Crossons-Longview Forest Restoration Project Environmental Assessment

Vegetation Specialist Report V4

South Platte Ranger District
Pike National Forest
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JW Associates Inc.

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1. Introduction

The purpose of the proposed project is to restore sustainable forest conditions that are resilient to fire, insects, and diseases, while providing for diverse wildlife habitats, recreational opportunities, and sustainable watershed conditions. The specific purposes of this project are:

- To reduce the potential of land-scape scale, high-intensity wildfires with uncontrollable fire behavior, such as active crown fire.
- To reduce the potential that a wildfire would negatively affect public water supplies from subsequent severe flooding and sedimentation.
- To improve forest health, vigor, and resilience to large-scale fire, insects and disease.
- To enhance wildlife habitats including shrublands, aspen and Pawnee montane skipper habitat in conjunction with vegetation treatments designed to reduce wildfire risk.

2. Project Description

Alternative B – Proposed Action

The South Platte Ranger District of the Pike and San Isabel National Forest proposes to treat 9,574 acres within the 22,729 acre Crossons-Longview Project Area to move the montane forest ecosystem towards historic conditions. The proposed actions would alter forest stand and understory conditions and would be accomplished by a combination of mechanical harvesting and hand treatment. Specific actions would be dependent on site-specific conditions and the vegetation type; however, actions would include thinning, created openings, and prescribed burning. Professional judgment would be used, within guidelines identified in the Environmental Assessment and taking into consideration the terrain and vegetative type, to determine which one or combination of treatments are most appropriate for individual treatment sites. Approximately 55 percent of the treatment areas are located within 0.5 miles of existing roads, with 33 percent of those areas treated by hand due to slopes between 35-60 percent. Approximately 61 percent of the treatment areas lie on slopes of 0-35 percent and would be considered appropriate for treatment with traditional harvesting equipment and commercial product removal. The treatments on slopes between 35-60 percent would likely be hand treatments. Where possible, vegetation treatments would take into consideration previously treated areas and/or past burned areas in order to increase the overall landscape benefit.

The Proposed Action does not include the establishment of any new system roads, however, approximately 10 miles of temporary roads would be used to access the proposed action treatment areas. The target vegetation

areas are identified on Table 1 and Figure 1. It is expected that project activities would take approximately 10 years to treat the proposed treatment area.

Table 1. Crossons-Longview Alternative B - Proposed Treatment Areas

Vegetation Type	Area (acres)	Percentage of Total Area Treated (%)
Xeric Ponderosa pine	4,581	48%
Mesic Ponderosa pine	3,684	38%
Mixed Conifer	603	6%
Lodgepole pine	557	6%
Aspen	121	1%
Shrubs	28	<1%
Total	9,574	

ALTERNATIVE C

Alternative C was developed in response to a concern that increasing access through the use of temporary roads would cause some negative effects. Alternative C proposes that minimal temporary roads will be built to accomplish the project's purpose and need. Temporary roads would be limited to short segments needed to accomplish the treatments, such as jump-up spurs. Relying solely on the existing road network will lessen the ability for product removal and will shift treatment methods toward more mastication and hand thinning. This alternative seeks to balance forest restoration with concerns about expanding the existing road network.

Because minimal temporary roads will be constructed, all treatment must occur off of existing roads, limiting the area that can be treated. It is assumed that all treatment will occur within 0.5 miles of existing roads, reducing the available treatment area to 6,325 acres. Table 2 presents the proposed treatment area by vegetation type for Alternative C.

