid montane woodlands ranging in elevation from 6,000 to 9,000 feet. Preferred habitats consist of brushy slopes, oak dominated canyons, scrub brush interspersed with pinyon-juniper woodland and ponderosa pine forest. This is especially true for the Forest when an oak understory is present. The Virginia’s warbler frequents dense growths of mountain mahogany (*Cercocarpus montanus*) and choke cherry (*Prunus virginiana*), along with rocky steep slopes and ravines, chapparral, riparian willow (*Salix* spp.) and alder (*Alnus* spp.) thickets. It is found in mixed-conifer forests near scrubby thickets. The Virginia’s warbler builds its nest on the ground in scrubby vegetation, embedded among dead leaves or in loose soil, sometimes at the base of a bush or hidden under a tussock of grass, but usually concealed by overhanging vegetation. The bird forages on the ground, as well as in foliage, and hawks insects on the wing.

**Black-chinned hummingbird**

Black-chinned Hummingbirds use a wide range of habitats, including riparian woodlands, lush urban vegetation, pinyon-juniper, and xeric desert washes (Kingery 1998, Baltosser and Russell...
In New Mexico, the species most often breeds in riparian areas dominated by cottonwood, sycamore, and willow. In southwestern New Mexico, the species is often found in relatively open areas interspersed with clumps of sycamore and cottonwood. Along the Gila River, the species nests in areas dominated by cottonwood, maple, and willow with an understory of Porter’s wild lovage and great ragweed (Baltosser 1986). Along the Rio Grande, the species nests most frequently in areas dominated by mature cottonwoods, and densities are thicker where there is a moderate to dense understory of shrubs (Hawks Aloft Inc., unpublished data). Nesting also occurs in urban areas with tall trees and numerous flowering plants.

On the Cibola National Forest this species is the foothills hummingbird that occurs on all mountain Districts up to about 7,000 ft. It is often found in mesic riparian habitat with strong deciduous component, especially Arizona Sycamore.

**Broad-tailed hummingbird**

Across its range, Broad-tailed Hummingbirds occupy many different vegetation types. It is generally associated with open woodlands, especially pinyon-juniper and pine-oak associations, as well as montane riparian areas and wet meadows, and areas of relatively open mixed conifers including fir, spruce, and pine (Calder and Calder 1992). In Colorado, although breeding bird atlasers recorded Broad-tailed Hummingbirds in ponderosa pine forest, it was recorded in higher densities and more frequently in areas dominated by aspen. Reports in foothill riparian, montane shrubland, and pinyon-juniper woodland also outnumbered ponderosa pine, but there is no indication of the quality of the ponderosa pine stands where breeding season observations were reported. Breeding was confirmed up to around 3,320 meters (10,300 feet) in elevation (Kingery 1998). Likewise, in New Mexico, the species also uses a variety of habitats, including pinyon-juniper woodlands, montane riparian areas and thickets, and open, mixed conifer forests. Surprisingly little research on this species has occurred over the past 20 years, and more specific data on habitat preference in New Mexico are lacking.

This mountain hummingbird is found from about 7,000 feet upwards. It frequents meadows and open forest with a shrubby component and forbs. It frequents meadows and open forests with a shrubby component and forbs. Gooseberry, figwort and Indian paintbrush are among its favorite flowers. Insects are an important part of the diet, especially when females are incubating and feeding young.

**Lewis’s woodpecker**

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. It is absent from dense ponderosa stands where fire suppression and grazing have prevented development of an open forest structure. The species also occupies burned (and sometimes selectively logged) forest areas, in the ponderosa zone and above, where large snags remain standing. Lewis’s Woodpecker does not occupy some areas of apparently suitable habitat.

On the Mt. Taylor Ranger District this species occurs in mid to high elevation, riparian woodland and open ponderosa forests. In addition to the open park-like ponderosa forests with brushy understory and dead and down materials, Lewis’s will also use burned forests-- and to a lesser degree oak woodlands.
3. Environmental Consequences

**Red-naped sapsucker**
Until 1983, Red-naped Sapsucker was considered conspecific with Yellow-bellied Sapsucker and Red-breasted Sapsucker. In New Mexico, Red-naped Sapsuckers breed in higher montane forests and mixed woodlands, particularly aspen groves. It avoids woodland edges (Dobkin et al. 1995). In breeding areas, this species drills sap wells in conifers, aspen or willow, and defends a constantly maintained network of wells from other species and other sapsuckers (Walters et al. 2002). It also forages for insects, particularly ants, when feeding young.

On the Cibola they are found in riparian woodland, ponderosa, mixed conifer and spruce/fir. This species prefers aspen and cottonwoods for nesting and are often found in oaks in winter.

**Grace’s warbler**
Grace’s Warbler is a pine specialist. It prefers park-like stands of mature tall pines, a habitat that has declined over time due to logging and fire suppression. In the southwest United States, it occurs primarily in ponderosa pine habitat, though Chihuahua pine and pine-oak woodlands of the Mexican Highlands are also used. Breeding may sometimes extend upslope into mixed conifer habitat (Stacier and Guzy 2002). In New Mexico, it is described as inhabiting mesa tops and canyon bottoms with ponderosa pine (Travis 1992), and may prefer areas with a Gambel oak understory (Levad 1998). In appropriate habitat in Arizona, Grace’s Warbler may be one of the more abundant species (Rosenstock 1996), but its densities are as much as 50% lower in New Mexico (Stacier and Guzy 2002). In northern Arizona, the species was common on both silviculturally thinned plots and control plots (Szaro and Balda 1979). It avoids lower elevation areas, even during migration, with far fewer records from the lowlands during migration than other migrant montane species.

On the Mt Taylor RD this species is fairly common in ponderosa pine but may extend into mixed conifer if ponderosa also present.

**Dusky Grouse**
Regularly occurs only on Mount Taylor, where it was introduced. It may occur casually in the Magdalenas, and possibly also the San Mateos. Prefers open shrubby high meadows in summer and coniferous forest in winter. A probable sighting in the Magdalenas at 9,600 feet on 5-20-02, if true, would indicate possible breeding in the meadows on or below the summit of this range. BNA: Creating or maintaining shrubby openings might be good for the species, but excessive grazing in these openings most certainly detrimental. Florence Bailey (1928) says (but not recorded in BNA): “The Dusky Grouse is one of the most notable game birds of the region, but if overgrazing is allowed to continue and as more and more campers go the mountains, it will become lamentably scarce unless wisely protected.”

**Williamson’s Sapsucker**
Williamson’s sapsucker is uncommon in Ponderosa, M/C and Spruce/Fir throughout mountain districts, especially in aspen groves, except on Magdalena RD, where it is probably rare in summer, or possibly absent. BNA: Seems to prefer aspen, utilizing live trees and snags for nesting. Also nests in pine snags, often in vicinity of open ponderosa. BNA is very specific re management guidelines: “Forest management plans should emphasize conservation of groups of large snags, rather than random assortment of variably sized snags. Patches of snags and areas of high snag density should be preserved, especially those in drainage bottoms or other low-lying areas. Fire in mixed coniferous forest that creates snags may increase breeding densities. Availability of sap trees (often large conifers) also would be important.”
Hammond’s Flycatcher
Although a migrant in all our mountains, it occurs only on Mount Taylor RD in summer, primarily in Ponderosa (old growth) and M/C, especially where Blue Spruce or aspen is part of the mix, but also in Middle/High Elevation Riparian, as at Rinconada, where it breeds in the alder/oak bosque. BNA: Generally inhabits cool mesic forests of mature or old-growth development, but also found in mixed forest with aspen, alder or oak. Birds prefer intact older stands rather than merely old trees widely spaced. Woodcutting, according to a study in the Jemez Mountains, can reduce a population.

Important Bird Areas
There are no Important Bird Areas (IBAs) associated with the project area. There would be no effects/impacts on IBAs resulting from the proposed project. There is no direct association or important link between the bird communities within the proposed project site and the Rinconada Basin IBA (north of I-40).

Over-wintering Areas
Important over-wintering areas have not yet been recognized as occurring on the Forest. The project site does not provide important wintering habitat for unique avian species or a high diversity of wintering birds. Significant concentrations of birds do not occur within the general location of the project area.

Environmental Consequences

Mexican Spotted Owl

Alternative A – No Action
Effects are expected for Mexican Spotted owl under the no action alternative. No vegetation treatments could mean, thick trees in the area along with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out suitable nesting and foraging habitat for the species. Indirectly stand replacing fire would also reduce the understory vegetation, which means prey species such as mice, voles, and prairie dogs could lose their habitat sources and either leave the area or die off, thus reducing Mexican spotted owl food source. This could reduce the population numbers, which would mean a reduction in population recovery.

Indirect effects are expected for the Mexican spotted owl because under this alternative decommission up to 200 miles of unauthorized roads would not occur. This could lead to increased illegal motorized use. Even with the travel management decision many users see a two track road and drive on them, whether it’s legal or not. If these roads are not rehabilitated it could lead to continued use. Security zones for wildlife between the routes would be reduced even further, as the habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. Impacts will become additive, as use increases, and private land development increases as well. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far
greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increased use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs can affect Mexican spotted owls in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, Mexican spotted owls may also leave the area to find habitat with reliable water sources. This can lead to a decline in the overall population of Mexican spotted owls.

No effects are expected if range infrastructure improvements do no occur.

The determination for Alternative A is: “May affect species, not likely to adversely affect species” for the Mexican Spotted Owl.

**Alternative B**
Decommissioning of unauthorized roads may cause wildlife to leave the area while work is ongoing, but once the work is complete wildlife is expected to return to the area. In areas of nesting bird species, this would occur outside the breeding season which would minimize this impact.

Mechanical treatments and prescribed fire could help the overall habitat within the project area. During actual treatments wildlife will leave the area, but once human activity is complete, wildlife species will return to the area. This impact is not expected to have a negative impact to overall species populations. These treatments will also take place at different times, so individuals will have other places to move to while treatment occurs within a single area. Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Improvement of grazing, and foraging habitat would help species such as deer, elk and turkey. Understory vegetation types would improve which would provide cover and protection from weather such as rain and snow, and would also provide protection for animals with young. Overall this alternative is expected to lead to an upward trend to Management indicator species along with migratory birds and their habitat types.

Part of the proposed action is to have two plan amendments. Amendment 1 is expected to have effects to Mexican spotted owls and their habitat. Positive and negative effects are expected for each of these PACs. Treatments within these PACs will occur outside of the breeding season, effects to nesting birds are not expect to occur. Effects are expected for the habitat within each PAC treated. Treatments will follow the 2012 Fish and Wildlife Service Recovery Plan, which is expect to have positive effects to the habitat.
The treatment area contains about 6,416 total acres of Mexican spotted owl protected habitat. There are 7 PACs (about 5,900 acres) in the Puerco treatment area. The remaining protected habitat occurs on steep slopes where timber harvest has not occurred in the previous 20 years and is not planned for mechanical treatment. Treatments for steep-slope protected habitat consist of prescribed fire only – no mechanical treatments are planned for this category of habitat. There are 56 established PACs entirely on or overlapping Cibola National Forest lands. Mechanical treatment would affect 7 (12 percent) of the 60 (includes 4 new proposed PACs in the Puerco Project) Cibola NF PACs and 3,694 acres (58 percent) of PAC habitat in the entire treatment area. Outside of PACs, there are 14,110 acres of mixed conifer and pine-oak forest type in the Puerco Project.

Changing the minimum basal area value in restricted habitat would only apply to target and threshold acres (those restricted acres being managed for nesting/roosting habitat as defined in the forest plan). About 1,346 acres (10 percent) of restricted target or threshold habitat could be affected by using a basal area range of 110 to 150 within the treatment area. This equates to affecting about 10 percent of the total estimated (13,700 acres) Mexican spotted owl restricted habitat on the Cibola NF’s portion of the project area. Work will be accomplished incrementally over a 10-15 year period. On average, less than 250 acres of PAC habitat would be treated per year. This is expected to balance the need to reduce the risk of crown fire while allowing for monitoring and feedback loops that will allow management to be adaptive.

Affects are expected for Plan amendment 1. Mechanical thinning up to 17.9 inches d.b.h. in 7 Mexican spotted owl PACs would affect 1 percent or less of the forest wide management area acres (Table A-2). Managing about 1,346 acres of restricted habitat to a range of 110 to 150 square feet basal area will affect 1 percent or less of the forest wide management areas. The amendment intent is consistent with the management emphasis of providing for multiple uses that includes wildlife habitat and meeting Mexican spotted owl standards and guidelines which emphasize improving and maintaining the quality of the habitat (MA 8 and MA 10) and moving ponderosa pine toward desired forest structure, including northern goshawk and Mexican spotted owl habitats. If these areas are not treated they are susceptible to diseases such as mistletoe and bark beetle, along with stand replacing fires which could wipe out an entire PAC along with foraging habitat as we have seen recently (Diener PAC) outside of the project area on the east side of the Zuni mountains.

<table>
<thead>
<tr>
<th>MA</th>
<th>MA Description</th>
<th>Forestwide Acres</th>
<th>Amendment Acres</th>
<th>Forestwide Acres Affected (Percent)</th>
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<tr>
<td>8</td>
<td>Ponderosa Pine Suitable Timberlands</td>
<td>292,055</td>
<td>2,213</td>
<td>&lt;1%</td>
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</tbody>
</table>

Table 3.5.10. Selected alternative Mexican spotted owl amendment 1 management area (MA) acres
When considering effects to CH, primary constituent habitat elements are reviewed to determine a project’s potential affect. Primary Constituent elements for MSO are related to maintenance of desired forest structure, desired canyon habitat structure and maintenance of adequate prey species habitat.

Under this alternative there is direct effect expected for Mexican spotted owl Critical Habitat. There is critical habitat present within the project area, and vegetation treatments will occur within this habitat. There is approximately 17,000 acres of critical habitat within the project boundary, and both positive and negative effects area expected. Treatment types for ponderosa pine-oak would follow the desired conditions outlined by the Mexican Spotted owl Recovery Plan 2012. Following this plan will improve habitat and prevent large stand replacing fire or other occurrences (such as bark beetle) from happening.

The range of tree species is expected to remain the same, mixed conifer, pine-oak, and riparian forest types will be left within the project boundary. Treatments are expected to keep the 30%-45% range of large diameter trees (12 inches or greater) within the critical habitat boundary, with desired conditions increasing the percentage in future years, along with a range of tree species (mixed conifer, pine-oak, and riparian forest). Canopy cover will open be opened up, with some areas less than 40% but as vegetation grows back that canopy will increase cover to over 40%. This is not expected to have a long term negative effect because it will increase sunlight to the ground level increasing plant species for adequate levels of residual plant cover to maintain fruits, and seeds for prey species. As well as increase overall vegetation within the area. Snags and dead trees 12 inches or greater when measured at 4.5 feet from the ground, this provide cover for prey species.

Riparian habitat restoration may have a positive effect on MSO and its Critical Habitat. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. All plant species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area. Improvement of riparian habitat will also have positive effects on the primary constituent elements for MSO CH.

Range improvements are not expect to have a negative impact on species or critical habitat. These improvements will not alter habitat types, so no change is expected for vegetation. Some of these improvements are water sources with is expect to help wildlife by providing more water sources. Rehabilitation and decommissioning of unauthorized roads is expected to reduce degradation to all habitat within the project area and could improve nesting/roosting/foraging habitat within the project area because minimizing illegal use would also reduce fragmentation of the landscape.
Zuni Flea Bane

No Action

Effects are expected for Zuni Flea Bane under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happen where the species is located. This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommission of 200 miles of unauthorized roads would not occur and could lead motorist to travel illegally in areas where the Zuni Fleabane may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increase use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Zuni flea bane in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May affect species, not likely to adversely affect species” for the Zuni Flea Bane.

Alternative B

Prescribed fire could help the overall habitat within the project area. These treatments are expected to have a positive effects to this species. There are 23,087 acre of habitat for the Zuni flea bane. Not all of these areas will be treated, and little to no mechanical treatment is expected because of the sensitivity of the soil type. The Zuni flea bane is located in areas were soil health is low, and so treatments will be adjusted to have minimal damage in these areas and help improve soil conditions. This will minimize any negative effects to the Zuni fleabane and its habitat. The types of treatments are expected to improve the overall health of the soil, which will improve the habitat for the Zuni Flea bane. These treatments could alter the number of acres for pinyon-juniper habitat, but reduce competition for them which could improve their overall health. Overall this alternative is expected to improve the Zuni fleabane and its habitat.

The two amendment changes are not expected to have any effects to Zuni flea bane or its habitat. The amendments take place outside of Zuni flea bane habitat and soil types.

Range improvements and wildlife trick tanks are not expect to have a negative effect on species. These improvements will not alter habitat types, and range structures tend to be in open areas outside of suitable nesting habitat. Rehabilitation and decommissioning of unauthorized roads is expected is not expected to affect the Zuni fleabane because there are no known unauthorized roads to decommission.
Riparian habitat restoration may have a positive effect on Zuni fleabane. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. All plant species need these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “May affect species, not likely to adversely affect species” for the Zuni Fleabane.

**Zuni Bluehead Sucker & Zuni Bluehead Sucker Critical Habitat**

**No Action**

Effects are expected for the No Action alternative. Without vegetation treatments to the area, thick trees in the area along with down woody debris can lead to increased risk of a stand replacing fire. This could shrink existing vegetation around the Aqua Remora spring area where the sucker occupies. This could increase sun exposure to the spring and intermittent stream which could dry out the area eliminating habitat for the sucker. If a stand replacing fire occurs up stream could also have detrimental effects. Sediment and ash can flow downstream, especially during high flow events, which can ruin the fish habitat. Both of these events can wipe out the population within the National Forest boundary along with the populations off of the forest to the southwest.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Zuni bluehead sucker in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the species may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May affect species, not likely to adversely affect species”.

**Alternative B**

Under this alternative, no direct effect is expected for the Zuni Bluehead sucker. There are no proposed treatments directly crossing or along the Aqua Remora area where Zuni Bluehead sucker are present.

Indirectly the preferred alternative has proposed treatment within the Upper Rio Nutria HUC 6 watershed and the Rio Nutria HUC 5 watershed. The Upper Rio Nutria watershed contains 42,876 acres. The entire area is not being treated only portions within the project boundary. With a design specification and best management practices used effects are expected to be minimal for Zuni Bluehead sucker.

The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of the watershed is expected. Within the watershed there are multiple types of tree species that will be treated. There is approximately 19,290 acres of the Upper Rio Nutria HUC 6 watershed within the project boundary. BMPs would be followed throughout the watershed acres as well as the 34 miles
of stream and within the Upper Rio Nutria watershed where Zuni bluehead sucker critical habitat, this would have positive effects for the riparian areas, streams and springs which could lead to an increase of occupied habitat in the long term future.

Range improvements and wildlife trick tanks are not expect to have an effect on this species because no improvements are going into this area. This is a non-active grazing allotment, so no cows are in the area, and no improvements need to be constructed. No wildlife trick tanks will be place within the Aqua Remora area, because water is already available for wildlife. Rehabilitation and decommissioning of unauthorized roads is expected to reduce degradation to all habitat within the project area because minimizing illegal use would also reduce fragmentation of the landscape and watershed.

The determination for Alternative B is: “May affect species, not likely to adversely affect species and its critical habitat”.

**Southwestern Willow Flycatcher**

**No Action**

There is approximately 250 acres of riparian habitat within the project area. These areas are scattered throughout the project area. Some of these areas have small amounts of willows present. Southwestern willow flycatchers have not been found within the project area. No effects are expected to the species because no treatment work will take place within these areas. Affects may occur if riparian areas are not improved or restored. If this does not happen, riparian areas could dry up, and willows will survive without the water needed. This could lead to a decrease in areas for the southwestern willow flycatcher to migrate to if needed but would not eliminate existing habitat for them.

The determination for Alternative A is: “No Effect is expected for Southwestern willow flycatcher.”

**Alternative B**

Effect are not expected because there will be no thinning or burning within these riparian areas. There is also a buffer around these areas, to prevent any negative disturbance from treatments that are ongoing around riparian area. There are willows within some of the riparian area, but Southwestern Willow flycatchers have not been known to nest there. The only area on the district is in Bluewater Creek which is several miles east of the project boundary. The two forest plan amendments are not expected to have an effect than the original Forest Plan standards and guidelines because those types of treatments will not occur within southwestern willow flycatcher habitat.

Range improvements and wildlife trick tanks are not expect to have a negative impact on species. These improvements will not alter habitat types, and range structures are located outside of suitable habitat because water is already present in riparian area. The structure will be away from riparian area, because water is needed throughout the project area. Decommissioning of unauthorized roads may improve riparian areas, because it could reduce the number of vehicles that travel on them. It would be a reduce compaction to soil, and reduce sedimentation running into riparian area.
Riparian habitat restoration is expected to have a positive impact on riparian habitat, which is a positive impact for southwestern willow flycatchers. Improving these areas will help keep water in the project area, along with riparian vegetation such as willows, sedges, and narrow leaf cottonwoods, and keep springs and stream functioning at healthy levels. Wildlife species need these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “No Effect.”

**Mexican Wolf**

**No Action**

Under this alternative no vegetation treatments would occur, so there would be no effects expected for Mexican wolves because currently there are no known wolves in the areas. If an individual were to find its way to the area water is very important to all wildlife species. By not restoring or projecting water sources such as springs, streams or other riparian areas the wolves would move to other areas where water is more abundant.

The determination for Alternative A is: “Not likely to jeopardize Mexican Wolves.”

**Alternative B**

Currently there are no known wolves within the project area. Fish and Wildlife Service is monitoring all Mexican wolf activity and where they are moving.

Mechanical treatments and prescribed fire could help the overall habitat within the project area. During actual treatments wolves may avoid the area, but once human activity is complete, and vegetation starts to recover, then individuals may move into the area. This effect is not expected to have a negative impact to the overall species. These treatments will also take place at different times, so individuals will have other places to move to while treatment occurs within a single area. Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation such as Gamble’s oak. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Wolves could benefit from these treatments. Understory vegetation types would improve which would provide cover habitat for them. Overall this alternative is expected to improve habitat for Mexican wolves. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of wolf habitat is expected.

Range improvements and wildlife trick tanks are not expected to have a negative impact on this species. These improvements will not alter habitat types, and range structures tend to be in open areas outside of suitable habitat. They may supply water to wildlife species within the area. Decommissioning of unauthorized roads may cause wolves to leave the area while work is ongoing, but once the work is complete they may move into the area because this will reduce habitat fragmentation, and individuals can cross the area easier.
Riparian habitat restoration is expected to have a positive impact on all species. Improving these areas will help keep water in the project area, and keep springs and stream functioning at healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “No Effect.”

**Sensitive Species**

**Spotted Bat**

**No Action**

This alternative could have an impact to spotted bats which may impact species but would not result in a trend toward federal listing or loss of viability because there would be not decommission 200 unauthorized roads. This means that human disturbance could continue to occur in meadows and grass/shrub areas, reducing foraging habitat. Indirect effects are expected for spotted bats because this action can lead to increased use. Security zones for wildlife between the routes would be reduced even further, as the habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. Impacts will become additive, as use increases, and private land development increases as well.