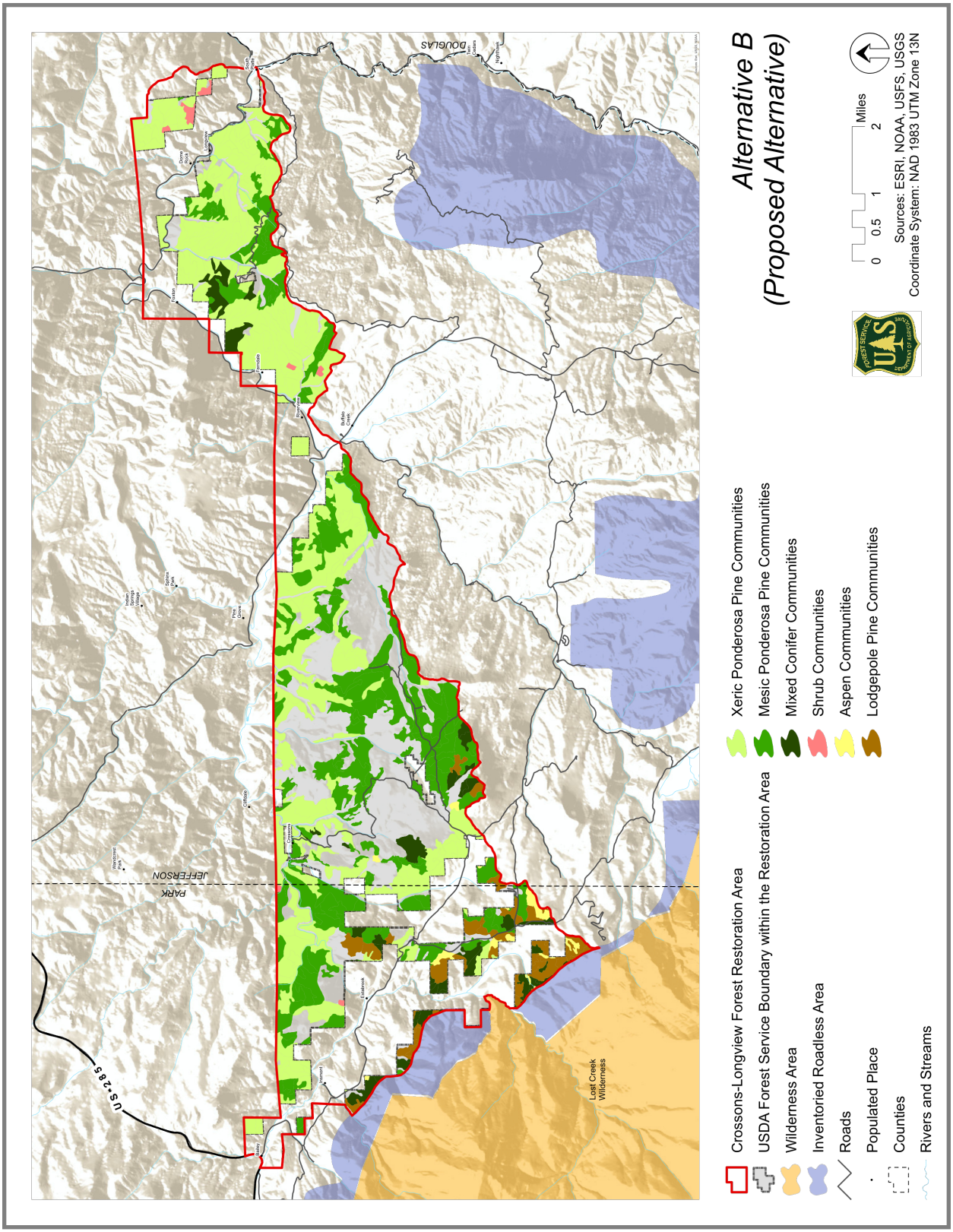

Figure 1. Crossons-Longview Treatment Area Map

Table 2. Crossons-Longview Alternative C - Proposed Treatment Areas

Vegetation Type	Area (acres)	Percent of Total Area Treated (%)
Xeric Ponderosa pine	2,919	46%
Mesic Ponderosa pine	2,500	40%
Mixed Conifer	422	7%
Lodgepole pine	354	6%
Aspen	115	2%
Shrubs	16	<1%
Total	6,326	

3. Regulatory Framework

3.1 National Forest Management Act

The Land and Resource Management Plan for the Pike and San Isabel National Forests; Comanche and Cimarron National Grass Lands (USDA Forest Service 1984), as amended, provides the framework to guide the day-to-day resource management operations of the Pike-San Isabel National Forests and subsequent land and resource management decisions made during project planning. The 1976 National Forest Management Act (NFMA) requires that site-specific project decisions must be consistent with the Forest Plan. Forest Plan goals and objectives guide the identification and selection of potential agency projects. The determination of whether or not an individual project is consistent with the Forest Plan is based on whether or not the project adheres to forest-wide and management area standards.

4. Analysis Methods

4.1 Definition of Project Area

The lands within in the boundaries of the Project Area include both National Forest System lands and a significant portion of private lands. The Project Area covers 22,729 acres of which 15,196 acres are National Forest System lands and 7,533 acres are private lands that are excluded from consideration for treatments. For the vegetation analysis the term "Project Area" refers only to the National Forest System lands.

4.2 Forest Vegetation

The Region 2 Vegetation (R2Veg) database was used to characterize the current structure of the forested landscape. The data on vegetation contained in this database were obtained from a combination of aerial photo interpretation and field surveys conducted prior to September 2007. Information used to characterize the forest vegetation of the Crossons-Longview area includes cover types, structural stages, crown cover, and elevation.

Cover types are a way of classifying areas by the vegetation that occupy a site. Cover type data from the R2Veg database were used to assess the existing species composition of the vegetation across the Project Area. Cover types are named for the plant species that presently dominate on the site. Forest cover types within the R2Veg database use the Society of American Foresters definitions, and the shrub, grass and forb dominated sites use the Society of Range Management definitions.

Vegetation is also characterized by structure. Structure is described by habitat structural stages, which are defined by size class, tree diameter, and canopy closure (measured as crown cover percent). Table 3 displays habitat structural stage definitions.

Table 3 Habitat Structural Stage Definitions.[1]

Habitat Structural Stage	Size Class	Diameter (inches)	Crown Cover (%)
1T[2]/1M[3]	Grass-Forb	Not applicable	0 – 10
2T[2] /2S[4]	Shrub-Seedling	< 1	0 - 10
3A	Sapling-Pole	1 – 9	11 – 40
3B	Sapling-Pole	1 – 9	41 - 70
3C	Sapling-Pole	1 – 9	71 - 100
4A	Mid-aged	9+	11 – 40
4B	Mid-aged	9+	41 - 70
4C	Mid-aged	9+	71 - 100%
5[5]	Mature	Not applicable[5]	Not applicable[5]

Crown cover is a measure of density and is the percentage of a fixed area covered by the vertical projection of the outermost perimeter of the tree crowns. The total crown cover of an area cannot exceed 100 percent. Crown cover is used to describe stand density or how open or closed the tree crowns are within a stand. Research of historical conditions of ponderosa pine forests of the region has estimated that the typical crown cover was 25 to 30 percent, although higher crown cover may have characterized some ponderosa pine stands in the upper montane.

The crown cover categories used within the R2VEG database information are as follows:

1. less than 40% crown cover (A)
2. 40% to 70% crown cover (B)
3. greater than 70% crown cover (C)

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[1] Hoover and Wills, 1987

2 Opening in forest cover type created by some type of disturbance – previously tree covered.

3 Natural meadow – not previously tree covered.

4 Shrub cover type

5 Old Growth, Forest Criteria and Documentation usually determined by a scoring system. Class does not distinguish between canopy cover classes, existing conditions in this class is assumed to be >40 percent crown cover.

Elevation was used to determine the vegetation zones used in the discussion of the historic landscape. These zones include:

1. < 6,500 feet
2. 6,500 to 7,500 feet
3. 7,500 to 8,500 feet
4. 8,500 to 9,500 feet

Xeric Ponderosa Pine

Xeric ponderosa pine consists of mostly ponderosa pine as the dominant vegetation, with smaller areas having no dominant tree type but having Gambel oak/mountain mahogany. These systems would have a history of frequent, low intensity fires, creating more open forested conditions.

Xeric Ponderosa pine is classified as:

1. Ponderosa pine stands below an elevation of 6500 feet
2. Ponderosa and Douglas-fir stands between 6500 and 7500 feet in elevation except on north slopes
3. Ponderosa and Douglas-fir stands between 7500 and 8500 feet in elevation on south and west aspects, and exposed ridges.

The treatment objective on the xeric ponderosa pine sites would be to create more open forested conditions. The treatments would reduce the basal area to a range of 20 to 80 square feet per acre by creating clumps of trees (defined here as five or more trees with their crowns touching), and openings of 1 to 40 acres where at most individual trees are present with a canopy cover ranging from 15 to 20 percent.

Mesic Ponderosa Pine

Mesic Ponderosa pine likely developed under a mixed severity fire regime (Crane 1982 and Kaufmann et al. 2006) that would have resulted in a greater variety of stand structures and ages than would have developed on the drier (more xeric) Ponderosa pine sites.

Mesic Ponderosa pine is classified as:

1. Ponderosa pine stands between 6500 and 7500 feet in elevation on north aspects
2. Ponderosa pine stands between 7500 and 8500 feet in elevation on north and east aspects
3. Ponderosa pine stands between 8500 and 9500 feet in elevation on all aspects

As with the Xeric Ponderosa pine, the treatment objectives would be to create more open forested conditions. However, there would be a greater range of residual stand densities and fewer fire-maintained openings in these more mesic areas. Larger clumps (both in overall size and number of trees present per clump) would be present compared to the xeric systems. There would also be a greater amount of Douglas-fir left within the residual stands. Treatments would result in residual stand densities between 40 to 120 basal area (square feet per acre) and openings would be between 1 to 20 acres, depending on terrain. Canopy cover in these stands would average 20 to 35 percent.

Lodgepole Pine

Lodgepole pine grows on a wide range of sites, typically between 7,500 and 10,000 feet and can occur in pure or mixed stands (Shepperd and Alexander 1983). Lodgepole is mostly shade intolerant and exists as a seral species where environmental change such as fire has occurred. Stand-replacing fires are typical in lodgepole pine and, because the majority of the cone production from the lodgepole species is serotinous (cones being covered in sap), the cones generally open up after a fire has swept through, creating a new cohort of even-aged saplings crops up soon after a fire. Fire therefore effectively sets the seedbed for a new generation of trees, which often reproduce prolifically following wildfire (Agee 1993). Studies of lodgepole pine in the Central Rockies indicate that the return interval of stand-replacing fire is 50 to 200 years while mixed severity fires occur every 40 to 500 years. Stand-replacing fires are the most common, occurring 73 percent of the time (USDA Forest Service, FEIS, accessed on January 7, 2014). Lodgepole pine is susceptible to bark beetles, mistletoe, blow down and fire (Lotan 1964).