By not restoring up to 250 acres of riparian areas, stream functions, springs, or road drainage crossings this could impact spotted bat because healthy water sources could help foraging and cover habitat for the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Spotted bats.

**Alternative B**

Mechanical treatments and prescribed fire could help the 51,660 acres of spotted bat habitat within the project area. During actual treatments bats may leave the area, but once human activity is complete, they are expected to return to the area. This effect is not expected to have a negative impact to the overall species. These treatments will also take place at different times, so individuals will have other places to move to while treatment occurs within a single area. Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation such as Gamble’s oak. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Spotted bats could benefit from these treatments. Understory vegetation types would improve which would provide cover habitat for bats. Overall this alternative is expected to improve recovery habitat for spotted bats. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of spotted bat habitat is expected.
Range improvements and wildlife trick tanks are not expect to have a negative impact on this species. These improvements will not alter habitat types, and range structures tend to be in open areas outside of suitable habitat. Some of these improvements, depending on their size may also provide water for bats in the area.

Riparian habitat restoration is expected to have a positive impact on spotted bats. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area. Decommissioning of unauthorized roads may cause bats to leave the area while work is ongoing, but once the work is complete they are expected to return to the area.

The determination for Alternative B is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Spotted bats.

**Gunnison’s prairie dog**

**No Action**

This alternative could have an impact to Gunnison’s prairie dog, which may impact species but would not result in a trend toward federal listing or loss of viability because under this alternative there would be no decommissioning of unauthorized routes, which means human disturbance would continue to occur in meadows and grass/shrub areas, reducing foraging habitat.

Indirect effects are expected for Gunnison’s prairie dogs because decommissioning of unauthorized roads would not occur, which could lead to increase motorized use. Security zones for wildlife between the motorized routes would be reduced even further, as the habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. Impacts will become additive, as motorized use increases, and private land development increases as well. User-created routes may increase erosion, which can have impacts to surrounding habitats far greater than just the route surface itself (down cutting and side channeling, as a result of heavy rains). New user-created routes would receive increasing use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

By not restoring up to 250 acres of riparian areas, stream functions, springs, or road drainage crossings this could impact prairie dogs because healthy water sources could help foraging and cover habitat for the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Gunnison’s prairie dogs.

**Alternative B**

Decommissioning of unauthorized roads may cause prairie dogs to leave the area while work is ongoing, but once the work is complete they are expected to return to the area.

Mechanical treatments and prescribed fire could help 3,359 acres of Gunnison’s prairie dog habitat within the project area. During actual treatments Gunnison’s prairie dogs may leave the area, but once human activity is complete, they are expected to return to the area. This effect is
not expected to have a negative impact to the overall species. These treatments will also take place at different times, so individuals will have other places to move to while treatment occurs within a single area. Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation such as Gamble’s oak. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Gunnison’s prairie dogs could benefit from these treatments. Understory vegetation types would improve which would provide cover habitat for Gunnison’s prairie dogs. Overall this alternative is expected to improve recovery habitat for Gunnison’s prairie dogs. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Gunnison’s prairie dog habitat is expected.

Range improvements and wildlife trick tanks are not expect to have a negative impact on this species. These improvements will not alter habitat types, and range structures tend to be in open areas outside of suitable habitat. Some of these improvements, depending on their size may also provide water for bats in the area.

Riparian habitat restoration is expected to have a positive impact on Gunnison’s prairie dogs. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Gunnison’s prairie dogs.

**Pale Townsend’s big-eared bat**

**No Action**

This alternative could have an impact to pale Townsend’s big-eared bat which may impact species but would not result in a trend toward federal listing or loss of viability because there would be not decommission 200 unauthorized roads. This means that human disturbance could continue to occur in meadows and grass/shrub areas, reducing foraging habitat. Indirect effects are expected for spotted bats because this action can lead to increased use. Security zones for wildlife between the routes would be reduced even further, as the habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. Impacts will become additive, as use increases, and private land development increases as well.

By not restoring up to 250 acres of riparian areas, stream functions, springs, or road drainage crossings this could impact spotted bat because healthy water sources could help foraging and cover habitat for the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Pale Townsend’s big-eared bat.
Alternative B
Decommissioning of unauthorized roads may cause bats to leave the area while work is ongoing, but once the work is complete they are expected to return to the area.

Mechanical treatments and prescribed fire could help 52,243 acres of Pale Townsend’s big eared bat habitat within the project area. During actual treatments bats may leave the area, but once human activity is complete, they are expected to return to the area. This effect is not expected to have a negative impact to the overall species. These treatments will also take place at different times, so individuals will have other places to move to while treatment occurs within a single area. Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation such as Gamble’s oak. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Pale Townsend’s big-eared bats could benefit from these treatments. Understory vegetation types would improve which would provide cover habitat for bats. Overall this alternative is expected to improve recovery habitat for Pale Townsend’s big-eared bats. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Pale Townsend’s big-eared bat habitat is expected.

Range improvements and wildlife trick tanks are not expect to have a negative impact on this species. These improvements will not alter habitat types, and range structures tend to be in open areas outside of suitable habitat. Some of these improvements, depending on their size may also provide water for bats in the area.

Riparian habitat restoration is expected to have a positive impact on spotted bats. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “May affect species, not likely to adversely affect species” for the Pale Townsend’s big-eared bats.

Northern Goshawk

No Action
Impacts are expected for northern goshawks under the no action alternative. No vegetation treatments could mean, thick trees in the area along with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out suitable nesting and foraging habitat for the species. Indirectly stand replacing fire would also reduce the understory vegetation, which means prey species such as mice, voles, and prairie dogs could lose their habitat sources and either leave the area or die off, thus reducing goshawk food source. This could reduce the population numbers, which would mean a reduction in population recovery.

Indirect effects are expected for goshawk because under this alternative decommission up to 200 miles of unauthorized roads would not occur. This could lead to increased illegal motorized use.
Even with the travel management decision many users see a two track road and drive on them, whether it’s legal or not. If these roads are not rehabilitated it could lead to continued use. Security zones for wildlife between the routes would be reduced even further, as the habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. Impacts will become additive, as use increases, and private land development increases as well. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increased use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs can affect goshawks in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, goshawks may also leave the area to find habitat with reliable water sources. This can lead to a decline in the overall population of northern goshawks.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Northern Goshawks.

**Alternative B**

Mechanical treatments and prescribed fire could help the overall habitat within the project area. During actual treatments goshawks may leave the area, but once human activity is complete, they are expected to return to the area. This effect is not expected to have a negative impact to the overall species. These treatments will also take place at different times, so individuals will have other places to move to while treatment occurs within a single area. Any treatments within PFAs will occur outside of the breeding season, this would reduce negative effects to breeding pairs. Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation such as Gamble’s oak. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Within goshawk habitat the Northern goshawk guidelines will be in place to help with thinning prescriptions. These prescriptions are used to improve the overall northern goshawk habitat. Understory vegetation types would improve which would provide habitat for prey species such as squirrels, and prairie dogs. Overall this alternative is expected to improve recovery habitat for Northern Goshawks.

Amendment 1, Mexican spotted owl habitat management is not expected to have an impact on Northern goshawk because their habitat is outside of the Mexican spotted owl PACs, and treatments will not change for goshawk under this amendment.

Amendment 2, Management of canopy cover and ponderosa pine with an open reference condition within goshawk habitat is expected to have impacts to northern goshawks. These impacts will be similar to impacts listed above. Bringing stands to uneven age stands will be beneficial for goshawk and their prey inside and outside of their PFAs. Opening up the understories will improve forage and cover for prey species but still be open enough for goshawk
to hunt their prey. Overall this will improve northern goshawk habitat, while maintain a healthy ponderosa pine structure.

Range improvements and wildlife trick tanks are not expect to have a negative impact on species. These improvements will not alter habitat types, and range structures tend to be in open areas outside of suitable nesting habitat. Wildlife trick tanks may even supply water for birds in the areas. These tanks are usually in not visible from roads, and thicker vegetation. Construction of these tanks will occur outside the breeding season if in suitable goshawk habitat.

Riparian habitat restoration is expected to have a positive impact on northern goshawks. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Northern Goshawks.

**Northern leopard frog**

**No Action**

Effects are expected for the No Action alternative. Without vegetation treatments to the area, thick trees in the area along with down woody debris can lead to increased risk of a stand replacing fire. This could shrink riparian areas that northern leopard frog may use if present. This could increase sun exposure to the spring and intermittently stream which could dry out the area eliminating habitat for the sucker. If a stand replacing fire occurs up stream could also have detrimental effects. Sediment and ash can flow downstream, especially during high flow events, which can ruin riparian areas. Both of these events can reduce riparian habitat within the National Forest boundary which could reduce any suitable habitat that may be present with in the project area. The two forest plan amendments are not expected to have an effect than the original Forest Plan standards and guidelines because those types of treatments will not occur within Northern leopard frog habitat.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may impact norther leopard frog habitat in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the species may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Northern Leopard Frogs.

**Alternative B**

Effect are not expected because there will be no thinning or burning within these riparian areas. There is also a buffer around these areas, to prevent any negative disturbance from treatments that are ongoing around riparian area.
Range improvements and wildlife trick tanks could have an impact on the species. These improvements will not alter habitat types, and range structures are located outside of suitable habitat because water is already present in riparian area. The structure will be away from riparian area, because water is needed throughout the project area. But due to the fact earth tanks provide water to an area where there is none, could attract any frog in the area to use these water sources for habitat. This could help the species expand their habitat, with some individuals being directly impacted by cattle and other ungulates that use the area. Wildlife trick tanks are not expected to impact the frogs. Decommissioning of unauthorized roads may improve riparian areas, because it could reduce the number of vehicles that travel on them. It would be a reduce compaction to soil, and reduce sedimentation running into riparian area.

Riparian habitat restoration is expected to have a positive impact on riparian habitat, which could be a positive impact for Northern leopard frogs. 259 acres of riparian habitat will have improvements occurring within the project area. There will be no work directly in the riparian areas which is expected to have no impacts to the frogs. Springs are expected to have improvements to preserve them and the water source. Improving these areas will help keep water in the project area, along with riparian vegetation such as willows, sedges, and narrow leaf cottonwoods, and keep springs and stream functioning a healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Northern leopard frog habitat is expected.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Northern Leopard Frogs.

Villous groundcover milkvetch

No Action

Effects are expected for villous groundcover milkvetch under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happen where the species is located. This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommission of 200 miles of unauthorized roads would not occur and could lead motorist to travel illegally in areas where the Villous groundcover milkvetch may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increase use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.
Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect villous groundcover milkvetch in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Villous Groundcover Milkvetch.

**Alternative B**
Decommissioning of unauthorized roads are may impact the villous groundcover milkvetch. Roads that are being decommissioned could improve soil condition by eliminating the existing road, which would also keep traffic off, which eliminated compaction. Once this is complete, the plant species could start to grow along the old roads, which would help their overall population.

Mechanical treatments and prescribed fire could help the 40,750 acres of Villous groundcover milkvetch habitat within the project area. These treatments are affect to have a positive effects to this species. The villous groundcover milkvetch is located in areas were soil health is low, and so treatments will be adjusted to have minimal damage in these areas. The types of treatments are expected to improve the overall health of the soil, which will improve the habitat for the villous groundcover milkvetch. These treatments would alter the number of acres for pinyon-juniper habitat, but reduce competition for them which could improve their overall health.

Overall this alternative is expected to improve habitat for villous groundcover milkvetch. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Villous groundcover milkvetch habitat is expected.

Range improvements and wildlife trick tanks are not expect to have a negative effect on species. These improvements will not alter habitat types, but cattle do tend to gather around watering holes, which prevents plants from growing in the immediate area. These structure are staying in the same footprint, so no additional ground disturbance is expected. Before any new structures go up, specialist will check the area to make sure this species is not present.

Riparian habitat restoration may have a positive effect on villous groundcover milkvetch. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. All plant species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Villous Groundcover Milkvetch.

**Sivinski’s fleabane**

**No Action**
Effects are expected for Sivinski’s Flea Bane under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happen where the species is located.
This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommission of 200 miles of unauthorized roads would not occur and could lead motorist to travel illegally in areas where the Sivinski’s Fleabane may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increase use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Sivinski’s Flea Bane in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Sivinski’s Flea Bane.

**Alternative B**

Decommissioning of unauthorized roads are may impact the Sivinski’s Flea Bane. Roads that are being decommissioned could improve soil condition by eliminating the existing road, which would also keep traffic off, which eliminated compaction. Once this is complete, the plant species could start to grow along the old roads, which would help their overall population.

Mechanical treatments and prescribed fire could help 25,701 acres of Sivinski’s Flea Bane habitat within the project area. These treatments are affect to have a positive effects to this species. The Sivinski’s Flea Bane is located in areas where soil health is low, and so treatments will be adjusted to have minimal damage in these areas. The types of treatments are expected to improve the overall health of the soil, which will improve the habitat for the Sivinski’s Flea Bane. These treatments would alter the number of acres for pinyon-juniper habitat, but reduce competition for them which could improve their overall health. Overall this alternative is expected to improve habitat for Sivinski’s Flea Bane. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Sivinski’s fle A habitats is expected.

Range improvements and wildlife trick tanks are not expect to have a negative effect on species. These improvements will not alter habitat types, but cattle and other ungulates do tend to gather around watering holes, which prevents plants from growing in the immediate area. These structure are staying in the same footprint, so no additional ground disturbance is expected. Before any new structures go up, specialist will check the area to make sure this species is not present.

Riparian habitat restoration may have a positive effect on Sivinski’s Flea Bane. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. All plant species needs these areas to keep populations healthy and sustainable. Also
keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Sivinski’s Flea Bane.

**Zuni milkvetch**

**No Action**

Effects are expected for Zuni milkvetch under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happen where the species is located. This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommission of 200 miles of unauthorized roads would not occur and could lead motorist to travel illegally in areas where the Zuni milkvetch may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increase use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Zuni milkvetch in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Zuni Milkvetch.

**Alternative B**

Decommissioning of unauthorized roads are may impact the Zuni milkvetch. Roads that are being decommissioned could improve soil condition by eliminating the existing road, which would also keep traffic off, which eliminated compaction. Once this is complete, the plant species could start to grow along the old roads, which would help their overall population.

Mechanical treatments and prescribed fire could help 25,701 acres of Zuni milkvetch habitat within the project area. These treatments are affect to have a positive effects to this species. The Zuni milkvetch is located in areas were soil health is low, and so treatments will be adjusted to have minimal damage in these areas. The types of treatments are expected to improve the overall health of the soil, which will improve the habitat for the Zuni milkvetch. These treatments would alter the number of acres for pinyon-juniper habitat, but reduce competition for them which could improve their overall health. Overall this alternative is expected to improve habitat for Zuni milkvetch. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Zuni milkvetch habitat is expected.
Range improvements and wildlife trick tanks are not expect to have a negative effect on species. These improvements will not alter habitat types, but cattle and other ungulates do tend to gather around watering holes, which prevents plants from growing in the immediate area. These structure are staying in the same footprint, so no additional ground disturbance is expected. Before any new structures go up, specialist will check the area to make sure this species is not present.

Riparian habitat restoration may have a positive effect on Zuni milkvetch. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. All plant species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Zuni milkvetch.

Arizona leatherflower Clustered leatherflower

No Action
Effects are expected for Arizona leatherflower Clustered leatherflower under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happen where the species is located. This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommission of 200 miles of unauthorized roads would not occur and could lead motorist to travel illegally in areas where the Arizona leatherflower Clustered leatherflower may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes would receive increase use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Arizona leatherflower Clustered leatherflower in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Arizona leatherflower Clustered leatherflower.

Alternative B
Decommissioning of unauthorized roads are may impact the Arizona leatherflower Clustered leatherflower. Roads that are being decommissioned could improve soil condition by eliminating the existing road, which would also keep traffic off, which eliminated compaction.
Once this is complete, the plant species could start to grow along the old roads, which would help their overall population.

Mechanical treatments and prescribed fire could help 7,407 acres of Arizona leatherflower Clustered leatherflower habitat within the project area. These treatments are affect to have a positive effects to this species. The Arizona leatherflower Clustered leatherflower is located in areas where soil health is low, and so treatments will be adjusted to have minimal damage in these areas. The types of treatments are expected to improve the overall health of the soil, which will improve the habitat for the Arizona leatherflower Clustered leatherflower. These treatments would alter the number of acres for pinyon-juniper habitat, but reduce competition for them which could improve their overall health. Overall, this alternative is expected to improve habitat for Arizona leatherflower Clustered leatherflower. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Arizona leatherflower Clustered leatherflower habitat is expected.

Range improvements and wildlife trick tanks are not expect to have a negative effect on species. These improvements will not alter habitat types, but cattle and other ungulates do tend to gather around watering holes, which prevents plants from growing in the immediate area. These structure are staying in the same footprint, so no additional ground disturbance is expected. Before any new structures go up, specialist will check the area to make sure this species is not present.

Riparian habitat restoration of 250 acres may have a positive effect on Arizona leatherflower Clustered leatherflower. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. All plant species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

A determination for this Alternative is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Arizona leatherflower Clustered leatherflower.

**Chaco milkvetch**

**No Action**

Effects are expected for Chaco milkvetch under the no action alternative. No vegetation treatments could mean, trees with down woody debris can lead to increased risk of a stand replacing fire. This could wipe out the species if the fire happen where the species is located. This could reduce the population numbers, which would mean a reduction in population recovery.

Effects to this species are expected because decommission of 200 miles of unauthorized roads would not occur and could lead motorist to travel illegally in areas where the Chaco milkvetch may occur, which could have a negative effect. User-created routes can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the trail surface itself (down-cutting and side channeling, as a result of heavy rains). New user-created routes
would receive increase use from all types of recreation users over time adding to the current density of routes by an as yet unknown amount.

Water is very important to all species, by not doing improvements to riparian areas, streams, and springs may affect Chaco milkvetch in the long term. These areas can dry up over time if not monitored and managed properly. If the water goes away, the plants in this area may decline, which could reduce the overall population of the species.

The determination for Alternative A is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Chaco milkvetch.

**Alternative B**

Decommissioning of unauthorized roads are may impact the Chaco milkvetch. Roads that are being decommissioned could improve soil condition by eliminating the existing road, which would also keep traffic off, which eliminated compaction. Once this is complete, the plant species could start to grow along the old roads, which would help their overall population.

Mechanical treatments and prescribed fire could help 25,701 acres of Chaco milkvetch habitat within the project area. These treatments are affect to have a positive effects to this species. The Chaco milkvetch is located in areas were soil health is low, and so treatments will be adjusted to have minimal damage in these areas. The types of treatments are expected to improve the overall health of the soil, which will improve the habitat for the Chaco milkvetch. These treatments would alter the number of acres for pinyon-juniper habitat, but reduce competition for them which could improve their overall health. Overall this alternative is expected to improve habitat for Chaco milkvetch. The two forest plan amendments are not expected to have a different effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of Chaco milkvetch habitat is expected.

Range improvements and wildlife trick tanks are not expect to have a negative effect on species. These improvements will not alter habitat types, but cattle and other ungulates do tend to gather around watering holes, which prevents plants from growing in the immediate area. These structure are staying in the same footprint, so no additional ground disturbance is expected. Before any new structures go up, specialist will check the area to make sure this species is not present.

Riparian habitat restoration may have a positive effect on Chaco milkvetch. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. All plant species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

The determination for Alternative B is: “May Impact Species but Would Not Result in a Trend toward Federal Listing or Loss of Viability” for Chaco milkvetch.

**Migratory Birds and MIS**

No Action
Under the no action alternative impacts are expected. Vegetation treatments would not occur, which would leave veg types as they currently are. But due to all of the dense trees and debris on the ground, a large wildfire can wipe out large portions of the vegetation and reduce the overall number of acres for each veg type. For some species this could impact them negatively, by eliminated nesting habitat within the project area. Other species such as elk and deer could come back to the area once the understory vegetation such as grasses and forbs begin to grow back. Overall this would not cause any species to decline in numbers due to the existing habitat surrounding the project area.

Areas where trees are dense and canopy cover is thick, these areas would continue to keep sunlight from the understory vegetation. This would not help understory vegetation such as grasses and forbs and could eliminate them in some areas.

Illegal use of unauthorized roads would could lead to increase use of motorized travel in areas where MIS species may occur, which could stress individual species causing them to leave them area. Security zones for wildlife between the routes would be reduced even further, as habitat becomes increasingly more fragmented. Unrestricted winter and summer use would increase disturbance (noise) impacts to wildlife incrementally over time. New user-created roads could receive increasing use from all types of recreation users over time adding to the current density of trails and roads by an as yet unknown amount. Also under this alternative there would be no rehabilitation of unauthorized motorized routes which means human disturbance would continue to use in between designated routes throughout the project area causing wildlife to move during critical times and increase stress.

No riparian habitat would be improved, but due to the low numbers of acres within the project area, impacts are expected to be minimal.

**Alternative B**

Decommissioning of unauthorized roads may cause wildlife to leave the area while work is ongoing, but once the work is complete wildlife is expected to return to the area. In areas of nesting bird species, this would occur outside the breeding season which would minimize this impact.

Mechanical treatments and prescribed fire could help the overall habitat within the project area. During actual treatments wildlife will leave the area, but once human activity is complete, wildlife species will return to the area. This impact is not expected to have a negative impact to overall species populations. These treatments will also take place at different times, so individuals will have other places to move to while treatment occurs within a single area. Ponderosa stands would open up, which would open up the canopy, and improve the health of the understory vegetation. These treatments would alter the number of acres for ponderosa, mix conifer, and pinyon junipers habitat, but reduce competition for them which could improve their overall health. Management indicator species would benefit from these improvements. Improvement of grazing, and foraging habitat would help species such as deer, elk and turkey. Understory vegetation types would improve which would provide cover and protection from weather such as rain and snow, and would also provide protection for animals with young. Overall this alternative is expected to lead to an upward trend to Management indicator species and their habitat types. The two forest plan amendments are not expected to have a different
effect than the original Forest Plan standards and guidelines. The effects will remain the same, meaning overall improvement of migratory birds discussed above habitat is expected.

Range improvements are not expect to have a negative impact on species. These improvements will not alter habitat types, so no change is expected for vegetation. Some of these improvements are water sources with is expect to help wildlife by providing more water sources.

Riparian habitat restoration is expected to have a positive impact on management indicator species. Improving these areas will help keep water in the project area, and keep springs and stream functioning a healthy levels. Wildlife species needs these areas to keep populations healthy and sustainable. Also keeping these water sources up will help the overall vegetation communities within the project area.

**Cumulative Effects for all species discussed above**

**Alternative A**

Under the No Action Alternative, no mechanical treatments, prescribed fire, riparian restoration, range improvements, wildlife trick tank installation, and decommission of unauthorized roads would not occur within the projection boundary. With the travel management decision many users see a two track road and drive on them, whether it’s legal or not. If these roads are not rehabilitated it could lead to continued use. Unrestricted winter and summer use would increase disturbance (noise) impacts to all threatened, endangered and sensitive species incrementally over time and private land development increases as well. User-created trails can be expected to increase erosion, which can have impacts to surrounding habitats far greater than just the road surface itself (down cutting and side channeling, as a result of heavy rains). New user-created roads would receive increasing use from all types of users over time, adding to the current density of roads by an as yet unknown amount.

Ongoing projects such as WUI treatments, cattle grazing, mountain bike trails, horse trails, hiking trails and timber treatments are expected to continue as regeneration takes place; unrestricted OHV use off of roads/trails may create routes through these treatments after they occur (since habitat will be more open). This potentially reduces forage recovery (and wildlife security) in the thinned areas. In areas such as washes and areas of more gentle terrain (low ridges between the washes), loss of vegetation could potentially be severe in these dry habitats, reducing forage for wildlife and increasing erosion. Areas where mining exploration occurs and possible actual mining in the future may also have an impact on wildlife. Noise disturbance from the equipment used within the mine may keep wildlife away from surrounding areas of suitable foraging habitat. Cumulative impacts over time to wildlife from noise disturbance and habitat loss would be greatest under the No Action Alternative and could impact species listed in this document.
Alternative B
Cumulative impacts to threatened, endangered and sensitive species listed above are discussed in this section; it focuses impacts to wildlife species from noise disturbance, direct mortality, and habitat degradation. The boundary for cumulative effects is the Zuni mountain range. Treatments and projects considered as past, present, and reasonably foreseeable future actions include: prescribed burns; WUI fuels reduction treatments; cattle grazing; special use permits; timber thinning; dead and down fuel wood gathering; mining and exploration.

Mechanical treatments, prescribed fire, riparian restoration, range improvements, wildlife trick tank installation, and decommission of unauthorized roads along with cattle grazing, past timber harvesting and past prescribed burning have been ongoing, could have an effect to wildlife. Individual species would have to find other areas for security during times when human disturbance is present, meaning their habitat could be fragmented and less secure.

Ongoing projects such as WUI treatments, cattle grazing, fuel wood gathering of dead and down timber, and timber treatments are expected to continue. This potentially reduces forage recovery (and wildlife security) in the disturbed areas. In areas such as washes and areas of more gentle terrain (low ridges between the washes), loss of vegetation could potentially be severe in these dry habitats, reducing forage for wildlife and increasing erosion. Areas where exploration occurs and possible actual mining in the future may also have an impact on wildlife. Noise disturbance from the equipment used within the mine may keep wildlife away from surrounding areas of suitable foraging habitat. Cumulative impacts over time to wildlife from noise disturbance and habitat improve could occur under this Alternative. These effects are not expected to cause a decline in population for threatened or endangered species or lead in a trend toward federal listing for sensitive species.

3.6 Recreation Resources

Affected Environment
There are three developed sites located within the analysis area, two campgrounds and one day use site. The campgrounds include Quaking Aspen and McGaffey, and the day use site McGaffey Lake fishing site.

There are approximately 80 miles of non-motorized trails within the analysis area, 27 existing and 53 under construction. These trails are manage as pack and saddle, bicycle, and hiker/pedestrian. There are two existing trailheads and one proposed for construction associated with this trail system with in the analysis area. There are approximately 11 miles of motorized ATV trails within the analysis area.

Forest Service recreation management is guided by the Recreation Opportunity Spectrum (ROS), which allocates and manages outdoor recreation opportunities and activities by natural resource
setting. The analysis area contains three of the six ROS classes. The distribution of the ROS classes in the analysis area is shown in the table and map below. ROS is a framework for understanding the relationships and interactions between recreational benefits from the Forest and the settings in which the users experiences them.
Figure 3.6.1. Developed Recreation Sites, Trails and Recreation Opportunity Spectrum
Environmental Consequences

Alternative A – No Action

Developed recreation sites and motorized & non-motorized use would continue within the analysis area. Forest users would retain motorized and non-motorized access within the analysis area.

There would be no impact to developed recreation sites, trails, and trailheads. These recreation sites will continue to be managed to meet public health and safety standards and optimum use. Recreationist seeking developed site experience would continue to use the recreation sites throughout the summer use season.

This alternative provides the greatest opportunity for uninterrupted motorized and non-motorized recreation activities described in the affected environment as compared with Alternative B. Motorized trails would remain open to wheeled vehicle traffic except during wildlife Habitat Protection Area closure from December 15 through April 15. Non-motorized trails would remain open year round and dispersed recreation use would continue to occur. Forest users would continue to utilize all existing trailheads, non-motorized trails, and dispersed recreation sites without any project activity interruptions.

Alternative B

There will be no direct effects to the developed recreation sites and site management since the majority of the vegetation treatment and prescribed burn activities would occur outside the designated recreation site. However, there are some treatments that are proposed to occur within the recreation sites. For those activities, there will be direct effects to Quaking Aspen and McGaffey campgrounds, and the day use fishing site at McGaffey Lake. For thinning in the campgrounds, there is a potential of damaging recreation improvements during thinning and burning operations. This effect would be minimized by implementing the design criteria to avoid

Table 3.6.1. ROS distribution in the analysis area

<table>
<thead>
<tr>
<th>ROS Class</th>
<th>Acres</th>
<th>Percent of Area</th>
<th>Where found within the analysis area?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roaded Natural (RN)</td>
<td>25,369</td>
<td>31</td>
<td>RN is a natural appearing environment with low to moderate interaction between users. RN is found along New Mexico State Highway 400, County Road 50, NFSR 151, 164b, 164c, 191, 503a and 547.</td>
</tr>
<tr>
<td>Semi-Primitive Motorized (SPM)</td>
<td>52,790</td>
<td>66</td>
<td>SPM is a natural appearing environment of large size with low interaction between users and the opportunity for a high degree of interaction with the natural environment. SPM encompass the majority of the analysis area outside of the RN corridors.</td>
</tr>
<tr>
<td>Semi-Primitive Non-motorized (SPNM)</td>
<td>2,653</td>
<td>3</td>
<td>SPNM is a natural appearing environment of large size with low interaction between users and the opportunity for a high degree of interaction with the natural environment. SPNM is found near the old Continental Divide radar site and east of Barometer Mountain.</td>
</tr>
</tbody>
</table>
dropping trees on recreation infrastructure and improvements along with pile burning with these recreation sites. Proposed thinning, lop/scatter, and burning would have minimal impact to motorized and non-motorized trails but for the thinning with commercial removal, the impact to trails would be through disturbance of the trail tread during timber extraction operation.

Thinning trees in the campground would improve site management and experience for users through a healthy and aesthetically pleasing environment within the recreation sites. In addition, the risk of damage from a wild fire to the facilities and improvements would decrease as a result of thinning trees. There are no anticipated management changes to the developed sites because thinning and prescribed burn activities will be conducted after the campgrounds have been closed for the season.

This alternative would have a direct effect on recreation uses and motorized and non-motorized access within the analysis area. Public access into cutting/burning units would be affected, specifically during periods of operation. A majority of the non-motorized trail access could be affected up to a year or more, depending on size, terrain, type of prescription within the unit, and weather conditions (Olson, 2017). Timing of operation would occur year round therefore restricted recreation access would vary depending on the implementation schedule. Follow up prescribed burning activities would limit dispersed recreation access during burning operations which generally are 3 to 5 day duration depending on the size of the unit.

The greatest impact would occur to the non-motorized trail users where portions of all the non-motorized trails within the analysis area overlap with the proposed activities which would result in user displacement during implementation. As displaced non-motorized trail users seek to enjoy outdoor recreation activities, they could begin to develop new unauthorized trails. Mountain bikers in particular have expressed dismay to closing areas off to mountain bike use (Zuni Mountain Trails Project EA, 2017). To a lesser extent, displacement would occur to motorized trail users during implementation of this project. The motorized use community are even more vocal about limiting motorized access or closures (Travel Management EA, 2009).

**Cumulative Effects**

The analysis area has been impacted, in the past, to some degree by various past, present, and reasonable foreseeable future actions. Activities include timber harvest prescribed burns, livestock grazing, road maintenance, and implementation of ZMTP.

A temporal and spatial bounding overlap analysis was used to determine the cumulative effects. Spatial data is not available for the prescribed burn activities therefore no spatial overlap was analyzed. There are no temporal overlaps with past timber and prescribed burn activities but there are temporal overlaps with grazing, road maintenance, and ZMTP implementation.

There are no cumulative effects to the Developed Recreation Resources from grazing, prescribed fires, and road maintenance. Even though livestock grazing occurs during the summer season, livestock are not permitted within the recreation sites. Prescribed fires have occurred more than 10 years in the past and considered to be outside the temporal bounding for cumulative effects. Road maintenance effects are limited to the road prism.

There are no cumulative effects to recreation opportunities and displacement from livestock grazing or road maintenance because dispersed recreation opportunities would not be interrupted despite some temporal and spatial overlap. Road maintenance occurring where the non-motorized trails intersect system roads generally takes less than an hour to complete. The incremental contributions from the past, present, and foreseeable future projects will not exceed the threshold for develop and dispersed recreation resources.

### 3.7 Scenic Resources

**Affected Environment**

“Scenic Integrity” has to do with the “state of naturalness” or the “state of disturbance created by human activities or alterations”. The existing scenic integrity of the CNF has been mapped during the Forest Plan Revision Process, and identifies the existing condition of scenery. Often scenic integrity has to do with the size, scale, and location of past timber harvest units and road building and how these past activities relate to the inherent landscape character (Agriculture Handbook 701, Landscape Aesthetics: A Handbook for Scenery Management, Chapter 2, Scenic Integrity, pages 2-2 through 2-7). Existing Forest Plan direction for Visual Quality Objectives (VQO) will be adhered to until the Record of Decision for the revised Forest Plan is signed.

The majority of the Rio Puerco project area consists of landscapes with existing Moderate scenic integrity. There are inclusions of High, and Very Low scenic integrity but these are very site specific. The following defines the Scenic Integrity levels represented in the Rio Puerco project area:
Table 3.7.1. Existing Scenic Integrity in Project Area

<table>
<thead>
<tr>
<th>Scenic Integrity Level</th>
<th>Definition</th>
<th>Acres in Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Landscapes where the valued landscape character “appears intact” have high scenic integrity. Deviation may be present but must repeat the form, line, color, texture and pattern common to the landscape character so completely and at such a scale that they are not evident. In the project area, landscapes with High scenic integrity include the Hogback ridge and Bill Spring/Cottonwood Canyon area.</td>
<td>906</td>
</tr>
<tr>
<td>Moderate</td>
<td>Landscapes where the valued landscape character “appears slightly altered” have moderate scenic integrity. Noticeable deviations must remain visually subordinate to the landscape character being viewed. Moderate scenic integrity areas in the project area are those where past timber harvesting and road building have taken place. The majority of the project area is Moderate, meaning past activities are slightly evident.</td>
<td>78,418</td>
</tr>
<tr>
<td>Low</td>
<td>Landscapes where the valued landscape character “appears moderately altered” have low scenic integrity. In these areas, deviations begin to dominate the valued landscape character being viewed while still borrowing from valued attributes such as size, shape, edge effect, and pattern of natural openings or vegetation type changes. No acres of Low occur in the project area.</td>
<td>0</td>
</tr>
<tr>
<td>Very Low</td>
<td>Landscapes where the valued landscape character “appears heavily altered” have very low scenic integrity. In these areas, deviations may strongly dominate the valued landscape character being viewed.</td>
<td>439</td>
</tr>
</tbody>
</table>

Visual Quality Objectives (VQO) are measurable standards for the management of visual resources of the landscape. Refers to the degree of acceptable alterations of the characteristic landscape based on the importance of aesthetics. Visual Quality Level (VQL) was the title given during the inventory. Because of intensive review in this process, the levels will now be called “Objectives” for the land. Objectives used in the ALRMP are:

Table 3.7.2. Existing Visual Quality Objective in Project Area

<table>
<thead>
<tr>
<th>Visual Quality Objective</th>
<th>Definition</th>
<th>Acres in Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retention</td>
<td>Man’s activities are generally not evident to the casual visitor. In the project area, landscapes with a VQO of Retention include steep areas in full view of County Road 50 west of McGaffey Lake and west of State Highway 400 north of Quaking Aspen Campground.</td>
<td>602</td>
</tr>
<tr>
<td>Partial Retention</td>
<td>In general man’s activities may be evident but must be subordinate to the characteristic landscape.</td>
<td>34,857</td>
</tr>
<tr>
<td>Modification</td>
<td>Man’s activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color and texture. Man’s activities should appear as natural occurrences when viewed from foreground or middle ground.</td>
<td>22,922</td>
</tr>
<tr>
<td>Maximum Modification</td>
<td>Man’s activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.</td>
<td>22,638</td>
</tr>
</tbody>
</table>
Landscape Visibility

Landscape visibility addresses the relative importance and sensitivity of what is seen and perceived in the landscape. The project area is quite large and can be viewed from a variety of locations within and outside of the project boundary. The best locations to view scenery within the project area are from high use roads, recreation sites, and trails. These viewpoints are considered most important in evaluating changes to scenery since they receive the greatest amount of use and since most recreation users have a high degree of sensitivity to or appreciation of visual quality/scenery. Distance is also imperative to viewer experience and perception of scenery. Foreground is the \( \frac{1}{4} - \frac{1}{2} \) mile in front of the observer, and the immediate foreground is 300 feet in front of the observer, and is also High Sensitivity. Middle ground is 3-5 miles from the observer, and Background is 5 miles and beyond from the viewer.

Existing Landscape Character

The existing landscape, or scenic, character describes the physical appearance and cultural context of a landscape giving an area a scenic identity or ‘sense of place.’ The existing scenic character provides a baseline from which to measure impacts to visual quality from proposed project activities. The following existing scenic character is taken from the Cibola National Forest Scenic Character Report, done in 2015 as part of Forest Plan Revision.

The Rio Puerco project area is located within the Zuni Mountains. Within the Forest Service’s "The National Hierarchical Framework of Ecological Units" (ECOMAP 1993), the project area lies within the Colorado Plateau Semi-Desert Province, Navajo Canyonlands Section, Subsections 95, North Plains and Subsection 107, Mountain Division.

Valued Landscape Attributes

The Zuni Mountains are a significant visual element in the landscape in central northwest New Mexico. The Zuni Mountains provide the natural backdrop which defines a sense of place for many communities including towns, villages and pueblos. The Zuni Mountains are not very steep, but gentle rolling mountains and hills. They were formed by volcanic activity and erosion. Vegetation is dominated by ponderosa pine at higher elevations and pinyon-juniper types on the lower slopes. Distinctive vegetation includes riparian fingers along intermittent and perennial streams and a few pockets of aspen and Engelmann spruce.

Landscapes viewed from State Highway 400 include the historic landscape around Ft Wingate. McKenzie Ridge is viewed on the north side south of McGaffey campground. Oso Ridge is visible in the southwestern portion of the project area.

Slopes

Dominant landforms include gently rolling slopes with hills and valleys adjacent to the steep scarp slopes. Common landform features include mountains, piedmonts, alluvial fans, tilt-block faulting, structural domes and stream terraces. A few scarp slopes and rock outcrops define the
distinctive landform. The area is characterized by horizontal sandstone beds that have been subject to great erosion creating tablelands, cuestas, rock terraces, retreating escarpments, shallow canyons, and dry washes. The hogback in the south west portion of the division is a distinctive landform.

**Vegetation**

Common vegetative species include ponderosa pine and scattered patches of pinyon-juniper, patches of alderleaf mountain mahogany and ponderosa pine-Douglas fir mix. Gambel oak is the primary understory species other than grasses. Aspen is another distinctive vegetation type. Deciduous shrubs and pockets of aspen provide contrasting colors and textures among the evergreen species. Deciduous trees add striking visual diversity, especially when intermingled with conifer stands. These trees also create an impressive scenic impact in the fall when the leaves have turned shades of golden and bright yellow.

Many meadows occur to the east of Fort Wingate and northeast of Forest Roads 178 and 140 between Bluewater Creek and the Zuni River. The dry meadows that are dominated by grasses including western wheatgrass and grama mix. Some showy species include iris, yarrow, and cinquefoil.

**Riparian**

Riparian areas along intermittent and running creeks have isolated trees or patches of narrowleaf cottonwood, Scouler willow, and arroyo willow. Distinctive riparian vegetation corridors occur along portions of The Notches, the west side of Johnny Mack Corral, along Bluewater Creek and in the Rice Park area. Understories of some creeks and riparian areas associated with some springs have plants like Nebraska sedge, beaked sedge, baltic rush, tufted hairgrass, spike rushes, monkey flower and Kentucky bluegrass. (Dick-Peddie 1993; Brown 1994; Zeedyk 1996).

**Past Visual Impacts**

The ponderosa pine forest here experienced extensive railroad logging during the early part of this century. Favorable topography and a relatively continuous pine forest facilitated a heavy and widespread tree harvest during that time. This area has experienced additional harvest entries since the railroad logging days, but tractor logging has been the primary means of removal (Tidwell 1996). Railroad logging, wildlife habitat improvement projects including prescribed fire, fuel reduction projects with prescribed fire, and unauthorized fuelwood gathering have impacted the landscape, creating the current vegetative mosaic. Fires suppression has contributed to a loss of seral stage development in the forest canopy leading to a more mature forest and openings are being encroached with trees. Some understories are being lost to thickening of stands of vegetation.
The area was overgrazed in the late 1800’s prior to being managed as Forest Service lands. However, in response to the increased demand for meat and wool during World War I and II Congress directed the Forest to quadruple stocking rates. Conditions were so deteriorated in some areas that recovery didn’t begin until sometime in the 1950 -1960’s.

**Environmental Consequences**

The evaluation criteria for direct and indirect effects to scenic resources will be based on an evaluation of the following:

- Immediate scenic effects of project activities
- Whether VQOs are being met throughout the project area

Analysis is evaluated on the basis that the project area is most often viewed at distances of 300 feet (immediate foreground) from high use travelways and developed sites, where scenery is dominated by the forest canopy and understory.

Analysis of effects assumes the implementation of the scenery design features and mitigation measures are incorporated in all action alternatives.

**Alternative A – No Action**

The VQOs of the project area would continue to be met under the No Action alternative due to no alterations caused by the project activities, and the existing landscape character would continue to change gradually over time by natural processes. However, visual quality within the project area would continue to decline over time. The desired landscape character would likely not be achieved without the intervention of human activities or natural forces such as fire. Further, there would be no opportunities to enhance and improve the scenic quality along high use roads, trails, and developed recreation sites under this alternative since there will be no thinning or other treatments.

If no fuels treatments occur, the project area would continue to be vulnerable to the threat of high severity wildfire. If such a fire were to occur, the VQOs of the project area would be met, because fire is considered a natural part of the ecosystem. However, the current state of the project area is such that if a high intensity wildfire took place, the fire would reshape the existing landscape character. Existing landscape character and desired landscape character would not be met until vegetation fully recovered. The appearance and character of the area would shift from densely forested to patchy and open, depending on the severity of the fire. For several years, the landscape would be dominated by blackened, dead and downed trees; if allowed to come down on their own, the trees would likely fall in a dense, jack-straw pattern. These changes would be visible throughout the project area in the foreground, middleground, and background of the project areas’ roads, trails, and developed recreation sites. The effects would also have limited visibility as background features from areas outside the project area such as from I-40.
Initial public reaction to a fire may be negative, as many people do not consider a catastrophic, stand-replacing fire with its extensive, blackened landscapes to be natural appearing. These effects are often perceived by forest visitors as interesting but as a degradation of the scenic quality nonetheless. In addition, emergency fire suppression actions such as fire lines and emergency post-fire treatments could result in unnatural appearing scars on the landscape. With proper mitigation measures, the effects of the suppression and emergency treatments would not be evident to the casual forest visitor within one to two years of completion, although effects from the fire itself would remain visible far longer. Within two or three years, public perception would begin to change and the effects of the fire would be viewed in a more positive light as the understory component of grasses and shrubs moved in and as aspen regenerated. Opportunities for scenic viewing, particularly during fall color, would increase and improve with aspen regeneration; however, it would take several years to be realized.

**Alternative B**

Proposed mitigations are intended to reduce impacts to the scenery resource and ensure the project meets or exceeds VQOs at the end of implementation. The VQOs of retention, partial retention, modification, and maximum modification located throughout the project area would be met with the implementation of this alternative with the integration of the scenery mitigation measures, particularly as conditions moved toward the desired landscape character. Overall, the scenic quality would improve as the diversity of tree species, size, and spatial distribution increased. Generally speaking, as a result of this alternative, viewers would see a more open landscape, an increase in sunlight to the forest understory, and a greater visual penetration into the understory as a result of the proposed activities. Thinning trees along NM 400 and County Road 50 would have a positive effect on the scenic quality as views to the Hogback, McKenzie Ridge, and Oso Ridge are opened up and enhanced.

**Mechanical Treatment**

The proposed action calls for machine and hand piling and prescribed burns following mechanical treatment. Mechanical treatments include, but are not limited to: use of chainsaws or feller-bunchers to cut trees and lop slash, skidders to move material to landings, bulldozers to pile slash, and specialized equipment such as feller-buncher or track-type hot saws, and tree shears to cut, chop, break, and lop fuel material. Some areas would be hand-thinned using chainsaws only due to resource concerns such as sensitive soils. In these areas, slash would be hand piled without the use of heavy machinery.

There would be a slight to moderate effect on scenic quality during and immediately following implementation of these treatment methods (1-3 years for mechanical treatment). If used, the track-type hot saw would have less ground impacts than other equipment since it sits in one spot to operate. Where this equipment has been used on other projects, typically stumps are cut flush unless prevented by rocks or other natural features.
The presence of skid trails, landings, temporary roads, stumps, and piled or scattered slash would also result in a moderate reduction of the scenic quality for the duration of the project. The effects in these areas would not be long-term since skid trails and temporary roads would be rehabilitated and activity generated slash would be removed upon completion of the project. Additionally, if scenery mitigation measures are incorporated there will be minimal effects as activities will avoid the 300 ft. immediate foreground surrounding roads, trails, and recreation sites. In areas using machine piling (the majority of the total project area), large machine piled slash would be visible at landings immediately following thinning. Until piles are removed or burned, piles would dominate the scenery at the landings.

Machine piling also often leads to surface disturbance and destruction of ground covers. Disturbed ground cover would also appear visually evident to the casual observer traveling along high use roads and trails. The ground disturbance resulting from using machines to pile slash would be noticeable for at least 1 year after project completion, depending on how quickly the areas were rehabilitated and vegetation regenerated. Proposed mitigations such as avoiding placing landings and temporary roads in the immediate foreground of high use areas, immediate rehabilitation of any disturbances to system trails, flush-cut to low stump heights, and prompt treatment of slash ensure that treatments meet VQOs following project implementation. Forest Plan direction requires slash to be treated in Retention and Partial Retention areas, so VQOs will be met in the short and long-term.

Where generated product is left for public fuelwood removal, there will be a short-term impact to visual quality due to the lop and scatter material visible. If mitigations are incorporated and this material is placed outside of the 300ft immediate foreground, impacts to scenery would be minimal. Additionally, any effects would be resolved once fuelwood gathering occurs, which is anticipated to occur shortly after project completion. Once these materials are removed, the VQOs would be met.

Over time, these treatments would result in stands appearing slightly more open and more diverse over time when compared to the existing condition, although the difference may not be noticeable to the casual forest visitor, particularly when driving along the roads. The resulting forest structure would be clumpy groupy, with openings and uneven-aged managements with a reduction in canopy cover, meeting overall desired scenery characteristics. These would be positive effects on scenery.

The impact to scenery during implementation would be minimal as hand thinning produces smaller piles than mechanical treatment would. Mitigation measures ensure that slash piles would be pulled 300’ back from the immediate foreground where possible, and that the slash would be burned promptly. Some post-burn effects may be visible, but would be localized and would recover in 3-8 years.
Hand thinning
The impact to scenery during implementation would be minimal as hand thinning produces smaller piles than mechanical treatment would. Mitigation measures ensure that slash piles would be pulled 300’ back from the immediate foreground where possible, and that the slash would be burned promptly. Some post-burn effects may be visible, but would be localized and would recover in 3-8 years.

Fuelwood Removal
Where vehicles will be used to access the harvested trees for fuelwood there may be some ground disturbance. In the immediate foreground this appears as disrupted forest litter (fallen needles, leaves and other natural debris) and exposed soil, which is often lighter in appearance to the surrounding area. During the period where trees are being cut and removed, residual slash will be visible. This would give a coarse textural quality to the ground, until ground cover has been established. It is anticipated that within five years, the color contrast created by the ground disturbance will be reduced as normal forest litter is deposited and ground cover has been established.

Prescribed Fire Treatment

Initial Burn
Prescribed fire would result in short-term, moderate reduction in scenic quality. Depending on fire severity, short-term visual distractions would include smoke, burn scars, blackened or scorched understory, burnt soil, and dead and dying vegetation from the prescribed burn. Prescribed burning has potential to occur throughout the calendar year, dependent on moisture conditions of fuels and weather patterns. Surrounding communities and recreation visitors may be impacted by smoke from burning activities, depending on wind and ventilation conditions. Short-term impacts of smoke are lack of visibility and obscuring of scenery, and are temporary. Smoke from a prescribed burn occurs only for the duration of the burn, and the smoke produced from a prescribed burn results in low intensity smoke that dissipates into the atmosphere. Comparatively, smoke from a high-intensity wildfire can heavily impact an area’s air quality and visibility for weeks and months.

Over the long term, use of prescribed fire and other treatments identified in the project would result in a more varied forest structure with desirable visual characteristics such as open park-like stands, views into the forest, and species diversity.

Pile burn
This management prescription would occur prior to initial entry prescribed burning as a method for removing slash produced from thinning activities. This clean-up burn is essential for improving the aesthetic acceptability of these areas. The burned area following initial burns of slash piles would not recover immediately; it often takes 3-8 years for native vegetation to
become established due to some soil sterilization following burning. Following burning, small amounts of blackened, partially burned materials would still be visible, and some trees near the burned piles are expected to be singed. There would be small pocked areas of tree mortality resulting from tree singe adjacent to some piles. When all slash piles have been treated through burning, all residual material has been removed after pile burning, and vegetation within disturbed ground areas has begun to reestablish, VQOs would be met.

In the long-term, these treatments would lead the project area to the desired conditions for scenery, creating a more visually acceptable forest stand and improvements to species composition and diversity that is overall compatible with desired scenic character.

**Maintenance burn**

Maintenance burns would take place to mimic natural return intervals every 2-10 years depending on fuel accumulations. The low to moderate intensity maintenance burns would result in the consumption of surface litter, logs and mortality of small groups of trees. Smoke would be visible during the burning operations. Post burning, blackened soil, trunks, dead or dying vegetation, or partially burned slash, dead and downed trees would be visible. The maintenance burn would promote a more open understory, a preferred landscape aesthetic. Following prescribed burning, the understory grass and shrub vegetation would become noticeable after one to two growing seasons. Long term improvements in soil and vegetation health would encourage a more sustainable stand of forest allowing for improved visual qualities.

**Roads and Improvements**

Existing roads would be used to the extent possible for hauling harvested trees. Any temporary roads created for the project would not be added to the forest transportation system and would be decommissioned after project was completed.

During road construction, vegetation would be cleared and pruned to accommodate trucks and other equipment, the road prism would be defined and surfaced with aggregate, and drainage features (e.g. rock-lined low water crossings) would be installed. Upon completion of the project, these temporary roads would be recontoured, ripped and reseeded, returning them to their original condition to the extent feasible. Effects associated with constructing these temporary roads would be very noticeable throughout the duration of the project in the immediate foreground and would diminish after the roads were decommissioned. The overall effect on the scenic quality would be slight to moderate.

In addition, this project is proposing to decommission up to 200 miles of unauthorized roads. This would improve scenic quality in the immediate areas, and would slightly improve the scenic integrity in the area.
High Viewpoints
Some of the proposed treatments may be visible during the short-term, project implementation period from surrounding high viewpoints such as McGaffey Lookout. Those treatments visible from this perspective may include prescribed burns and associated smoke, temp roads and landings, but are all short-term and would be visible only during project implementation. Long-term effects of the Proposed Action would increase scenic quality as viewed from long distances at high elevations; forest would appear more open with varied structure and density.

Aspen, Meadow, and Spring Restoration
In areas where meadows and springs are restored, this treatment would produce the significant result of moving these areas to desired scenic quality, by reintroducing a valued scenic element back into the landscape and sustaining it over time.

Fencing could be a method of aspen treatment to exclude elk from aspen and oak regeneration. There would be a slight, localized visual impact from the fence line while it is in place. This impact would be offset by the restoration of the aspens, an important visual element of the desired landscape character description. Following treatment, aspen would be visible to forest visitors, providing year-round texture and color interest for fall foliage viewing.

Fencing may be constructed to protect springs and deter ungulates, encourage riparian vegetation growth, and protect the quality of the spring. Water would be released to restore and recreate the riparian area, providing new habitat for wildlife. There would be a slight, localized visual impact from the fence line while it is in place; however mitigation measures ensure that VQOs would be met and to ensure stability of scenic quality. This proposed action would have the added benefit of enhancing scenic quality around the springs in the long term, as the restored water features would provide increased wildlife viewing and overall scenic interest.

Conclusion
The proposed action would result in a forest that more closely reflects the natural range of variability and desired conditions for scenery. Scenic quality would be enhanced as the diversity of tree species, size, and spatial distribution increased. Throughout much of the project area, stand density would be reduced. The views along major use roads would be more diverse. Visitors traveling along these corridors would experience a sequence of enclosures and openings that add variety and afford more expansive views into the project area. Natural meadows would be restored and aspen stands protected, which would increase visual diversity and place more emphasis on these valued scenic features. Stands would feature clumped, uneven-aged groups interspersed with openings. The understory component of shrubs, grasses and forbs would develop and respond to the open canopy conditions, further increasing visual diversity. Overall, scenic interest and resources would be improved in the project area through implementation of the proposed action treatments.
Cumulative Effects

Cumulative effects in the project area include past, present, and foreseeable future timber harvesting, prescribed burning, road reconstruction, recreational use, and grazing. Any change to the visual resource from these alternatives would be in addition to past harvests and this analysis includes all past and present effects.

Timber Harvesting Activities

Past timber harvesting has occurred in the project area. This past timber harvesting can be viewed from the main roads and trails within the project area. This past harvesting activity is reflected in the existing Moderate scenic integrity of the area. By improving the health of the forests within the project area through reduction of existing vegetation density, this alternative would combine cumulatively with other restoration projects past, present, and future within the immediate project area in reducing the threat of catastrophic wildfire. The reduction of existing vegetation density from these restoration projects would result in the long term in a forest structure closer to desired conditions for scenery.

Road Maintenance

Open forest roads in the project area would continue to be maintained into the future. These activities include improving road and surface drainage, clearing of roadside vegetation, and repair and maintenance of culverts. Visual effects of this type of work are short-term (less than 5 years) and often go unnoticed by forest visitors.

Recreation

The analysis area has been impacted, in the past, to some degree by various past, present, and reasonable foreseeable future actions listed in Appendix B. Activities include timber harvest prescribed burns, livestock grazing, road maintenance, and implementation of Zuni Mountain Trail Project (ZMTP).

A temporal and spatial bounding overlap analysis was used to determine the cumulative effects. Spatial data is not available for the prescribed burn activities therefore no spatial overlap was analyzed. There are no temporal overlaps with past timber and prescribed burn activities but there are temporal overlaps with grazing, road maintenance, and ZMTP implementation.


There are no cumulative effects to the Developed Recreation Resources from grazing, prescribed fires, and road maintenance. Even though livestock grazing occurs during the summer season, livestock are not permitted within the recreation sites. Prescribed fires have occurred more than
10 years in the past and considered to be outside the temporal bounding for cumulative effects. Road maintenance effects are limited to the road prism

There are no cumulative effects to recreation opportunities and displacement from livestock grazing or road maintenance because dispersed recreation opportunities would not be interrupted despite some temporal and spatial overlap. Road maintenance occurring where the non-motorized trails intersect system roads generally takes less than an hour to complete. The incremental contributions from the past, present, and foreseeable future projects will not exceed the threshold for develop and dispersed recreation resources.

**Forest Plan Revision and Update to Scenery Management System**

As the Cibola National Forest Land and Resource Management Plan revision is completed and implemented, the Visual Management System would be updated to the Scenery Management System, which focuses more on existing and desired scenic integrity and landscape character. All Forest projects undertaken by the Forest Service in the future would consider scenery, and would intend to move forest landscapes to desired conditions, desired landscape characters, and scenic integrity objectives, therefore having a beneficial impact on scenic resources.

### 3.8 Transportation

**Affected Environment**

There are 151.7 miles of National Forest System (NFS) roads (system roads) in the analysis area. When referring to the route number of a system road, the acronym NFSR is often used. Table 3.8.1 displays the NFS road miles in the analysis area by maintenance level (ML).

<table>
<thead>
<tr>
<th>Maintenance Level</th>
<th>Length (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11.2</td>
</tr>
<tr>
<td>2</td>
<td>132.4</td>
</tr>
<tr>
<td>3</td>
<td>8.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>151.7</strong></td>
</tr>
</tbody>
</table>

The Forest Service uses five maintenance levels: ML 1 to ML 5. An ML 1 road requires the least amount of maintenance effort and an ML 5, the greatest. There are no ML 5 roads in the analysis area. ML 1 roads are closed to all motorized traffic for periods exceeding one year. ML 2 roads are maintained for high clearance vehicles. These are typically single lane roads with a native material surface and limited turnouts. ML 3 and 4 roads are maintained for standard passenger cars and generally provide for a greater degree of driver comfort. ML 3 roads typically have a gravel surface, while ML 4 roads can be surfaced with either gravel or asphalt. Complete descriptions of the road MLs can be found in the Transportation Specialist Report.
In addition to the system roads, there are approximately 187 miles of unauthorized routes that exist in the analysis area. The term unauthorized route can be defined as:

- a road or trail that was created by repeated off-road travel along the same path, without the knowledge and approval of the Forest Service, or
- A temporary road constructed by the Forest Service for a particular project that was planned for, but not decommissioned/rehabilitated when it was no longer needed.

Some of the unauthorized roads adversely affect the surrounding environment through degradation of wildlife habitat, vegetation or soil productivity, interruption of natural hydrologic processes, or disturbance to archeological sites. They also provide access for illegal wood product removal activities.

Figure 3.8.1 shows the motor vehicle designations for the system roads in the analysis area. These designations resulted from the Mt Taylor Ranger District Travel Management decision signed in 2011. There are 23.4 miles of unauthorized roads that were designated for motor vehicles under the Travel Management decision. The designation of these roads is pending archaeological clearance.
Figure 3.8.1. National Forest System Roads in the Puerco Project
Environmental Consequences

**Alternative A**

Because no activities would be proposed under this alternative, road maintenance would be accomplished only as funding allows and priorities dictate. The road maintenance budget for the Cibola National Forest has decreased substantially over the last several years. As a result, annual road maintenance has not been accomplished on many of the roads in the analysis area for some time.

**Alternative B**

No new roads, permanent or temporary, would be constructed for this project. All wood products generated from project activities would be removed from NFS lands using NFS roads, motorized NFS trails and unauthorized road. Unauthorized roads are not system roads. All unauthorized roads used for project activities would be decommissioned when they are no longer needed for these activities, as funding allows.

For roads located on flat or gentle terrain, decommissioning treatments typically consist of decompacting the road surface, seeding the disturbed soil, and spreading slash over the seeded area to retain moisture and eliminate motorized traffic on the disturbed surface. Additional treatments are sometimes required if the road has a steep grade or is located on a side slope. For a road with a steep grade, water bars may need to be constructed to divert runoff from the road surface at intervals sufficient to prevent rutting of the surface during rain events. For a road segment located on a side slope, runoff patterns are restored to as near natural as practicable by pulling the fill material up and blending it with the natural ground. This treatment is generally referred to as recontouring.

A seasonal restriction (Appendix C) for wildlife habitat protection is in place for a portion of the analysis area. The roads or road segments located within the restriction area are closed to the public between December 15th and March 30th.

ML 1 roads used for project activities would be changed to ML 2 during implementation. When no longer needed for project activities, these roads would be returned to ML 1 status, unless they were designated for motor vehicle use under the 2011 Travel Management decision. All unauthorized road used for project activities would be decommissioned/rehabilitated when no longer needed, unless they were designated for motor vehicle use under the 2011 Travel Management decision.

Use of most of the primary proposed haul routes is restricted in some way, or the road would need a moderate-to-substantial amount of work prior to use with commercial hauling vehicles.
There are segments of NFSRs 50, 164C, 164H, 166 and 464 with no Forest Service right-of-way (Table 3.8.2). Easements, or some other form of permission, would have to be acquired from the landowners prior to use for project activities.

Table 3.8.2. Road Access Concerns.

<table>
<thead>
<tr>
<th>Route No.</th>
<th>Location (T,R,S)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>154BB</td>
<td>13N,16W,22,23</td>
<td>No apparent legal access to this road.</td>
</tr>
<tr>
<td>154BC</td>
<td>13N,16W,22,23</td>
<td>No apparent legal access to this road.</td>
</tr>
<tr>
<td>154BD</td>
<td>13N,16W,22,23</td>
<td>No apparent legal access to this road or across private.</td>
</tr>
<tr>
<td>164C</td>
<td>14N,15W,12,13</td>
<td>FS easement across private at north end but encountered locked gate during field visit.</td>
</tr>
<tr>
<td>164H</td>
<td>14N,15W,16</td>
<td>Segment through state land with no apparent FS easement.</td>
</tr>
<tr>
<td>164HB</td>
<td>14N,15W,16</td>
<td>Segment through state land with no apparent FS easement.</td>
</tr>
<tr>
<td>166</td>
<td>14N,14W,28,32</td>
<td>No FS easement for private at north end.</td>
</tr>
<tr>
<td>191D</td>
<td>13N,16W,9</td>
<td>No FS easement across private.</td>
</tr>
<tr>
<td>402A</td>
<td>13N,15W,30</td>
<td>No apparent legal access to this road.</td>
</tr>
<tr>
<td>459A</td>
<td>12N,15W,7,8,17</td>
<td>No apparent legal access to this road.</td>
</tr>
<tr>
<td>464</td>
<td>14N,14W,28,32</td>
<td>Segments through State and private land with no apparent FS easement.</td>
</tr>
<tr>
<td>465</td>
<td>13N,14W,5; 14N,15W,36</td>
<td>No FS easement across private.</td>
</tr>
<tr>
<td>494</td>
<td>13N,16W,21,22,23</td>
<td>No FS easement across private.</td>
</tr>
<tr>
<td>494B</td>
<td>13N,16W,23</td>
<td>No FS easement across private.</td>
</tr>
<tr>
<td>50</td>
<td>11N,13W,18,19; 12N,14W,19,20,28,29,33</td>
<td>Easements needed for six separate segments.</td>
</tr>
<tr>
<td>50I</td>
<td>12N,15W,10; 12N,15W,15</td>
<td>No FS easement across private (3 segments).</td>
</tr>
<tr>
<td>50IC</td>
<td>12N,15W,10; 12N,15W,15</td>
<td>No apparent legal access to this road because of access concern on NFSR 50I.</td>
</tr>
<tr>
<td>50ICA</td>
<td>12N,15W,10; 12N,15W,15</td>
<td>No apparent legal access to this road because of access concern on NFSR 50I.</td>
</tr>
<tr>
<td>50ICB</td>
<td>12N,15W,10; 12N,15W,15</td>
<td>No apparent legal access to this road because of access concern on NFSR 50I.</td>
</tr>
<tr>
<td>50J</td>
<td>12N,15W,13</td>
<td>Private segment south to NFSR 50 with no apparent FS easement. Also, not sure if 50 there is county road (county road layer doesn't show as their road).</td>
</tr>
<tr>
<td>NM-400</td>
<td>Bridge #4186 has a posted load limit of 17 tons for 2-axle truck, 22 tons for 3-axle truck, or 38 tons for 5-axle truck.</td>
<td></td>
</tr>
</tbody>
</table>

There is a timber bridge on NM-400 with a reduced load rating because of its deficient condition. The bridge is located approximately 1.7 miles south of Interstate 40 and crosses the Rio Puerco. The load limit for the bridge is 17 tons for trucks configured with 2 axles, 22 tons for 3 axles, and 38 tons for 5 axles.

Most of the potential haul routes would require nothing more than routine maintenance. Several of the potential primary haul routes would require substantially more then what could be
considered as routine maintenance. The following is a summary of the additional work that would be required for some on these haul routes:

- NFSR 547 would need extensive drainage and surface erosion repair prior to use with commercial hauling vehicles, primarily along the northern seven miles, through Six Mile Canyon. There are several culverts that are undersized and would need to be replaced with larger culverts. Roadside drainage would need to be reestablished in spots, and the road template would need to be repaired at several locations.

- Much of NFSR 50 is located in a valley bottom. The road has poor drainage and has not been maintained in many years because of the inability to acquire easements for many of the private segments along the road. Substantial road template and drainage reconstruction work would need to be completed prior to use by commercial hauling vehicles.

- Portions of NFSR 164C, 164H and 164HB would require a substantial amount of surface and drainage reconstruction work. This work may include raising the road surface and adding drainage features.

- Forest Road (FR) 166 is a previously decommissioned road. Portions of this road would require a substantial amount of surface and drainage reconstruction work. This work may include raising the road surface and adding drainage features.

There are three National Forest System trails (NFST) in the analysis area: 2301, 2302 and 2303. The last 2.7 mile segment of NFSR 191J was converted to motorized trail (NFST 2301) under the Travel Management decision. Use with full size vehicles is prohibited on this segment. There is an unauthorized road identified as a potential haul route that would not be accessible without access on 191J.

The first 2.7 mile segment of NFSR 496A and all of NFSR 496B were designated as motorized trail under the Travel Management decision. This road and road segment are considered shared features. They maintain their status as National Forest System road but were added to the trail system as NFST 2302. While designated as a NFS trail, use with full size vehicles on these routes is prohibited. The motor vehicle designation would have to be changed to use these routes as access to treatment areas.

The vast majority of the potential haul routes are native surface roads and are not suitable for use when wet.

**Cumulative Effects**

There are no anticipated cumulative effects resulting from the combination of the proposed activities related to this project and any ongoing or reasonably foreseeable future projects.
3.9 Heritage Resources

Tribal Consultation

The Cibola National Forest consults with seven American Indian Tribes and 13 Chapters of the Navajo Nation regarding proposed projects and management activities on the Mt. Taylor Ranger District. These include: the Hopi Tribe, the Navajo Nation, and the Pueblos of Acoma, Laguna, Zuni, Jemez, and Santa Ana and the following Navajo chapters: Baca/Prewitt, Casamero Lake, Crownpoint, Mariano Lake, Ojo Encino, Ramah, Smith Lake, Thoreau, To’hajiilee, Torreon, Whitehorse Lake. In 2016, the Forest began consulting with the Baahaali and Churchrock Chapters.

Consultation pursuant to Section 106 of the National Historic Preservation Act was initiated in 2013. The Puerco Landscape Restoration project was highlighted in the Forest’s annual project consultation letter sent to the Tribes and Chapters in 2013, and again in 2014 and 2015. Project consultation meetings were initiated in the summer of 2013 and have continued into 2018. The Cibola National Forest has received additional comments during project consultation and other meetings.

The Zuni Mountains are regarded as culturally significant by all the Tribes consulted, and are used on an ongoing basis by most for a variety of traditional activities. All the Tribes regard springs and other natural water sources as significant, culturally and ecologically.

Navajo traditional use of the Zuni Mountains is widespread. Based on past consultation with the Navajo Nation Historic Preservation Department, several geographic landforms of cultural significance and areas of traditional use have been identified in the Zuni Mountains, a few of which are located within the Puerco project area. In addition, over the past several years, cultural items thought to be Navajo in origin have been discovered during archaeological inventory for this project; all are located in treatment areas where prescribed burning and/or vegetation treatment is proposed.

The Pueblo of Laguna has acknowledged its use of the Zuni Mountains for traditional activities, however those activities appear to be focused in the eastern portion of the Zuni Mountains, outside of the project boundary. The Pueblo has stressed the importance of retaining and protecting Douglas fir due to its ongoing use in ceremonial activities.

The Pueblo of Zuni has indicated that its key areas of concern involve springs, watershed health, erosion, sedimentation, and water for the Zuni Bluehead sucker. Under a partnership between the Forest Service and the Zuni Cultural Resource Enterprise, Zuni Pueblo’s Cultural Resource Advisory Team is preparing to conduct a cultural inventory at several springs within the Puerco project area in anticipation that restoration at some of the springs will be accomplished as part of project implementation.
To date, the Pueblos of Acoma and Jemez have not provided any specific comments or expressed any concerns regarding the Puerco project. The Pueblo of Santa Ana has indicated it does not have any concerns or comments about the Puerco project.

To date, no Tribe has expressed concern that the forest restoration treatments being proposed will have an impact upon culturally significant sites or traditional practices. Those Tribes that are engaged in the Zuni Mountain Collaborative Forest Landscape Restoration partnership (CFLRP) have participated in aspects of the data collection and planning process for this project, and have expressed support for the agency’s forest restoration efforts. Some treatments may result in improved opportunities for the collection of forest products, including fuelwood.

**Affected Environment**

Cultural resources represent the tangible and intangible evidence of human behavior and past human occupation. They may consist of archaeological sites, historic-age buildings and structures, traditional use areas and cultural places that are important to a group’s traditional beliefs, religion or cultural practices. The following discussion provides information on contemporary Native American uses, documentation of tribal consultation, and a summary of archaeological sites within the area of potential effect.

The types of archaeological sites previously located within the Puerco Analysis Area have been divided into 12 general archaeological site type categories outlined below. Many of these sites have been previously evaluated for eligibility into the National Register of Historic Places. Many of the sites with unknown temporal affiliation are lithic scatters with no diagnostic material. The sites found in the project also vary in size and function. Sites range from low intensity use areas, small-large residential structures, pictographs, mining features, and homesteads.

**Lithic scatter:** Surface scatter of cultural artifacts and debris that consists entirely of lithic (i.e., stone) tools and chipped stone debris, but which may also contain other or additional artifact types such as pottery or bone artifacts, to a camp which contains habitation features, such as hearths, storage features or occupation features, or to other site types that contain different artifacts or features.

**Ceramic Scatter:** Surface scatter of cultural artifacts and debris that consists entirely of ceramic sherds and fragments of ceramic vessels. This is a common prehistoric site type that is contrasted to a cultural material scatter, which contains other or additional artifact types such as lithic or bone artifacts, to a camp which contains habitation features, such as hearths, storage features or occupation features, or to other site types that contain different artifacts or features.

**Corral/Animal Pens:** Historic Log or brush enclosures used to confine livestock.

**Mineral Extraction Site:** Locations where mineral resources were either mined or dug from its natural source. In the past, the Zuni people extracted turquoise and azurite from sources in the...
Zuni Mountains. Historically, mines looking for copper, silver, and fluorspar have been dug within the Zuni Mountains.

**Peeled Trees**: Culturally modified trees, typically ponderosa pine, used for sustenance, culinary, and medicinal purposes.

**Railroads**: Transportation. Railroad logging was once very prevalent in the Zuni Mountains and many remnants such as railroad grades, trestles, and crossings remain.

**Rock Art**: Images or symbols carved, drawn, or painted onto immovable rock surfaces. Images that are carved or engraved into rock are called petroglyphs. Images made with paint or other pigment are referred to as pictographs. Some rock art images, like painted petroglyphs, were created using a combination of techniques.

**Rock Shelters**: Shelter bluffs or stone overhangs used or occupied by people in the past.

**Stone structures**: Contact or precontact structures or buildings constructed of stone and or masonry. Precontact structures are typically roomblocks and foundations, historical structures may be home or farmsteads, or associated with mining or logging.

**Traditional Cultural Properties**

There are six categories of features that may also be TCP’s

- Springs
- Trails
- Shrines
- Offering places
- Cairns
- Tinajas

Of these potential TCP feature types, only the vegetation around springs is likely to be affected by the proposed project activities.

**Water Control Features**: Stone or wooden features used to channelize or divert stream flow.

**Wooden Structures**: Structures built or constructed from wooden components. These may range from forked-stick hogans, log cabins and historical structures, to sawmill remnants.

**Environmental Consequences**

Under the regulations, an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a cultural resource that qualify the property for inclusion
in the National Register. Consideration shall be given to all qualifying characteristics of a
historic property, including those that may have been identified subsequent to the original
evaluation of the property’s eligibility for the National Register. Adverse effects may include
reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther
removed in distance or be cumulative. Specific examples of adverse effects cited in statute
include (36 CFR 800.5):

- Physical destruction of or damage to all or part of the property.
- Removal of the property from its historic location.
- Change of the character of the property’s use or of physical features within the property’s
  setting that contribute to its historic significance.
- Introduction of visual, atmospheric or audible elements that diminish the integrity of the
  property’s significant historic features.

Impacts to cultural resources, especially archeological sites, can be generally defined as anything that
results in the removal of, displacement of, or damage to artifacts, features, and/or stratigraphic deposits
of cultural material. In the case of traditional cultural properties and sacred places, additional
considerations may include alterations that would affect the character and use of the location, and/or
presence and availability of a specific traditionally used natural resource.

**Alternative A: No Action Alternative**

Under the ‘No Action Alternative’ the current conditions of the Puerco Analysis Area would
remain the same. There would not be any direct impacts to heritage resources and sites would
only be exposed to the customary and natural threats, such as weathering, erosion, and exposure
to the elements. Indirect effects of the “No Action” alternative include an expected buildup of
fuels, which will lead to more intense wildfire behavior. This may cause increased damage to fire
sensitive archaeological sites exposed to the sustained, intense heat from wildfires.

**Alternative B: Proposed Action Alternative**

**Mechanical and Manual Vegetation Treatments:**

The removal of trees will reduce long-term fuel continuity, fuel loading, and fire hazard. This
type of treatment will benefit cultural resources within the project area by decreasing the
potential for adverse effects caused from high intensity, high severity wildfires. If the mitigation
measures discussed in Chapter 2 are followed, the proposed mechanical and manual vegetation
treatments should have no negative direct effects on listed, eligible and unevaluated cultural
resources.

There is some potential for negative indirect effects of vegetation treatments on cultural
resources. Increased erosion following initial treatments may result from loss of ground cover
and soil disturbance from vehicle use (during mechanical treatments and fuelwood cutting).
There have been few post-treatment studies (if any) that monitor the effects of large scale
vegetation treatments on archaeological sites. Because many of the sites are susceptible to erosion (85 of the 118 sites discussed in the ‘Previous Impacts’ section above), there is some potential for vegetation treatments to increase the amount of erosion across the surface of the site (at least initially – prior to ground cover regeneration). Data from the Cibola National Forest corporate geodatabase indicates that there is a significant amount of ground in the project that lies within areas with soil conditions susceptible to severe erosion impacts. The Proposed Action Alternatives B and C have, however, eliminated these areas from being harvested for timber or fuelwood. While effects from erosion due to mechanical and manual treatments may not be significant, an attempt should be made to monitor sites for erosion impacts following treatments. In addition to erosion, increased site visibility caused by removal of vegetation can substantially increase inadvertent or advertent looting activities.

**Prescribed Fire:**
The use of prescribed fire may have some direct impacts on archaeological sites. These include but are not limited to, the re-firing of ceramic material, melting obsidian artifacts, and the accelerated erosion of site features caused by hydrophobic soils denuding of the ground surface and exposing cultural materials. Sites that are either combustible or include combustible cultural material are the most vulnerable to fire because archaeological material can be completely consumed during a fire event. Although unpredictable creeping and spread of prescribed fires have the potential to damage fire sensitive cultural material, proper mitigation and consultation between the fire management staff and forest service archaeologists will decrease the likelihood of negative direct effects to cultural resources.

The indirect impacts of fire on archaeological sites often have more lasting effects than the direct impacts. Increased site visibility caused by removal of vegetation can substantially increase inadvertent or advertent looting activities. The biggest indirect impact of prescribed fire to site condition, however, is due to increased erosion from loss of ground cover (North et al 2003). Data from the Cibola National Forest corporate geodatabase indicates that there is a significant amount of ground in the project that lies within areas with soil conditions susceptible to severe erosion impacts. The Proposed Action, Alternative B, however, eliminated these areas from being harvested for timber or fuelwood. The only proposed prescriptions in areas with severe soil conditions are prescribed burn treatments. There are 65 sites that are located within project areas with severe soil conditions. Prescribed burn treatments may have some effect on sites in these areas that are susceptible to erosion, but the effect may be negligible. An attempt should be made to monitor sites for erosion impacts following treatments. A catastrophic fire, however, would undoubtedly have more indirect impacts on cultural material than a broadcast burn.

**Cumulative Effects**
The cumulative effects on cultural resources should take into account all surface-altering actions that have occurred or are likely to occur within the Puerco Analysis Area. As discussed in detail in the ‘Previous Impacts’ section of this report, current and previous Forest Service management
activities, public resource procurement and recreational use and natural processes have impacted cultural resources. However, through the use of standard mitigation measures, these impacts have substantially diminished. Within the Forests, there are other planned or reasonably foreseeable activities that may affect cultural resources. Although many of these activities will coincide with the proposed action, if proper mitigation measures are followed and sites sensitive to erosion and fire are monitored during the prescribed burns, it is not anticipated that the cumulative effects will have a significant impact on heritage resources.

3.10 Range Management

Affected Environment
The table identifies the seven grazing allotments affected and the number of acres to be treated across the landscape. The existing conditions and information on each grazing allotment were obtained from 2210 Allotment Folders.

Table 3.10.1. Puerco Allotments and Proposed Treatments

<table>
<thead>
<tr>
<th>Allotments</th>
<th>Total Acres of Allotment</th>
<th>Total Acres of Vegetation Treatments</th>
<th>Proposed Range Improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prewitt/6A</td>
<td>39,173</td>
<td>33,289</td>
<td>8</td>
</tr>
<tr>
<td>Wingate</td>
<td>28,642</td>
<td>28,378</td>
<td>7</td>
</tr>
<tr>
<td>Brennan</td>
<td>3,993</td>
<td>3,650</td>
<td>7</td>
</tr>
<tr>
<td>Berger 167</td>
<td>167</td>
<td>167</td>
<td>1</td>
</tr>
<tr>
<td>Stinking Springs</td>
<td>6,841</td>
<td>6,739</td>
<td>9</td>
</tr>
<tr>
<td>Dent/Dan Valley</td>
<td>19,214</td>
<td>847</td>
<td>0</td>
</tr>
<tr>
<td>Cottonwood/Las Tuces</td>
<td>53,869</td>
<td>196</td>
<td>0</td>
</tr>
<tr>
<td>Dan Off</td>
<td>5,176</td>
<td>2,067</td>
<td>0</td>
</tr>
</tbody>
</table>

Prewitt/6A Allotment
The management unit is a combination of the old Prewitt and 6A grazing allotments. They were combined and have been managed together as one unit for approximately over 25 years to date. The allotment is located near the western end of the Zuni Mountains, approximately 40 miles west of Grants NM and just south of the gas refinery near Gallup NM. There is a total of 39,173 acres of Forest lands within this allotment. In addition to the Forest lands in the allotment, there are approximately 3,600 acres of private and State leased lands that lie with the allotment boundaries and are used in conjunction with Forest lands.

The current stocking rate for Prewitt/6A is a total of 240 mixed/class cattle and season of use is for a total of five months (1,304 AUMs). There are four pastures – Four Mile, Smith/Foster, Red Rock and Sanchez which is managed under a deferred rotation system. The periods of use and stocking rate are determined each year and written in their Annual Operating Instruction (AOI).
Each pastures are usually grazed during a different time each year, providing for varying season of rest for forage species on the allotment from year to year.

**Wingate Allotment**

Wingate Allotment is located at the west end of the Zuni Mountains, approximately 14 miles southeast of Gallup.

The Wingate Allotment is currently permitted for 123 mixed class (M/C) cattle for a period of five months normally from May until October, (627 AUMs). Grazing is carried out utilizing a five pasture rotation system. The permittee tries to rotate through each pasture at a different time each year, however; it depends on availability of livestock water. The adaptive livestock practice helped improved distribution of livestock in response to various factors such as forage growth, drought conditions, recreational events, and other unforeseen events.

The stocking rate on the allotment has been steadily reduced over the years until 1980 when the current stocking rate was established. In 1980 or so, Range analyses and Production/Utilization (PU) studies showed a very poor range condition in the early days of Forest management. The condition has improved markedly over the past 30 to 40 years to a fair to good condition rating. This improvement is no doubt due to the adjustment of livestock used to match actual capacity and improving water distribution to promote proper use of the range resources. Water sources on the allotment are earthen tanks, windmill and distributed by pipelines to drinking troughs.

**Brannon Allotment**

The Brannon Allotment is located between Prewitt/6A and Wingate Allotments in the western portion of the Zuni Mountains, approximately 15 miles southeast of Gallup, New Mexico. There is a total of 3,993 acres of Forest Service lands within this allotment, 2,365 acres of which are classified as “capable” for livestock grazing.

The Brannon Allotment is currently permitted for 40 mixed/class cattle for a period of 6 months each year (05/01 – 10/31). This is a total of 245 AUMs each year. The management plan includes the four pasture, deferred rotation system. Herding and salt placement is used to insure proper livestock distribution and use of the entire allotment.

Each pasture is grazed at a different time each year, providing for varying seasons of rest for forage species on the allotment from year to year. Specific grazing schedules and pasture rotations are outlined each year in the Annual Operating Instructions (AOI).

An intensive allotment inspection was performed on this allotment in August of 2001, in preparation for completing this EA. Grasslands on the allotment were found to be in good to excellent condition, with an upward or static trend. This shows steady improvement over the past 30 years, due to implementation of a proper stocking rate and good management practices.
Stinking Springs Allotment

Stinking Springs Allotment is located south of Gallup NM on the extreme western end of the Zuni Mountains of the Mt. Taylor Ranger District. There are a total of 6,841 acres of Forest lands and capable land are 3,879 acres. It is bordered by Navajo Reservation lands on the west, north by the Army Depot, Zuni Indian Reservation to the south and the Wingate Allotment on the east.

The Stinking Springs Allotment is permitted for 39 head of cow/calf pairs from May 16 to October 15 each year, (207 AUMs). There are three pastures: West, Middle and East. Cattle usually rotate through the pasture depending on available water. The Middle Pasture is the largest and has the most forage production, while the East and West are fairly small due to dense tree cover.

There are two earthen tanks. Navajo dam is partly washed out and should be cleaned out and have the spillway reconstructed with filter cloth and rock on the spillway. Little Bear dam is currently holding water. The fence around the tank is in need of repair. The old corral is made out of wooden pellets and should be removed. The permittee is planning on building a new corral.

In the past, livestock water was provided from Stinking Springs. There is an old fence around the spring which is in bad condition. In the summer of 2016, a new well was drilled above the spring and piped to the storage tank located downstream and to a drinker. Another developed spring, Little Bear Spring is located at the northeastern corner of the allotment and is providing water for livestock and wildlife.

In 1999, the range condition was observed to be mostly in fair. A small portion of the acreage in the southern portion rated poor, but all the grassland type is showing a definite improvement except on the steep slopes and where conifers dominate the vegetation. Forage production was observed to be very good despite a very low snowpack from the winter ranging from 500 pounds to 800 pounds per acre. In the past, utilization was approximately 10% in the West Pasture and ranged from 0% to 15% in the Middle Pasture, and 25% in the northern areas. Re-growth was plentiful when livestock were rotated through the pasture.

Berger Allotment

This management unit is the smallest allotment found on the Mt. Taylor Ranger District. It consists of 187 acres of Forest lands, all of which are classified as “capable” for livestock grazing. It is surrounded by Wingate Allotment near the western boundary of the Mt. Taylor district, in the Zuni Mountains, approximately 15 miles southeast of Gallup, New Mexico.

The allotment is currently permitted for eight mixed/class cattle for a total of four months each year. This is a total of 32 AUMs each year. This small allotment is a one unit with continuous grazing for the four months. Grazing normally occur during the months of May, June, August and September with rest during the month of July. To reflect the adaptive management approach,
the actual grazing period during any specific year has been negotiated between the permittee and the Forest Service.

There is a large earthen tank, known as Prewitt Lake, at the southern end of the allotment. This tank catches large amounts of runoff, and is a relatively consistent source of water for livestock and wildlife in the area.

Livestock have used this area, as well as the whole of the Zuni Mountains, for well over 100 years. Exact usage of this small area is difficult to determine because it was used by different individuals over the years. It was separated out from the surrounding area and used as a special use pasture starting sometime in the 1930’s. A portion of this pasture, at the southern end, just north of FR191, was used as a rodeo ground for some time in the 1940’s and 1950’s. The area was badly damaged by this activity and the vehicle use associated with it. It has taken many years for it to recover.

**Cottonwood/Las Tuces Allotment**

Cottonwood/Las Tuces Allotment is located in the central portion of the Zuni Mountains, approximately 20 miles northwest of Grant NM. It is the largest allotment on the Mt. Taylor Ranger District, encompassing approximately 53,869 acres.

The stocking rate was steadily reduced over the years to bring livestock numbers and use was balanced with the allotment capacity. The current stocking rate of 292 mixed class (M/C) cattle for 5 months (1,460 AUMs) was established since 1997. Livestock are usually split into two herds of unequal size and each herd uses three of the pastures in a deferred rotation system.

Prior to 1948, much of this area was in private ownership. The Forest Service purchased and/or traded for the private lands in this area during the late 1940’s. The Cottonwood Allotment took on its present configuration in 1985 when the Las Tuces Allotment was combined with the Cottonwood Allotment (becoming the Las Tuces Pasture) and the boundaries were firmed up.

There are a number of drainages on the allotment which run water at least intermittently during snowmelt and/or monsoon season. The more prominent of these include Sawyer Creek and Cottonwood Creek. There a number of man-made watering facilities found throughout the allotment, including wells and earthen stock tanks.

**Dent/Dan Valley Allotment**

Dent/Dan Valley Allotment is one unit located north of Ramah NM. There is a total of 19,214 acres of Forest lands within the allotment, of which 11,420 acres are classified as “capable” for livestock grazing.
The stocking rate and season of use for the Dent/Dan Valley Allotment is 64 mixed/class of cattle for five months each year, a total of 326 AMUs. A deferred rotation system based on forage and water availability is used.

**Dan Off Allotment**

Dan-Off, a former allotment, is located to the far southwest end of the Zuni Mountain on the Mt. Taylor Ranger District. The total acres of the area is approximately 5,176 acres. The former allotment is bordered to the south by Zuni Indian Reservation and surrounded by the Navajo Tribal Trust Land and Indian Allotments.

Currently, Dan-Off Allotment is a closed allotment and not permitted to anyone. The last authorized livestock grazing was in 1952 according to the 2210 file. There is no boundary fence around Section 34, T13, R12W and other smaller partial of National Forest System land to the north. Landowners have been maintaining fences that border their private land and Section 36. There is an illegal fence construction done along the road leading to the homes on the Navajo Tribal Trust Lands. In the past, it was reported that 150 sheep and goats, 50 head of cattle and horses were seen to be grazing on the areas various times of the year.

In 2012, a productive/utilization survey was conducted in Section 35. The survey revealed the production varied from 100 to 500 lbs. per acre in Map Unit (MU) 11 which is the valley bottoms. Forage utilization by ungulates ranged from 0% to 20.6%.

**Environmental Consequences**

The following discussion will describe the affects to the seven grazing allotments in relations to vegetation and livestock grazing, and the potential changes to those environments due to proposed Puerco Landscape Restoration projects in each alternative.
Alternative A - No Action

Current livestock grazing and management will continue on the seven allotments. None of the proposed management activities would be implemented under this alternative. No new range improvements would be implemented to address existing vegetation, fuels, wildlife, watershed, recreation or range infrastructure concerns. Improve livestock distribution would not be addressed under this decision. The desire to improve forage production, density and diversity is expected to continue but may not be at the rate as in Alternative 2. However, currently, the allotments are managed under flexible and adaptive management approach which will allow for some improvements.

This alternative would not be consistent with the Cibola National Forest Land and Resources Management Plan (LRMP) over the long term as it would not meet the goals and objectives or provide the desired conditions described in the LRMP, page 33.
Alternative B – Proposed Action

The fuel treatments proposed for the Puerco Landscape Restoration over the next 10 to 15 years would have a varying effects on livestock grazing because the treatments will be done at various times. These treatments are expected to begin in year 2019-2020. Mechanical treatments will occur outside the winter season. In general, the overall effects on the allotments will be beneficial to the rangeland resources that are important for livestock and wildlife grazing.

Where treatments are done, the forage components would increase in production, density, diversity and additional range improvements will be constructed to improve livestock distribution across the allotments. Underutilized rangelands due to dense canopy covers with sparse understory forage and limited livestock watering sources will be improved. Having adequate litter is important for resource protection such as to alleviate quick runoff, prolong erosion and to allow for infiltration of moisture.

Livestock grazing on the seven allotments will continue with livestock grazing with minor adjustment in livestock numbers, season of use and short term grazing deferment in all or portion of the allotment if determined necessary. The actual assessment on the ground will depend on the types of treatment done and will define an alternative management needed to foster the recovery of understory species such as grasses, forbs, shrubs and browed species, and meet the goals and objectives of the Puerco Landscape Restoration Project. These species are important for livestock and wildlife forage needs.

Prewitt/6A Allotment:

The majority of the northern areas of the Prewitt/6A have sensitive Chinle Formation soils that were reclassified from hand thin, lop and scattering slash and prescribe burning to thinning, lop and scattering and no prescribe burning. This will protect soil conditions and reduce potential erosion. However, the area in and around McKenzie Ridge in the northeastern portion of the project area were reclassified from thinning and prescribe burning to burn only.

Approximately 33,289 (85%) acres would be treated out of the total 39,173 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame. Livestock can still graze the pastures as thinning, lop and scatter is accomplished. Cattle are found to keep distance away from the treatment area as demonstrated in the Bluewater Restoration treatment areas. When it comes time to burn atop of McKenzie Ridge, livestock grazing may be deferred for a growing season to allow for understory forage to get re-established and make sufficient growth after the burn. The concern here is some of the treatment areas consists of shallow soil over underlying rock. The recovery of understory vegetation may take longer to start new growth.
The Annual Operating Instructions will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee.

To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

- A new well in Section 19 south end of Red Rock Pasture. T13N, R15W. Section 19
- Re-drill existing well #021070 in Section 18 of Red Rock Pasture extend pipeline to drinkers.
- Re-drill existing well #22275 (Wildcat well) in Smith Canyon, Section 22.
- New well in private land in Section 17 in Fourmile Pasture. Pipeline will be extended to State land.
- New dirt tank in Fourmile Canyon, Section 30.
- Reconstruct fence #022165 approx. 2.5 mile and #021112, interior fence between Smith/Foster and Four Mile Pastures. Approx. 5 miles
- New cattle guard on fence #021100 in Section 26.
- Redirect wash from old gravel pit. Sediment wash out from Un-reclaimed gravel pit in Section 28 & 29 has become a problem.
- Clean out 8 dirt tanks.

**Wingate Allotment:**

Approximately 28,378 (99%) acres would be treated out of the total 28,642 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame. The majority of the treatment on this allotment will include low thin, lop and scatter, no mastication and no burning is proposed on 11,486 acres while thin, commercial removal and burn is proposed on 11,807 acres. This allotment will be most affected by commercial treatments.

The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee.

To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

- Clean out dirt tank #021026
- A new well is proposed but not located yet
- Erosion control in Six Mile canyon
- New cattle guard in Six Mile canyon, redirect water away.
- New cattle guard at Forest entry on Highway 400 from Wingate.
• Reconstruct/repair Six mile well, re-design, need new storage tank and drinkers.
• Reconstruct north boundary fence along Navajo Reservation, approximately 8 miles.

**Brennon Allotment:**
Approximately 3,993 (91%) acres would be treated out of the total 3,650 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame. The majority of the treatments includes thin, commercial removal and burn is proposed on 2,392 acres while thin, lop and scatter or masticate and burn is proposed by 1,075 acres. This allotment will also be most affected by commercial treatments. The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee.

To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

• Clean out 2 dirt tanks and build up dike at Gravel Tank.
• New dirt tank in Section 16.
• Reconstruct fence #021084.
• Clean and fix culverts on roads.
• Reconstruct corral in Recreation Pasture.
• Close two track road at Gravel Tank.

**Stinking Springs Allotment:**
Approximately 6,739 (98.5%) acres would be treated out of the total 6,841 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame. The majority of the treatments includes thin, commercial removal and burn is proposed on 2,981 acres while thin, lop and scatter or masticate and burn is proposed by 2,432 acres. This allotment will be most affected by commercial treatments. Due to machineries, hauling and disturbance on the ground may limit livestock movements.

The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee.

To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

• Erosion control structures in main drainages, downstream from Little Bear Reservoir, Whitewater Arroyo and downstream from Stinking Springs.
• Reconstruct dirt tank in Section 14.
• Clean out tanks – South tank
• Need to create a trail to get to Grasshopper Spring.
• Clean out cattle guard off FR 191 at the top adjoining Wingate Allotment.
• Extend pipeline to corral and put in a trough in Section 15. Will have to cross the Road 419 going to Garcia Ranch.
• Close/decommission unauthorized road near gap of Hogback with erosion control structures.
• Close/decommission unauthorized roads, newly made by wood cutters.
• Remove old barbed wire fence north of Little Bear Tank.

Berger Allotment:
Looking at the allotment map, approximately 80 (50%) acres would likely be treated out of the total 167 acres of the allotment. The eastern portion of the allotment is open grassland with some encroaching ponderosa saplings and seedlings. These treatments in this small could be done in a couple of years rather than over the 10 to 15 year time frame, depending upon availability of funding and personnel.

Thin, lop and scatter, mastication and burning is proposed on 88 acres while thin, commercial removal and burning is proposed on the remaining acres. This small allotment is a one unit with continuous grazing for the months of May, June, August and September with a rest period in July. This break was planned for monsoon season. During cutting and removal of wood products, cattle are likely to graze in the open meadow. After conducting prescribed burning livestock grazing may be deferred for a growing season to allow for understory forage to get established and make sufficient growth after the burn. If determined that livestock need to be deferred for a longer period then the permittee may have to find alternative pastures and may have an economic impact on him.

The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee.

To improve availability and distribution of water to benefit both range and wildlife species across the Puerco project, the following developments and improvements are proposed:

• Clean out Prewitt Tank #021028

Dent/Dan Valley Allotment:
Approximately 847 (4.4%) acres would be treated out of the total 19,214 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame.
The treatment is proposed on the northern edge of the allotment where ponderosa pine mixed stands are abundant. The treatment area is located on the mesa top where livestock grazing is very little to no grazing. Distance from water limits grazing in the northern edge of the allotment. The treatments will have very little effects on livestock grazing.

The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee. In the immediate area of treatment no water development or improvements were proposed.

**Cottonwood/Las Tuces Allotment:**
Approximately 196 (0.36%) acres would be treated out of the total 53,869 acres of the allotment. These treatments would be spread out over a 10 to 15 year time frame. Low thin, lop and scatter, no mastication and no burning is proposed on 97 acres while thin, commercial removal and burn is proposed on 95 acres. This small treatment would have no effects on livestock grazing.

The Annual Operating Instruction will contain any specific instruction about the grazing rotation, season of use and livestock numbers will be discussed and agreed upon with the grazing permittee. In the immediate area of treatment no water development or improvements were proposed.

**Dan Off:**
Of the 5,176 acres, 2,067 (40%) acres is proposed to be treated. Dan Off is a former grazing allotment that is no longer active. The boundary fences have not been maintained. Portions of the former allotment have become an open range utilized by the people residing adjacent to the Forest Service System Lands. Any treatments proposed for the area would not have a direct impact on Forest permitted livestock grazing on the National Forest.

In the immediate area of treatment no water development or improvements were proposed.

**Cumulative Effects**
The geographical extent of the cumulative effects would include the allotments and the surrounding communities. Past, present and future foreseeable actions on the project areas would have an effect on vegetation resources which includes: livestock grazing, wildlife grazing, recreational activities, and along with past timber sales, timber stand improvement thinning, prescribed burning, wild and domestic grazing, riparian improvements projects, recreation projects development (trails for mountain bike, other motorized) and increase invasive and noxious weeds.
3.11 Socioeconomics

Affected Environment

Environmental Justice

Executive Order (EO) 12898 (Office of the President 1994) directs federal agencies to focus attention on the human health and environmental conditions in minority and low income communities. The purpose of EO 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Environmental Justice means that, to the extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by government programs and activities affecting human health or the environment.

Environmental Justice is the fair treatment and meaningful involvement of people of all races, cultures, and incomes, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The goal of environmental justice is for Federal 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.

The emphasis of environmental justice is on health effects and/or the benefits of a healthy environment. The Council on Environmental Quality (CEQ) has interpreted health effects with a broad definition: “Such effects may include ecological, cultural, human health, economic or social impacts on minority communities, low income communities or Indian Tribes…when those impacts are interrelated to impacts on the natural or physical environment” (Council on Environmental Quality 1997).

The Puerco Landscape Restoration Project lies within McKinley County with the southeastern portion located in Cibola County, New Mexico. McKinley and Cibola Counties have a higher proportion of Hispanic and American Indian residents than the United States. Due to the high proportion of Hispanic and American Indian residents in the study area, it has been determined that these ethnic groups meet the Environmental Justice requirements of a minority population meaningfully greater than the population of the nation. Therefore, decision makers should pay careful attention to the potential impacts of management actions on those ethnic groups.

In the U.S., the poverty rate in 2016 (12.7 percent) was not significantly higher than the poverty rate in 2007 (12.5 percent), the year before the most recent recession. McKinley and Cibola Counties are two of the poorest counties in New Mexico. In 2016, the McKinley County poverty
rate was 34.4 percent and the rate for Cibola County was 26.9%. Both of these counties and New Mexico had poverty rates higher than the national average. Such rates suggest that a substantial proportion of the existing population should be considered as a low-income group. Therefore, decisions regarding future management actions on the Mt Taylor Ranger District should carefully assess the effects on low-income populations.

**Economic Conditions and Trends:**
Employment and income statistics are important indicators of economic health. The most common industries in 2016 for McKinley County were Health Care/Social Assistance (29%), Educational Services (21%), and Accommodation and Food Services (11%). In Cibola County the most common industries are similar with Health Care/Social Assistance (23%), Educational Services (13%), and Retail Trade 12%. In the city of Grants, the most common industries are Public Administration (16%), Mining, quarrying, and oil and gas extraction (13%), and Manufacturing (9%). Forestry, fishing & related activities are a non-service related industry with relatively low total employment, however the manufacturing sector in Grants includes a wood processing plant that is dependent on timber being removed from the Cibola National Forest.

**Environmental Consequences**

**Alternative A – No Action**
Socioeconomic conditions of the local communities would not change under this alternative. Residents would not have access to temporary seasonal jobs associated with the forestry.

**Alternative B**
Implementation of the forest landscape treatments would contribute to the surrounding communities, the Pueblos of Zuni, Laguna, Acoma, and the Navajo Nation by creating jobs and meeting tribal member demand for forest products such as firewood. Employment for Pueblo Natural Resources/fire/fuels crews are anticipated in support of implementing landscape restoration treatments by contracting these crew resources to complete treatments in the Puerco Project on the Cibola National Forest. These crews are trained to work in a broad range of forest management activities, including timber falling, wildfire suppression, pile burning, lopping and scattering, forest stand exams, and forest equipment operation.

**Environmental Justice**
In cases where the management decisions are expected to create jobs and income in the local economy, it is unlikely that there would be a disproportionate adverse effect on minority and low income populations. Individuals in those populations may benefit from any increase in jobs and income in the area.
Economic Impacts
In addition to hiring more labor, industries must meet technical requirements by purchasing more equipment, supplies, and other inputs to production. Some of these purchases will be made from other local industries; for example, additional fuel purchased by the logging companies at local gas stations increases the output in the oil and gas industry.
4 Consultation and Coordination

Interdisciplinary Team Members
- Alvin Whitehair – District Ranger
- Shawn Martin – Forest Silviculturist
- Ian Fox – Natural Resource Staff/Timber Management Officer
- Anthony Pacheco - Fire and Fuels Management
- Virginia Ashley-Yazzie – Range Management
- Consuelo Lemaire – Wildlife Biologist
- Cynthia Benedict - Tribal Consultation and Cultural Resources
- Doug Kosik - Heritage Resources
- Livia Crowley - Soil and Water Resources
- Jessica Dunn - Scenic Resources
- Richard Graves – Transportation Engineer
- Arnold Wilson - Recreation and Trails
- Rob Arlowe – GIS
- Daniel LeVrier - GIS

Federal, State, and Local Agencies
- Bureau of Indian Affairs – Navajo Region
- Bureau of Land Management
- U.S. Fish and Wildlife Service
- Natural Resource Conservation Service
- El Malpais National Monument
- White Sands Missile Range
- New Mexico State Forestry Division
- New Mexico State Land Office
- New Mexico Department of Fish and Wildlife
- McKinley County Board of Commissioners
- Cibola County Commissioners
- McKinley Soil and Water Conservation District
- Lava Soil and Water Conservation District
- City of Grants
- Village of Milan

Tribes
The following Tribes and Pueblos were consulted during the development of this EA.

The Pueblos of Acoma, Zuni, Santa Ana, and Jemez
Hopi Tribe
Navajo Nation
Baca/Prewitt Navajo Chapter
Casamero Lake Navajo Chapter
Crownpoint Navajo Chapter
Mariano Lake Navajo Chapter
Ramah Navajo Chapter
Smith Lake Navajo Chapter
Thoreau Navajo Chapter
To’hajiilee Navajo Chapter
Torreon Navajo Chapter
Ojo Encino Navajo Chapter
Whitehorse Lake Navajo Chapter
Baahaali Navajo Chapter
Churchrock Navajo Chapter

**Congressional/Others**

- Senator Tom Udall
- Senator Martin Heinrich
- Congressman Steve Pearce
- Congressman Ben Ray Lujan
- Center of Biological Diversity
- Wild Earth Guardians
- Forest Stewards Guild
- Great Old Broads for Wilderness
- The Nature Conservancy
- National Wild Turkey Federation
- Cibola Outdoorsmen
- San Mateo Grazing Association
- Jeeps West
- Lobo Canyon Outfitters
5 Literature Cited


Appendix A – Forest Plan Amendments


Appendix A: Forest Plan Amendments

The following Project Specific Forest Plan amendments are being proposed for the Puerco Collaborative Landscape Restoration Project to facilitate restoration of highly departed forest types, wildlife habitat and increase resiliency.
The purpose of Amendment 1 is to bring the Proposed Action Alternative in alignment with the revised Mexican Spotted Owl Recovery Plan (USDI FWS 2012). Amendment 2 clarifies existing direction related to managing canopy cover and interspace in the forest plan. The purpose of Amendment 2 is to bring the project into alignment with the best available science (Reynolds et al. 2013) that provides desired conditions for restoring fire-adapted ponderosa pine in the Southwest.

Amendments 1 and 2 were evaluated in accordance with the significance amendment criteria in FSM 1926.51 and FSM 1926.52. The significance analysis for each amendment included in the Proposed Action Alternative is displayed in this appendix. No amendment alters multiple use forest plan goals and objectives, adjusts management area boundaries or management prescriptions. The changes in standards and guidelines are considered to be minor because they reflect the latest, best available science (Reynolds et al. 2013). The amendments bring the alternatives into alignment with the revised Mexican spotted owl Recovery Plan. No amendment will alter the long-term relationship between levels of multiple-use goods and services originally projected for the Cibola NF. These outputs were specific to a planning period ranging from 10 to 15 years (as identified in 1987). In the selected alternative:

• Amendment 1: The amendment would affect about 3,694 acres or 9 percent of the 41,507 acres of Mexican spotted owl protected activity center (PAC) habitat on the Cibola NF. Potentially affected PACs include:
  † 6-Mile
  † Foster
  † Milk Ranch
  † Proposed Agua Remora
  † Proposed Hogback
  † Proposed McGaffey
  † Proposed Smith Canyon

• Amendment 2 is a clarification amendment. The amendment will affect about 23,484 acres of goshawk habitat, approximately (6 percent) of all goshawk habitat on the Cibola NF. Managing 23,484 acres of ponderosa pine for an open reference condition will affect less than 5 percent of all suitable goshawk habitats on the Cibola NF.

For these reasons, the amendments will not result in an important effect to the entire land management planning area. Each amendment is a specific, one-time variance for this restoration project. The best available science for management in Southwestern forests Reynolds et al. 2013), the (Cibola NF) forest plan revision process, is affecting ongoing and future analyses. The plan amendments that are specific to this project do not impose direction on ongoing or future analyses.
Alternative 2 (Proposed Action) – Cibola National Forest Site-Specific Nonsignificant Forest Plan Amendments

Amendment 1. Mexican Spotted Owl Habitat Management
Mechanical Treatment Up to 17.9 inches d.b.h. in Select PACs (3,694 acres)

Data evaluation has indicated that all 7 Mexican spotted owl PACs (approximately 6,416 acres) would have nesting and roosting habitat benefits, fire risk reduction, and move toward recovery plan desired conditions from mechanically cutting selected trees up to 17.9 inches d.b.h.

Increasing the range of the mechanical treatment thresholds up to 17.9 inches within 7 Mexican spotted owl PACs will provide for a higher degree of stand structure improvements to nesting and roosting habitat. The proposal is in alignment with the revised Mexican spotted owl recovery plan (USDI FWS 2012). Figure A-1 displays the general location of mechanical treatment up to 17.9- inch d.b.h., and prescribed fire. In addition, the removal of ladder and canopy fuels would reduce the crown fire risk in the 7 PACs (to the extent possible).
Figure A-1: Amendment 1: General location of mechanical treatment up to 17.9-inch d.b.h.
Table A-1: Amendment 1: Current and Proposed MSO Forest Plan Language

<table>
<thead>
<tr>
<th>Current Forest Plan Direction</th>
<th>Proposed New Standard or Guideline Language for Puerco Collaborative Landscape Restoration Project</th>
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<tr>
<td><strong>MSO Standards</strong></td>
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<tr>
<td>No corresponding direction currently exists.</td>
<td>The Puerco Collaborative Landscape Restoration Project will comply with the biological opinion and monitoring protocol developed in consultation with the USFWS.</td>
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<tr>
<td>Provide three levels of habitat management – protected, restricted, and other forest and woodland types to achieve a diversity of habitat conditions across the landscape (Cibola NF Forest Plan, p. 71).</td>
<td>Provide three levels of habitat management – protected, recovery, and other forest and woodland types to achieve a diversity of habitat conditions across the landscape (p. 65).</td>
</tr>
<tr>
<td>Protected areas include delineated protected activity centers; mixed conifer and pine-oak forests with slopes greater than 40% where timber harvest has not occurred in the last 20 years; and reserved lands which include wilderness, research natural areas, wild and scenic rivers, and congressionally recognized wilderness study areas (Cibola NF Forest Plan, p. 71).</td>
<td>Within the Puerco Collaborative Landscape Restoration Project boundary, protected areas include delineated protected activity centers; and reserved lands which include wilderness, research natural areas, wild and scenic rivers, and congressionally recognized wilderness study areas. Recovery habitat includes pine-oak and mixed conifer forests on all slopes (Cibola NF Forest Plan, p. 71).</td>
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<td>Allow no timber harvest except for firewood and fire risk abatement in established protected activity centers. For protected activity centers destroyed by fire, windstorm, or other natural disaster, salvage timber harvest or declassification may be allowed after evaluation on a case-by-case basis in consultation with US Fish and Wildlife Service (Cibola NF Forest Plan, page 71).</td>
<td>Allow no timber harvest except for firewood and fire risk abatement in established protected activity centers except as follows: Allow firewood, fire risk abatement, and habitat structure improvement in the following established protected activity centers: Foster, Milk Ranch, 6-Mile, and proposed Agua Remora, Hogback, Smith Canyon and McGaffey PACs For protected activity centers destroyed by fire, windstorm, or other natural disaster, salvage timber harvest or declassification may be allowed after evaluation on a case-by-case basis in consultation with the U.S. Fish and Wildlife Service.</td>
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<tr>
<td><strong>MSO Guidelines – General</strong></td>
<td>No Change</td>
</tr>
<tr>
<td><strong>MSO Guidelines – Protected Areas, Protected Activity Centers</strong></td>
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<tr>
<td>Harvest fuelwood when it can be done in such a way that effects on the owl are minimized. Manage within the following limitations to minimize effects on the owl (Cibola NF Forest Plan, p. 71-1). Retain key forest species such as oak. Retain key habitat components such as snags and large downed logs. Harvest conifers less than 9 inches in diameter only within those protected activity centers treated to abate fire risk as described below.</td>
<td>Harvest fuelwood when it can be done in such a way that effects on the owl are minimized. Manage within the following limitations to minimize effects on the owl (Cibola NF Forest Plan, p. 71-1). Retain key forest species such as oak. Retain key habitat components such as snags and large downed logs. Harvest conifers less than 9 inches in diameter only within those protected activity centers treated to abate fire risk as described below, Harvest conifers up to 17.9 inches diameter within Foster, Milk Ranch, 6-Mile, and proposed Agua Remora, Hogback, Smith Canyon and McGaffey PACs to abate fire risk and improve habitat structure.</td>
</tr>
<tr>
<td>Current Forest Plan Direction</td>
<td>Proposed New Standard or Guideline Language for Puerco Collaborative Landscape Restoration Project</td>
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<tr>
<td>Treat fuel accumulations to abate fire risk.</td>
<td>Treat fuel accumulations to abate fire risk.</td>
</tr>
<tr>
<td>–Select for treatment 10% of the protected activity centers where nest sites are known in</td>
<td>–Select for treatment 10% of the protected activity centers where nest sites are known in each</td>
</tr>
<tr>
<td>each recovery unit having high fire risk conditions. Also select another 10% of the</td>
<td>recovery unit having high fire risk conditions. Also select another 10% of the protected</td>
</tr>
<tr>
<td>protected activity centers where nest sites are known as a paired sample to serve as control</td>
<td>activity centers where nest sites are known as a paired sample to serve as control areas</td>
</tr>
<tr>
<td>areas (Cibola National Forest Plan, page 71-1).</td>
<td>(Cibola National Forest Plan, page 71-1).</td>
</tr>
<tr>
<td>–Designate a 100 acre “no treatment” area around the known nest site of each selected</td>
<td>–Designate a 100 acre &quot;no treatment&quot; area around the known nest site of each selected protected</td>
</tr>
<tr>
<td>protected activity center. Habitat in the no treatment area should be as similar as possible</td>
<td>protected activity center. Habitat in the no treatment area should be as similar as possible in</td>
</tr>
<tr>
<td>in structure and composition as that found in the activity center.</td>
<td>structure and composition as that found in the activity center.</td>
</tr>
<tr>
<td>–Use combinations of thinning trees less than 9 inches in diameter, mechanical fuel</td>
<td>–Use combinations of thinning trees less than 9 inches in diameter, mechanical fuel treatment</td>
</tr>
<tr>
<td>treatment and prescribed fire to abate fire risk in the remainder of the selected protected</td>
<td>and prescribed fire to abate fire risk in the remainder of the selected protected activity center</td>
</tr>
<tr>
<td>activity center outside the 100 acre “no treatment” area.</td>
<td>outside the 100 acre &quot;no treatment&quot; area.</td>
</tr>
<tr>
<td></td>
<td>**Use combinations of thinning trees up to 17.9 inches dbh within: Foster, Milk Ranch, 6-Mile,</td>
</tr>
<tr>
<td></td>
<td>and proposed Agua Remora, Hogback, Smith Canyon and McGaffey PACs, mechanical fuel treatment</td>
</tr>
<tr>
<td></td>
<td>and prescribed fire to abate fire risk and improve habitat structure in the remainder of the</td>
</tr>
<tr>
<td></td>
<td>selected protected activity center outside the 100-acre “no treatment” area.</td>
</tr>
<tr>
<td>Treat fuel accumulations to abate fire risk. Pre and post treatment monitoring should be</td>
<td>Treat fuel accumulations to abate fire risk. Pre and post treatment monitoring should be</td>
</tr>
<tr>
<td>conducted in all protected activity centers treated for fire risk abatement. (See</td>
<td>conducted in all protected activity centers treated for fire risk abatement. **Monitoring</td>
</tr>
<tr>
<td>monitoring guidelines) (Cibola National Forest Plan, page 71-2).</td>
<td>guidelines:**</td>
</tr>
<tr>
<td></td>
<td>**Monitoring of owl populations and habitat within the Puerco Collaborative Landscape Restoration</td>
</tr>
<tr>
<td></td>
<td>Project boundary will follow the monitoring protocol developed and finalized through that</td>
</tr>
<tr>
<td></td>
<td>project’s consultation with the US Fish and Wildlife Service.</td>
</tr>
</tbody>
</table>
### Current Forest Plan Direction

Mixed Conifer and Pine-oak Forests (See glossary definition): Manage to ensure a sustained level of owl nest/roost habitat well distributed across the landscape. Create replacement owl nest/roost habitat where appropriate while providing a diversity of stand conditions across the landscape to ensure habitat for a diversity of prey species. The following table displays the minimum percentage of restricted area which should be managed to have nest/roost characteristics. The minimum mixed conifer restricted area includes 10% at 170 basal area and an additional amount of area at 150 basal area. The additional area of 150 basal area is +10% in BR-E and +15% in all other recovery units. The variables are for stand averages and are minimum threshold values and must be met simultaneously. In project design, no stands simultaneously meeting or exceeding the minimum threshold values should be reduced below the threshold values unless a district-wide or larger landscape analysis of restricted areas shows that there is a surplus of restricted area acres simultaneously meeting the threshold values. Management should be designed to create minimum threshold conditions on project areas where there is a deficit of stands simultaneously meeting minimum threshold conditions unless the district-wide or larger landscape analysis shows there is a surplus. (Cibola NF Forest Plan, pp.71-2).

### Proposed New Standard or Guideline Language for Puerco Collaborative Landscape Restoration Project

Mixed Conifer and Pine-oak Forests (See glossary definition): Manage to ensure a sustained level of owl nesting and roosting habitat well distributed across the landscape. Create replacement owl nesting and roosting habitat where appropriate while providing a diversity of stand conditions across the landscape to ensure habitat for a diversity of prey species. The following table displays the minimum percentage of restricted area which should be managed to have nesting and roosting characteristics. The minimum mixed conifer restricted area includes up to 10 percent at 170 square feet basal area and an additional amount of area at 150 square feet basal area. The additional area of 150 square feet basal area is +10 percent in BR-E and +15 percent in all other recovery units. In pine-oak, the minimum restricted area includes up to 10 percent at 110 to 150 square feet basal area. The variables are for stand averages and are minimum target and threshold habitat values and must be met simultaneously. In project design, no stands simultaneously meeting or exceeding the minimum target and threshold habitat values should be reduced below target and threshold values unless a districtwide or larger landscape analysis of restricted areas shows that there is a surplus of restricted area acres simultaneously meeting target and threshold values. Management should be designed to create minimum target and threshold habitat conditions on project areas where there is a deficit of stands simultaneously meeting minimum target and threshold habitat conditions unless the districtwide or larger landscape analysis shows there is a surplus.
<table>
<thead>
<tr>
<th>Current Forest Plan Direction</th>
<th>Proposed New Standard or Guideline Language for Puerco Collaborative Landscape Restoration Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Restricted Areas (Mixed conifer, pine-oak, and riparian forests)</strong></td>
<td><strong>Target habitat</strong> is a category of restricted habitat intended to provide future nesting and roosting habitat (see glossary definition for restricted habitat). The minimum values identified for the forest attributes represent the threshold for meeting nesting and roosting conditions (see the definition for threshold habitat). They can also be targets to be achieved with time and management. If less than 10 percent of the restricted habitat in ponderosa pine-Gambel oak qualifies as threshold habitat, the areas that can eventually achieve all threshold conditions simultaneously should be identified as target habitat and managed to achieve threshold conditions as rapidly as possible. Because no known nests or roosts occur in restricted habitat, target habitat is considered future nesting and roosting habitat.</td>
</tr>
<tr>
<td>No corresponding direction</td>
<td><strong>Threshold habitat</strong> is a category of restricted habitat intended to provide for future nesting and roosting habitat (see definition for restricted habitat). A variety of forest structural attributes are used to define when nesting and roosting habitat is achieved (summarized in table III.B.1 of the 1995 recovery plan and table C-2 of the 2012 recovery plan). Threshold habitat meets or exceeds these values. When the minimum values identified for the forest attributes are met simultaneously, they represent the threshold of nesting and roosting conditions. Up to 10 percent of restricted habitat in ponderosa pine-Gambel oak should be designated as threshold habitat. Management in threshold habitat cannot lower any of the forest attribute values below the nesting and roosting threshold unless a landscape analysis demonstrates an abundance of this habitat. Because no known nests or roosts occur in restricted habitat, target habitat is managed as future nesting and roosting habitat.</td>
</tr>
<tr>
<td>No corresponding direction</td>
<td>&quot;</td>
</tr>
</tbody>
</table>
Table A-2. Minimum Percentage of Restricted Area which should be managed to have Nest/Roost Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>MC All RU</th>
<th>MC BR-E RU</th>
<th>MC Other RU</th>
<th>Pine Oak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restricted Area %</td>
<td>10%</td>
<td>+10%</td>
<td>+15%</td>
<td>10%</td>
</tr>
<tr>
<td>Stand Average for: Basal Area</td>
<td>170</td>
<td>150</td>
<td>150</td>
<td>110-150</td>
</tr>
<tr>
<td>18 inch + trees/ac</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Oak basal area</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>20</td>
</tr>
<tr>
<td>Percent total existing stand density index by size class:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-18”</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>18-24”</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>24+”</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

Consistency with the Revised Mexican spotted owl Recovery Plan

The need to evolve from managing solely for firewood collection and fire risk abatement is reflected in the revised 2012 recovery plan. In the revised plan, the U.S. Fish and Wildlife Service states, “Management recommendations are most conservative within PACs, but by no means advocate a “hands-off” approach. The recovery team recognizes situations exist where management is needed to sustain or enhance desired conditions for the owl, including fire-risk reduction, as well as monitoring owl response. Mechanical treatments in some PACs may be needed to achieve these objectives; determining which PACs may benefit from mechanical treatments requires a landscape analysis to determine where the needs of fire risk reduction and habitat enhancement are greatest. PACs are the only form of protected habitat included in this revised Plan” (USDA FS 2012, page VIII). Treatments that would improve habitat by treating up to 17.9 inches d.b.h. is consistent with direction for retaining large trees in the revised Mexican spotted owl recovery plan (page 268 and table C.1-C.3 on pages 274 to 278).

By definition, PAC habitat and especially core areas have high fuel loading and the uncharacteristic accumulation of ground fuels puts them at further risk. Reducing fuels to reduce the risk of high-severity fire in these important habitats would contribute toward conservation of this threatened species. The amendment (allowing low intensity prescribed burning within the 100-acre core area) would eliminate the need for hand line and/or dozer line construction, allow for the maximum number of surrounding PAC acres to be treated with prescribed fire, and would potentially minimize up to 700 acres of ground disturbance to PAC habitat. Reducing fire risk in core areas is consistent with the direction in the Mexican spotted owl recovery plan, “Planned ignitions (prescribed fire) and unplanned ignitions (wildland fire) should be allowed to enter cores only if they are expected to burn with low fire severity and intensity. Fire lines, checklines, 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)” (Revised Mexican spotted owl Recovery Plan, page 263).

Managing for 110 to 150 square feet basal area is consistent with the minimum desired conditions for pine-oak forests managed for Recovery nesting/roosting habitat (page 278, table C.3). The continued use of the terms (and definitions) of target and threshold habitat (considered future nesting and roosting habitat as part of restricted habitat is consistent with Revised Mexican spotted owl Recovery Plan’s direction for nesting and roosting in recovery habitat (see page 274, table C.1).

The plan amendment defers monitoring to the project’s biological opinion from the U.S. Fish and Wildlife Service. Following the current forest plan direction would have resulted in few PACs being treated during the life of the project. Current plan direction suspends treatments until monitoring of the initial sample shows there are no negative impacts, or negative impacts are mitigated by modifying treatments. Following this direction could delay implementation for years, potentially decades’ if changes in populations had to be documented before additional treatments were implemented. Following the current forest plan direction would have resulted in few PACs being treated with the objective of fire-risk reduction or improving condition for the owl during the life of the project.

The deviation from selecting PACs and monitoring in 10 percent increments is consistent with the revised 2012 Mexican spotted owl recovery plan which states mechanical treatments can be conducted in up to 20 percent of the total non-core PAC area within each ecosystem management unit (treatments can exceed 20 percent of the non-core acreage a single PAC (page 274, table C.1). As noted above, the plan amendment defers monitoring to the project’s biological opinion from the U.S. Fish and Wildlife Service. This amendment meets the intent of the revised (2012) recovery plan by reducing the potential for creating excessively fragmented habitat and managing stands based on their capability to attain desired stand conditions. This amendment does not affect habitat designated in previous projects or in mixed-conifer habitat.

**Significance Evaluation**

Per 36 CFR 219:

219.8 Amendment:

(a) *Amending plans.* A plan amendment may add, modify, or rescind one or more of the decisions of a plan (§ 219.7). An amendment decision must be based on the identification and consideration of issues (§ 219.4), applicable information (§ 219.5), and an analysis of the effects of the proposed amendment (§ 219.6). In developing an amendment, the responsible official must provide opportunities for collaboration consistent with § 219.12 through § 219.18.

(b) *Environmental review of a proposed plan amendment.* For each proposal for a plan amendment, the responsible official must complete appropriate environmental analyses and public involvement in accordance with Forest Service NEPA procedures. A proposed
amendment that may create a significant environmental effect and thus require preparation of an environmental impact statement is considered to be a significant change in the plan. If a proposal for amendment requires the preparation of an environmental impact statement, the responsible official must give public notice and an opportunity to comment on the draft environmental impact statement for at least 90 calendar days.

Two project specific Forest Plan amendments are required under the current Forest Plan if this decision is signed prior to implementation of the revised Forest Plan. These project-specific amendments would be one-time adjustments to the current forest plan made according to the 2012 Planning Rule (36 CFR 219.13). Based on the regulations at 36 CFR 219.13(b)(2) opportunities for public participation and notification on the plan amendments is combined with the public participation and notification processes used for project planning at 36 CFR 218.

The Forest Service has enacted new regulations in 2012 to guide changes to forest plans, including amendments. Although the Coconino National Forest is currently revising its forest plan using a prior planning rule enacted in 1982, the 2012 planning rule (36 CFR 219) requires the Forest Service to use the new planning rule for amendments of plans created under a prior rule.15 Per 36 CFR 219.17(b)(2) for all projects initiated after May 9, 2015 “all plan amendments must be initiated, completed and approved under the requirements of this part.” The regulations at 36 CFR 219 are very different than the regulations under which the 1987 Coconino Forest Plan was developed, and reflects the complex nature of modern forest planning and management.

The project-specific amendments included in this project may affect substantive requirements of the 2012 planning rule at 36 CFR 219.9; which requires Forest Plans to provide for maintaining the diversity of plant and animal communities and the persistence of native species in the plan are. Since this project includes two project-specific amendments to modify current Forest Plan direction related to the management of Northern goshawk and Mexican spotted owl habitats, it is possible that the plan’s inherent capability to meet these attributes would be affected. We would like to hear your comments on the project, including the potential effects of the project-specific amendments on the Diversity of plant and animal communities identified at 36 CFR 219.9.

One or both project-specific amendments may not be necessary under the new Forest Plan, depending on the content of the approved final Forest Plan. Amendment 1 to the current Forest Plan relates to allowing management actions to more closely follow guidelines in the revised Mexican Spotted Owl Recovery Plan (USDI Fish and Wildlife Service, 2012) versus Forest Plan language based on the 1995 Recovery Plan; and Amendment 2 relates to the management of canopy cover and interspaces in forested stands.

Best Available Scientific Information (BASI): Per FSH 1909.12, Zero Code, the responsible official shall document how the best available scientific information was used to inform the assessment. The Puerco Collaborative Forest Landscape Restoration Project utilized Peer reviewed articles, scientific assessments, data prepared and managed by the Forest Service or other Federal agencies, including monitoring results, information in spatially referenced databases, data about the lands and resources of the planning unit, and various types of statistical or observational data, as well as information from public and governmental participation. Sources may be found in the Literature Cited section of this document.

Public Participation: Per FSH 1909.12, Chapter 40, during the land management planning public participation is required. Building on the experience of implementing the Bluewater CFLRP, the Puerco Collaborative Forest Landscape Restoration Project continued to:

- Directly engaged the public to exchange information with each other and work together on one or more issues during the planning process, and identified where there was agreement and disagreement.
- Worked closely with interested members of the public to clarify concerns and seek feedback on how to meet challenges presented by the planning process.
- Provided information to the public and seek suggestions as well as feedback on potential issues and concerns.
- Provided sufficient objective information to the public to convey an understanding of intended actions, processes, and preliminary issues.

Public Participation and collaboration is documented in the Public Involvement Section of Chapter One.

Timing: In terms of timing, the forest plan has been in place and amended several times since 1985, and revision efforts are underway. The forest plan incorporated direction (via an amendment) from the Forest Service Southwestern Region’s 1996 “Amendment of Forest Plans Record of Decision” (USDA FS 1996). The actions allowed via the amendment are consistent with existing forest plan direction in that it improves nesting and rooting habitat, reduces the risk of loss from fire, and will comply with the site-specific treatment and monitoring requirements in the U.S. Fish and Wildlife Service biological opinion. Forest plan direction may be amended to incorporate the revised Mexican spotted owl recovery plan (USDI FWS 2012) which recognizes that habitat restoration, in addition to the reduction of fire risk, is key to improving habitat quality.

Location and Size: The treatment area contains about 6,416 total acres of Mexican spotted owl protected habitat. There are 7 PACs (about 6,416 acres) in the Puerco treatment area. The remaining protected habitat (411 acres of mixed conifer and pine-oak) occurs on steep slopes where timber harvest has not occurred in the previous 20 years and is not planned for mechanical treatment. Treatments for steep-slope protected habitat consist of prescribed fire only – no mechanical treatments are planned for this category of habitat. There are 56 established PACs entirely on or overlapping Cibola National Forest lands.
Mechanical treatment would affect 7 (12 percent) of the 60 (includes 4 new proposed PACs in the Puerco Project) Cibola NF PACs and 3,694 acres (58 percent) of PAC habitat in the entire treatment area. Outside of PACs, there are 14,110 acres of mixed conifer and pine-oak forest type in the Puerco Project.

Changing the minimum basal area value in restricted habitat would only apply to target and threshold acres (those restricted acres being managed for nesting/roosting habitat as defined in the forest plan). About 1,346 acres (10 percent) of restricted target or threshold habitat could be affected by using a basal area range of 110 to 150 within the treatment area. This equates to affecting about 10 percent of the total estimated (13,700 acres) Mexican spotted owl restricted habitat on the Cibola NF’s portion of the project area. Work will be accomplished incrementally over a 10-15 year period. On average, less than 250 acres of PAC habitat would be treated per year. This is expected to balance the need to reduce the risk of crown fire while allowing for monitoring and feedback loops that will allow management to be adaptive.

**Relationship to Forest Goals and Objectives:** The amendment is consistent with forest plan goals for wildlife and fish of managing for a diverse, well-distributed pattern of habitats for viable populations

Habitat of wildlife and fish species in cooperation with states and other agencies (Cibola National Forest plan, page 33). It is consistent with the goal to manage habitat to help recover threatened and endangered species (Cibola National Forest plan, page 33). The amendment is consistent with goals and objectives by protecting conditions and structures used by Mexican spotted owls where they exist and to set other stands on a trajectory to grow into replacement nest habitat or to provide conditions for foraging and dispersal (USDI FWS 1995, 2012).

**Relationship to Management Prescriptions:** Mechanical thinning up to 17.9 inches d.b.h. in 7 Mexican spotted owl PACs would affect 1 percent or less of the forestwide management area acres (Table A-2). Managing about 1,346 acres of restricted habitat to a range of 110 to 150 square feet basal area will affect 1 percent or less of the forestwide management areas. The amendment intent is consistent with the management emphasis of providing for multiple uses that includes wildlife habitat and meeting Mexican spotted owl standards and guidelines which emphasize improving and maintaining the quality of the habitat (MA 8 and MA 10) and moving ponderosa pine toward desired forest structure, including northern goshawk and Mexican spotted owl habitats.

**Relationship to Outputs:** Outputs identified in the forest plan are associated with MMBF of sawtimber sales and products (meet demand for timber while reducing conflict with other resources), MMBF of firewood sold and free use (provide access to firewood), grazing capacity, and permitted livestock use. The amendment will not affect outputs or change the long-term relationship between levels of goods (timber, firewood) and services. Due to the minimal acres
affected, the amendment will not alter outputs on a forestwide basis or change the long-term relationship between levels of goods (timber, firewood) and services.

In comparison the forest’s total suitable timber lands (370,000 acres), the amendment would affect about 1 percent of those lands. For this reason, mechanical treatment within PACs and the minimal (1,346) acres treated in restricted habitat do not measurably increase or decrease timber outputs or firewood availability. There would be no measurable effect to outputs on a forestwide basis or the long-term relationship between levels of goods (timber, firewood) and services from managing restricted habitat for a basal area of 110 to 150 square feet, or deferring the final design of treatments and monitoring to the project’s biological opinion. The amendment would not affect decisions that have been made through separate analyses on grazing capacity or permitted livestock use.

Table A-3. Alternative 2 Mexican spotted owl amendment 1 management area (MA) acres potentially affected by mechanical treatment up to 17.9 inches DBH

<table>
<thead>
<tr>
<th>MA</th>
<th>MA Description</th>
<th>Forestwide Acres</th>
<th>Amendment Acres</th>
<th>Forestwide Acres Affected (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Ponderosa Pine Suitable Timberlands</td>
<td>292,055</td>
<td>2,213</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>10</td>
<td>Mixed Conifer Suitable Timberlands</td>
<td>49,871</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>13</td>
<td>No Capacity Rangelands</td>
<td>216,993</td>
<td>484</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>14</td>
<td>Full Capacity Rangelands</td>
<td>800,767</td>
<td>966</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

Amendment 2. Management of Canopy Cover and Ponderosa Pine with an Open Reference Condition within Goshawk Habitat (Cibola NF)

Background

Canopy cover is defined as “the percentage of a fixed area covered by the crowns of plants delimited by a vertical projection of the outermost perimeter of the spread of foliage” (Reynolds et al. 1992). Obtaining consistent results has been difficult; even the definition of the term is dependent on the method of measurement. To resolve this issue, the Forest Service used the Forest Vegetation Simulation (FVS) crown width model as the basis for developing stocking densities that would achieve desired canopy cover levels. Figure A-2 displays general locations
of goshawk habitat that is subject to canopy cover requirements in VSS 4 through VSS 6 on the forests.
Figure A-2: Amendment 2: General location of goshawk habitat.
Non-forested areas (interspaces) occur between individual trees, tree clumps, and tree groups. These non-forested areas (interspaces) are not equivalent to VSS 1. Whereas VSS 1 may provide openings in the short term, this structural stage is expected to regenerate tree cover in the long term. Refer to the Proposed Action in Chapter 2 which provides minimum stocking guidelines that have been developed to assure canopy cover requirements are met.

Approximately 38,373 acres (53 percent) of the forested areas (ponderosa pine and ponderosa pine – PJ mix) within the Puerco project area on the Cibola NF have an open reference condition. The desired condition is to have a portion of these acres (about 33,560 acres) managed as a relatively open forest with trees typically aggregated in small groups within a grass/forb/shrub matrix (Woolsey 1911, Cooper 1960, White 1985, Pearson 1950, Covington et al. 1997, Abella and Denton 2009).

**Amendment Description**

In the “Vegetation Management – Landscapes Outside Goshawk Post-fledging Family Areas” and “Vegetation Management – Within Post-fledging Family Areas” section of the forest plan, a site-specific, nonsignificant plan amendment will: (1) add the desired percentage of interspace within uneven-aged stands to facilitate restoration, (2) add the interspace distance between tree groups, (3) add language clarifying where canopy cover is and is not measured, (4) allow up to 33,560 acres to be managed for an open reference condition which affects canopy cover guidelines for VSS 4 through VSS 6 groups and reserve trees, and (5) add a definition to the forest plan glossary for the terms interspaces, open reference condition, and stands.

The forest plan directs projects to manage for uneven-aged stand conditions within goshawk habitat. Forested groups consist of an interspersion of six vegetation structural stages (VSS 1 to VSS 6). For the purposes of this amendment, the following definitions apply:

- **Stands** are defined as a contiguous area of trees sufficiently uniform in forest type, composition, structure, and age class distribution, growing on a site of sufficiently uniform conditions to be a distinguishable unit. Four classification characteristics are generally used to distinguish forest stands: biophysical site (soils, aspect, elevation, plant community association, climate, etc.), species composition, structure (density, and age (1-aged, 2-aged, uneven-aged)), and management emphasis (administrative requirements and local management emphasis that will shape structure over time). Based upon Agency guidelines, the minimum stand mapping size is 10 acres.

- **Interspaces** are defined as the open space between tree groups intended to be managed for grass/forb/shrub vegetation during the long term. Interspaces may include scattered single trees.

- **Open reference condition** is defined as forested ponderosa pine areas with mollic-integrate soils to be managed as a relatively open forest with trees typically aggregated in small groups within a grass/forb/shrub matrix.

Edited or added verbiage is shown in **bold** in table A-4.
<table>
<thead>
<tr>
<th>Current Cibola NF Forest Plan Direction</th>
<th>New Guideline Language</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Landscapes Outside of Goshawk Post-fledging Areas</strong></td>
<td><strong>General: Within ponderosa pine stands, manage over time for uneven-aged stand conditions composed of heterogeneous mosaics of tree groups and single trees, with interspaces between tree groups. The size of tree groups, as well as sizes and shapes of interspaces, should be variable. Over time, the spatial location of the tree groups and interspaces may shift within the uneven-aged stand.</strong></td>
</tr>
<tr>
<td>No similar direction in forest plan</td>
<td><strong>General: For the areas managed for tree crown development, the distribution of vegetation structural stages for ponderosa pine, mixed conifer and spruce-fir forests is 10 percent grass/forb/shrub (VSS 1), 10 percent seedling-sapling (VSS 2), 20 percent young forest (VSS 3), 20 percent mid-aged forest (VSS 4), 20 percent mature forest (VSS 5), 20 percent old forest (VSS 6). Note: the specified percentages are a guide, and actual percentages are expected to vary plus or minus up to 3 percent.</strong></td>
</tr>
<tr>
<td>Snags are 18” or larger d.b.h. and 30 feet or larger in height, downed logs are 12 inches in diameter and at least 8 feet long, woody debris is 3 inches or larger on the forest floor, canopy cover is measured with vertical crown projection on average across the landscape (Cibola NF forest plan, page 71-7).</td>
<td>Snags are 18” or larger d.b.h. and 30 feet or larger in height, downed logs are 12 inches in diameter and at least 8 feet long, woody debris is 3 inches or larger on the forest floor, canopy cover as defined by vertical crown projection is evaluated within mid-aged to old forest vegetation structural stage groups (VSS 4, 5, and 6).</td>
</tr>
<tr>
<td>No corresponding forest plan direction</td>
<td>Develop and maintain a highly diverse vegetation mosaic: 30 to 90 percent of the uneven-aged stand should be under ponderosa pine and deciduous tree crowns. Within areas managed for an open reference condition, 10 to 30 percent of the uneven-aged stand should be under ponderosa pine and deciduous tree crowns.</td>
</tr>
<tr>
<td>No corresponding forest plan direction</td>
<td>Tree group spatial distribution may be highly variable based on local site and current conditions; the interspaces between groups may range from 20 to 200 feet, but generally between 25 and 100 feet apart from drip line to adjacent drip line. This spacing of groups is not affected by single trees in the interspace.</td>
</tr>
<tr>
<td>No corresponding forest plan direction</td>
<td>Each tree group is generally dominated by one vegetation structure stage. The spatial arrangement of trees, high dispersion of vegetation structural stage diversity, and interspaces comprise each uneven-aged forest stand. Collectively these stands aggregate to uneven-aged forest landscapes, similar to natural conditions.</td>
</tr>
<tr>
<td>Canopy Cover: Canopy cover guidelines apply only to mid-aged to old forest structural stages (VSS 4, VSS 5, and VSS 6) and not to grass/forb/shrub to young forest structural stages (VSS 1, VSS 2, and VSS 3) (Coconino NF forest plan, page 71-7).</td>
<td>Canopy Cover: Canopy cover guidelines apply only to mid-aged to old forest structural stage groups (VSS 4, VSS 5, and VSS 6) and not to grass/forb/shrub to young forest structural stage groups (VSS 1, VSS 2, and VSS 3).</td>
</tr>
</tbody>
</table>
No corresponding forest plan direction

<table>
<thead>
<tr>
<th>VSS 3) or in interspaces, natural meadows, grasslands, or other areas not managed for forest cover.</th>
</tr>
</thead>
</table>

Ponderosa Pine: Canopy Cover for mid-aged forest (VSS 4) should average 40+ percent, mature forest (VSS 5) should average 40+ percent, and old forest (VSS 6) should average 40+ percent. Opening size is up to 4 acres with a maximum width of up to 200 feet. One group of reserve trees, 3–5 trees per group, will be left if the opening is greater than an acre in size. Leave at least 2 snags per acre, 3 downed logs per acre, and 5–7 tons of woody debris per acre (Cibola NF forest plan, page 71-7).

No corresponding forest plan direction

<table>
<thead>
<tr>
<th>Canopy cover is evaluated at the group level within mid-aged to old forest structural stages groups (VSS 4, VSS 5 and VSS 6) and not within grass/forb/shrub to young forest structural stage groups (VSS 1, VSS 2, and VSS 3) or in interspaces, natural meadows and grasslands, or other areas not managed for forest conditions.</th>
</tr>
</thead>
</table>

**Vegetation Management – Within Post-fledging Family Areas**

No similar direction in forest plan

<table>
<thead>
<tr>
<th>Canopy cover is evaluated at the group level within mid-aged to old forest structural stages groups (VSS 4, VSS 5 and VSS 6) and not within grass/forb/shrub to young forest structural stage groups (VSS 1, VSS 2, and VSS 3) or in interspaces, natural meadows and grasslands, or other areas not managed for forest conditions.</th>
</tr>
</thead>
</table>

No corresponding forest plan direction

<table>
<thead>
<tr>
<th>Develop and maintain a highly diverse vegetation mosaic: 30 to 90 percent of the uneven-aged stand should be under ponderosa pine and deciduous tree crowns.</th>
</tr>
</thead>
</table>

No corresponding forest plan direction

<table>
<thead>
<tr>
<th>Tree group spatial distribution may be highly variable based on local site and current conditions; the interspaces between groups may range from 20 to 200 feet, but generally between 25 and 100 feet apart from drip line to adjacent drip line. This spacing of groups is not affected by single trees in the interspace.</th>
</tr>
</thead>
</table>

No corresponding forest plan direction

<table>
<thead>
<tr>
<th>Each tree group is generally dominated by one vegetation structure stage. The spatial arrangement of trees, high dispersion of VSS structural stage diversity, and interspaces comprise each uneven-aged forest stand. Collectively these stands aggregate to uneven-aged forest landscapes, similar to natural conditions.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Glossary</strong></td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>No corresponding forest plan language</td>
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<td>No corresponding forest plan language</td>
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<tr>
<td>No corresponding forest plan language</td>
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</tbody>
</table>
Significance Evaluation

Per 36 CFR 219:

219.8 Amendment:

(a) Amending plans. A plan amendment may add, modify, or rescind one or more of the decisions of a plan (§ 219.7). An amendment decision must be based on the identification and consideration of issues (§ 219.4), applicable information (§ 219.5), and an analysis of the effects of the proposed amendment (§ 219.6). In developing an amendment, the responsible official must provide opportunities for collaboration consistent with § 219.12 through § 219.18.

(b) Environmental review of a proposed plan amendment. For each proposal for a plan amendment, the responsible official must complete appropriate environmental analyses and public involvement in accordance with Forest Service NEPA procedures. A proposed amendment that may create a significant environmental effect and thus require preparation of an environmental impact statement is considered to be a significant change in the plan. If a proposal for amendment requires the preparation of an environmental impact statement, the responsible official must give public notice and an opportunity to comment on the draft environmental impact statement for at least 90 calendar days.

Two project specific Forest Plan amendments are required under the current Forest Plan if this decision is signed prior to implementation of the revised Forest Plan. These project-specific amendments would be one-time adjustments to the current forest plan made according to the 2012 Planning Rule (36 CFR 219.13). Based on the regulations at 36 CFR 219.13 (b)(2) opportunities for public participation and notification on the plan amendments is combined with the public participation and notification processes used for project planning at 36 CFR 218.

The Forest Service has enacted new regulations in 2012 to guide changes to forest plans, including amendments. Although the Coconino National Forest is currently revising its forest plan using a prior planning rule enacted in 1982, the 2012 planning rule (36 CFR 219) requires the Forest Service to use the new planning rule for amendments of plans created under a prior rule.16 Per 36 CFR 219.17(b) (2) for all projects initiated after May 9, 2015 “all plan amendments must be initiated, completed and approved under the requirements of this part.” The regulations at 36 CFR 219 are very different than the regulations under which the 1987 Coconino Forest Plan was developed, and reflects the complex nature of modern forest planning and management.

The project-specific amendments included in this project may affect substantive requirements of the 2012 planning rule at 36 CFR 219.9; which requires Forest Plans to provide for maintaining the diversity of plant and animal communities and the persistence of native species in the plan are. Since this project includes two project-specific amendments to modify current Forest Plan direction related to the management of Northern goshawk and Mexican spotted owl habitats, it is

possible that the plan’s inherent capability to meet these attributes would be affected. We would like to hear your comments on the project, including the potential effects of the project-specific amendments on the Diversity of plant and animal communities identified at 36 CFR 219.9.

One or both project-specific amendments may not be necessary under the new Forest Plan, depending on the content of the approved final Forest Plan. Amendment 1 to the current Forest Plan relates to allowing management actions to more closely follow guidelines in the revised Mexican Spotted Owl Recovery Plan (USDI Fish and Wildlife Service, 2012) versus Forest Plan language based on the 1995 Recovery Plan; and Amendment 2 relates to the management of canopy cover and interspaces in forested stands.

**Best Available Scientific Information (BASI):** Per FSH 1909.12, Zero Code, the responsible official shall document how the best available scientific information was used to inform the assessment. The Puerco Collaborative Forest Landscape Restoration Project utilized Peer reviewed articles, scientific assessments, data prepared and managed by the Forest Service or other Federal agencies, including monitoring results, information in spatially referenced databases, data about the lands and resources of the planning unit, and various types of statistical or observational data, as well as information from public and governmental participation. Sources may be found in the Literature Cited section of this document.

**Public Participation:** Per FSH 1909.12, Chapter 40, during the land management planning public participation is required. Building on the experience of implementing the Bluewater CFLRP, the Puerco Collaborative Forest Landscape Restoration Project continued to:

- Directly engaged the public to exchange information with each other and work together on one or more issues during the planning process, and identified where there was agreement and disagreement.
- Worked closely with interested members of the public to clarify concerns and seek feedback on how to meet challenges presented by the planning process.
- Provided information to the public and seek suggestions as well as feedback on potential issues and concerns.
- Provided sufficient objective information to the public to convey an understanding of intended actions, processes, and preliminary issues.

Public Participation and collaboration is documented in the Public Involvement Section of Chapter One.

**Timing:** In terms of timing, the forest plan has been in place (and amended) since 1987 and plan revision efforts are underway.

**Location and Size:** There is approximately 477,052 acres of goshawk habitat on the Cibola NF (Mid-scale Vegetation, Dominance Type, Cibola GIS Database).

The canopy cover portion of the amendment would generally affect 38,373 acres (8 percent) of all goshawk habitat on the Cibola NF.
• The canopy cover portion of the amendment will affect approximately 38,373 acres (8 percent) of all goshawk habitat on the Cibola NF. The canopy cover portion of the amendment clarifies measurement occurs at the group level-only.

For these reasons, location and size was determined to be nonsignificant. The amendment would facilitate moving up to 38,000 acres toward the desired forest structure (groups and clumps with herbaceous openings) that maximizes prey base species habitat and allows for the reintroduction of fire into the ecosystem, moving toward historic reference conditions.

**Relationship to Forest Goals and Objectives**: The selected alternative will meet goshawk forest plan canopy cover requirements in VSS 4 to 6 in all acres except about 38,373 acres managed for an open reference condition. In all acres but the open reference condition acres, actions will move toward the desired VSS size class distribution.

The amendment is consistent with forest goals for wildlife and fish of managing habitat to maintain viable populations of wildlife and fish species and improve habitat for selected species (Cibola National Forest plan, replacement page 33). It is consistent with the goal to improve habitat for listed threatened, endangered, or sensitive species of plants and animals and other species as they become threatened or endangered (Cibola National Forest plan, replacement page 33).

**Relationship to Management Prescriptions**: Table A-3 displays the acres associated with Cibola NF management areas (MAs).

**Canopy Cover**: The acres of forestwide management areas affected by the canopy cover portion of the amendment (about 38,373 acres) would range from less than 1% percent (MA 10) to 7 percent (MA 38). The amendment is specific to this project and would not impose definition and clarification requirements on the future management of canopy cover within goshawk habitat.

**Open Reference Condition**: The acres of forestwide management areas affected by the open reference condition portion of the amendment (about 25,841 acres total) would range from 1 percent (MA 10) to 8 percent (MA 8). The amendment is consistent with the management emphasis of providing for multiple uses that includes wildlife habitat (MA 8 and MA 10) and moving ponderosa pine toward desired forest structure, including northern goshawk habitats. The amendment is specific to this project and would not impose requirements on future management of the about 38,373 acres of goshawk non-post-fledging family areas; however, forest plan revision decisions may.
Table A-3. Preferred alternative amendment 2 management area (MA) acres potentially affected by canopy cover amendment

<table>
<thead>
<tr>
<th>MA</th>
<th>MA Description</th>
<th>Forestwide Acres</th>
<th>Amendment Acres</th>
<th>Forestwide Acres Affected (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Ponderosa Pine Suitable Timberlands</td>
<td>292,055</td>
<td>20,353</td>
<td>7%</td>
</tr>
<tr>
<td>10</td>
<td>Mixed Conifer Suitable Timberlands</td>
<td>49,871</td>
<td>38</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>13</td>
<td>No Capacity Rangelands</td>
<td>216,993</td>
<td>2,983</td>
<td>1%</td>
</tr>
<tr>
<td>14</td>
<td>Full Capacity Rangelands</td>
<td>800,767</td>
<td>7,926</td>
<td>1%</td>
</tr>
</tbody>
</table>

**Relationship to Outputs:** Outputs identified in the forest plan are associated with MMBF of sawtimber sales and products (meet demand for timber while reducing conflict with other resources), MMBF of firewood sold and free use (provide access to firewood), grazing capacity, and permitted livestock use. The amendment would not affect outputs or change the long-term relationship between levels of goods (timber, firewood) and services. No portion of the amendment would affect decisions that have been made through separate analyses on grazing capacity or permitted livestock use.

The canopy cover portion of the amendment provides clarification and disclosure of methods for meeting forest plan requirements. It has no relationship to outputs or to the relationship between the level of goods (timber, firewood) and services and would not result in a change in land productivity or timber suitability classification.

**Timber Suitability:** The silviculture analysis evaluated the impact of treatments on timber suitability (see silviculture report). Within the analysis area approximately 214,200 acres on the Coconino NF were considered in the timber suitability class. Unsuitable lands include areas where prescription would preclude timber production such as critical wildlife habitat and developed recreation sites as well as areas where irreversible resource damage occur. Table B 6 shows total acres for the Coconino NF as reported in the forest plan and used in the timber suitability calculation.
Appendix B: Zuni Mountain CFLR Old Tree Retention Guidelines

On November 17, 2015, Cibola NF&NG Forest Supervisor made the decision that from that point forward, excluding areas that had already been cruised and included in the NWTF Stewardship Agreement, an Old Tree Retention Strategy would be implemented for all projects that occurred within the Zuni Mountain Collaborative Forest Landscape Restoration Area.

Guidelines for Retention of Pre-settlement (Mature and Old) Ponderosa Pine:

Every effort should be made to conserve old trees to promote a balanced, uneven-aged forest condition that maintains, or contributes to the restoration of pre-settlement old growth conditions characteristic of the forest type. This should be achieved by retaining pre-settlement trees, often the largest and tallest trees on site. All trees greater than 24” DBH will be retained on site regardless of condition or old tree characteristics, unless deemed an imminent hazard \footnote{Thomson, W. G. 1940. A Growth Rate Classification of Southwestern Ponderosa Pine. Journal of Forestry. 38:547-553.} to people or property.

In addition to trees >24” diameter, all trees with pre-settlement characteristics will be retained. For ponderosa pine, pre-settlement trees ($\approx$1865) may be determined by the following characteristics described by Thomson (1940) \footnote{Thomson, W. G. 1940. A Growth Rate Classification of Southwestern Ponderosa Pine. Journal of Forestry. 38:547-553.} as age class 3 (intermediate to mature) and age class 4 (mature to old):

- **Age** – approximately 150 years and older.
- **Bark** – ranging from reddish brown, shading to black in the top with moderately large plates between the fissures to reddish brown to yellow, with very wide, long and smooth plates occupying more than 50% of the tree bole.
- **Branching** – ranging from upturned in upper third of the crown, horizontal in the middle third and drooping in the lower third of the crown to mostly large, drooping, gnarled or crooked. Branch whorls range from incomplete and indistinct except at the top to completely indistinct and incomplete.
Additional Characteristics to Consider for Wildlife Tree Retention and Safety:

- Favor ponderosa pine with: flat tops, large horizontal limbs, broken branches, spiked (dead) top, advanced signs of decay: trees with damage or decay in the form of lightning scars, visible rot, fire scars/cat faces or bark seams beginning at the base of the tree, or gray xylem (hardwood) with or without the presence of holes or vertical cracks. Freshly exposed xylem wood where the tree may have sealed the wound with sap is not considered advanced decay.

- Intermediate aged trees with larger, reddish brown, smooth platy bark and one or more of the above characteristics can also be good snag/wildlife recruitment trees.

- Poor form (Minimum diameter that applies to this description is 12 inches DBH): dominant multiple forks, crooks, and sweeps may be used as selection criteria to leave a tree if the tree exhibits none of the old-tree characteristics or advanced decay. The mere presence of these characteristics should not automatically determine the tree is to be left.

- Presence of nests in the tree canopy. Cavity holes, burls or conks on the tree bole.
• Evaluate trees for the presence of metal within the bole, such as fencing wire, stakes, spikes, or nails. If cutting a tree poses a safety hazard to the tree faller, it should be retained.

• Hazard trees should be removed regardless of age and size per agency protocols to prevent personal injury and property damage. Any live tree may be felled for safety purposes, at the discretion of the contract/agreement administrator.
Appendix C: Transportation System Maps

Figure C-1. USFS System Roads.
Figure C-2. Unauthorized Roads
Figure C-3. Travel Management Motor Vehicle Designations
Figure C-4. Seasonal Road Restrictions
Figure C-5a. Potential Puerco Haul Routes
Figure C-5b. Potential Puerco Haul Routes
Appendix D: Best Management Practices

Soil and Water Conservation Practices: Description of general practices can be found in FSH 2509.22 and in the National Best Management Practices for Water Quality Management on National Forest System Lands (USDA 2012). The following are site specific mitigations also known as Best Management Practices (BMP) for the Puerco Project.

Riparian/Stream Protection BMP

1. Use of Project Area Maps for Designating Water Resource Features

Locations of protected water resource features and their Management Zones will be delineated on the project area and contract maps. Management zones are also referred to as buffers. Management zones are known by the name of the water resource feature being managed. Riparian management zones are located around riparian areas while spring management zones are associated with springs. Designated management areas will be delineated on the implementation documents such as contracts or permits. When project are completed by Forest Service staff, maps will be provided to make sure mitigations are followed. There are some features which are not currently mapped. As these features are recognized, the watershed specialist will be notified and appropriate mitigations will be incorporated to ensure effects are minimized.

2. Use of Management Zones to Protect Water Resource Features

Stream channels and other water resource features requiring mitigation will be shown on the project maps, along with their associated Management Zones (MZs), also known as buffers. MZs are measured from the outside edge of the feature as described in the table below. With few exceptions, activities within the MZs must benefit the values of the water resource features being protected. Exceptions include locations where stream crossings are needed for preexisting roads, utility corridors, and invasive plant treatments. MZ widths may be reduced or increased when determined necessary by the watershed specialist to ensure water resource features and associated values are maintained.
<table>
<thead>
<tr>
<th>Water Resource Feature</th>
<th>Management Zone Width</th>
<th>Measurement Edge</th>
<th>Treatment Mitigations</th>
</tr>
</thead>
</table>
| Perennial and intermittent streams     | 300 feet              | Edge of active floodplain                              | No tree removal except as designated by watershed specialist to benefit stream functions  
Large wood placement allowed for restoration as determined by watershed specialist                                                                 |
| Riparian areas                         | 300 feet              | Edge of riparian area                                  | No tree removal or cutting except as designated by watershed specialist to benefit riparian functions  
Large wood placement allowed for restoration as determined by watershed specialist  
Targeted invasive plant removal allowed                                                                                                           |
| Mapped Ephemeral Streams               | 100 feet              | Edge of active floodplain or top of bank if no floodplain present | No tree removal or cutting except as designated by watershed specialist to benefit stream functions  
Large wood placement allowed for restoration as determined by watershed specialist  
Targeted invasive plant removal allowed                                                                                                           |
| Unmapped ephemeral streams as identified in the field | 25 feet               | Edge of first break in slope above channel              | No tree removal or cutting except as designated by watershed specialist to benefit stream functions  
Large wood placement allowed for restoration as determined by watershed specialist                                                                 |
| Springs                                | 500 feet              | Edge of riparian area or potential riparian area associated with spring | No tree removal or cutting except as designated by watershed specialist to benefit spring condition                                                                 |
| Wetlands                               | 300 feet              | Edge of wetland                                        | No tree removal or cutting except as designated by watershed specialist  
Large wood placement allowed for restoration as determined by watershed specialist to benefit wetlands                                                                 |
| Drinking Water Supplies                | 500 feet              | Point of source waters or well                          | No pesticide use within 500 feet of source waters or well head  
No tree removal or cutting except as designated by watershed specialist to benefit source waters                                                                 |
3. Mitigation common to all MZs
   a. No heavy equipment will be allowed within the MZ water resource features except at designated temporary crossings with additional mitigations. Exception may be made as determined necessary by the watershed specialist. Temporary crossing are allowed for stream features. Other water resource features such as springs, seeps, and wetlands will not be crossed by motorized vehicles. Where temporary crossings are allowed, crossings will be restored and stabilized by the end of the project activities in that area. Multiple crossings should be spaced greater than 500 feet from each other on perennial and intermittent streams. Existing crossings that are part of the road system should be maintained to prevent impacts.
   b. Debris generated from treatment activities will be not be placed within MZs and will removed from these areas if it ends up there. Large wood such as whole trees (not limbed) may be placed in streams to stabilize and capture sediment where determined to be beneficial by the watershed specialist.
   c. Lead-out ditches or water-bars should be constructed in such a manner as to divert run-off away from MZs and related water resource features.

4. Treatment of Ephemeral Drainages
Ephemeral drainages are recognized in the following ways. They form the lowest spot of the surrounding ground. They form obvious channel continuity along its length and join with larger channels downstream.

There are two types of ephemeral channel mitigations. These include mapped ephemeral channels known prior to project implementation and those ephemeral channels that were not recognized prior to project implementation. Generally, the mapped ephemeral channels are the larger feature while the unmapped channels are smaller. Mapped ephemeral channels are included on the mitigation map and GIS file. To assist in project implementation, additional mitigations for the unmapped ephemeral channels are prescribed when these feature are recognized during project implementation. These mitigations are meant to be easily implemented during project work while maintaining the integrity of these features.

Objectives for ephemeral drainages is to provide for or to retain sufficient amounts of ground cover possible to maintain channel stability and prevent down cutting, Mitigations related to MZs are described in the section on management zones. Additional mitigation and clarification is included in this section.
   a. Motorized vehicles will not be allowed to drive up and down ephemeral drainages.
   b. Where temporary crossings are allowed, multiple crossings should be spaced greater than 300 feet from each other. Existing crossings that are part of the road system should be maintained to prevent impacts.
5. **Log Landing Location**
Log landings (or decking areas) are not be allowed in or within water resource features Management Zones. Landings will be located on slopes less than 15% and avoid areas with severe erosion hazard. Erosion control measures will be implemented around landings or decking areas to prevent loss of soil, sedimentation, and concentrated runoff.

6. **Slash Treatments in Sensitive Areas**
Slash piling shall not occur in MZs. Large wood can be placed as appropriate with the input of the watershed specialist to encourage improvements in stream condition. Masticated material depth should not exceed 4 inches. Masticated material should be discontinuous at least at the .25 acre scale.

7. **Prescribed Burning Treatments**
To maintain the sediment filtering capacity of management zones (MZs), reduce erosion, and retain long term soil productivity, several BMPs are indicated.

   a. Burn to allow for low to moderate burn intensities.
   b. Ignition should be outside of the MZs.
   c. Burn piles will be located outside of the MZ.

8. **Servicing and Refueling Equipment**
During servicing or refueling of equipment, pollutants shall not be allowed to enter any waterway, riparian area or stream course. Select service and refueling areas well away from wet areas and surface water, and by constructing berms around such sites to contain spills. Spill prevention, containment and countermeasures (SPCC) plans are required if the oil of any kind or in any form (including fuel) exceeds 660 gallons in a single container or if total storage at a site exceeds 1,320 gallons. The SPCC plan shall be submitted to the project administrator and the Forest Hazmat Coordinator prior to any operations or storage of materials. The project contract administrator shall designate the location, size and allowable uses of service and refueling areas. The authorized FS Officer shall be aware of actions to be taken in case of a hazardous substance spill.

The contractor shall take all reasonable precautions to prevent pollution of all National Forest soil and water. Equipment operators shall maximize the recovery and proper disposal of all fuels, fluids, lubricants, empty containers and replacement parts. Refuse resulting from the contractor’s use, servicing, repair or abandonment of equipment shall be removed from National Forest system
lands by the contractor to the appropriate disposal facilities. Any leaks originating from contractor equipment shall be repaired or the equipment replaced in a timely manner and reported to project administrator for any follow-up remediation actions required.

**Upland related BMPs**

1. **Limit the Operating Season**

   Ground disturbing activities from motorized vehicles or heavy equipment shall be limited to dry or solidly frozen soil conditions to reduce compaction and soil displacement (rutting) that is associated with tree removal activities when soils are wet or are saturated.

2. **Erosion Prevention and Control**
   
   a. Immediately after use, areas where compaction and bare soil are present such as landings, skid roads, temporary roads, and masticator tracks will be treated to prevent soil degradation and stabilize the sites. This includes decompaction treatments as needed to eliminate compaction. In addition, these areas could be mulched and seeded with an erosion control seed mix consisting of primarily native species.

   b. Slash or chips could be scattered on these areas to further retard formation of rills and gullies. If existing rills are present, these rills will be broken down prior to erosion control treatments.

   c. Construct and maintain the appropriate erosion control features on and adjacent to roads and disturbed areas such as skid trails or similar features created by multiple passes with motorized equipment.

   d. Heavy equipment should be limited to use on slopes 40% or less.

3. **Soil Productivity/Coarse Woody Debris**

   To maintain or improve soil productivity woody material should be left on the ground at levels appropriate to the vegetation type. This should include a distribution of size classes and decay classes. Retain wood in an advanced state of decay.

4. **Machine Piling of Slash**

   Do not use soil disturbing methods to pile slash. Minimize the use of slash piles. Do not place slash piles within MZs. When possible, burn slash piles in the winter. Piles will be less than 10 feet by 10 feet and composed of a variety of size classes with large wood distributed throughout the pile. Large wood should not be concentrated on the bottom to prevent excessive soil heating. Restore the soil underneath piles after burning, if needed.
5. Minimize ground disturbance
   a. No more than 15% of the project area should have new ground disturbance that results in impaired or unsatisfactory soil condition.
   b. When managing for groups of trees, at least 25% of the groups should be left completely undisturbed to maintain soil conditions. This means no trees will be removed, no mechanized or motorized activities, and ground cover is intact.

6. Prescribed Burning Treatments
   c. Schedule burning when the soil moisture conditions will minimize heat conductivity into the soils and result in low to moderate burn levels.
   d. Fire control lines on slopes greater than 40% or within designated shall be constructed by hand. Exceptions will be approved by local District Ranger with input from specialists. Fire lines will be treated as needed (waterbars, seeding etc.) to prevent concentrated water flows and erosion.

**Monitoring for Best Management Practices**

The desired result of BMP monitoring is to document that BMPs have been applied as prescribed and that they appear effective in reducing sediment and moderating flow regimes in forest streams. BMPs that are found to be ineffective in protecting identified resource, aquatic and water quality goals will be adjusted. BMPs will be monitored using the National Best Management Practices for Water Quality Management on National Forest system Lands (USDA FS, 2012). This protocol randomly selects project across the forest to assess for implementation and effectiveness of BMPs. This shows the overall implementation and effectiveness of projects across the forest, leading to improvement in BMPs.