Mixed Conifer

Mixed conifer areas are generally composed of limber pine, Douglas-fir, spruce, lodgepole pine and some ponderosa pine. The historical disturbance regime was mixed-severity fires with a fire recurrence interval of 30-100 years (Crane 1982), which created a mosaic of conditions composed of structural stages ranging from young to old trees. Stands were variable but generally uneven-aged and open, with occasional patches of even-aged structure. Denser tree conditions existed in some locations such as north facing slopes and valley bottoms. The historical pattern would be small clumps and groups of trees interspersed within variable-sized openings of grasses and shrubs and a greater variety of stand structures and ages (Crane 1982).

The density of the Project Area's mixed conifer stands has increased due to the lack of natural disturbances. In particular, understory trees that provide ladder fuels, are present across a larger proportion of the mixed conifer forest than would have existed historically. Therefore, these stands are at a high risk of large crown fires. Some areas would be thinned from below leaving a relatively even-aged stand of the larger cohorts. The thinning would retain the more mature trees and remove the more flammable understory vegetation.

Mixed conifer is classified as;

1. Bristlecone/limber pine, and xeric and mesic Mixed Conifer cover types
2. Douglas-fir cover type between 6500 and 7500 feet in elevation on north aspects
3. Douglas-fir cover types between 7500 and 8500 feet in elevation on north and east aspects

Aspen

Fire has also been important in maintaining the vigor and extent of aspen. Aspen in this area have been maintained by suckering from long-lived clones that prosper following fire. Aspen provides many benefits to the landscape, including natural fire breaks, species diversity and important wildlife habitat. Bartos (2000) argues that aspen has declined by 49 percent in Colorado due to encroachment by conifers. Other researchers (Kulakowski and Veblen 2006) do not agree that the magnitude of aspen reduction has been as great as that suggested by Bartos. In general, the occurrence of large and severe fires would increase the extent of aspen

and the lack of fires would allow the successional replacement of aspen by conifers (Veblen and Donnegan 2005). Disturbance regimes in aspen are generally similar to the conifer stands that are next to them (Veblen and Donnegan 2005). In the Project Area, aspen are present next to ponderosa pine and mixed conifer forests that have mixed severity fire regimes with fire return intervals of between 30 and 100 years. Therefore, aspen stands have likely experienced fewer disturbances in the past 100 years due to fire suppression than would be expected.

Aspen areas are defined as;

1. Aspen cover type
2. Lodgepole pine, ponderosa pine, and mixed conifer cover types that are adjacent to aspen stands, or have an aspen component in the understory.

Shrublands

Gambel oak and mountain mahogany are the two shrubs that occur in the Project Area and can dominate a stand or occur with ponderosa pine, Douglas-fir, and Rocky Mountain juniper.

Gambel Oak

In Colorado, Gambel oak only occurs in clones of small to large shrub form, and does not grow as large trees. As a broadleaf deciduous shrub Gambel oak contributes to the biodiversity of a stand and increases diversity of invertebrates, birds, and other wildlife. Acorn production from mature trees is valuable to wildlife (e.g., bears and turkeys). Its new leaves are good browse for deer and elk. However, extensive, tall stands of Gambel oak can outcompete grasses and herbaceous understory. These types of stands can also be a major factor in fire behavior because they have a substantial aerial biomass. Following fire, Gambel oak clones resprout quickly and vigorously in response.

Mountain Mahogany

Mountain mahogany generally occurs as a shrub and does not attain the stature that Gambel oak does in the Project Area. Mountain mahogany leaves and sprouts are a highly valuable browse resource for elk, mule deer, and bighorn sheep. Stands dominated by Mountain mahogany can become dense and decadent without fire, or other disturbances, and outcompete grasses and herbaceous understory plants. However, due to their smaller stature and smaller leaf biomass, Mountain mahogany does not influence fire behavior as much as Gambel oak. It does resprout following fire but does not come back as quickly or as dense as Gambel oak.

5. Forest Existing Conditions

This section describes the environmental baseline for forest vegetation. As discussed above in *Analysis Methods*, the term Project Area refers only to National Forest System lands within the Project Area boundaries.

Cover types are used to describe the vegetation that currently occupies a site and are named for that dominant vegetation. The Crossons-Longview Project Area is dominated by forest vegetation with xeric and mesic

ponderosa pine the major components. Lodgepole pine, mixed conifer, aspen and shrub communities are minor components. Figure 2 illustrates the distribution of these communities within the Project Area.

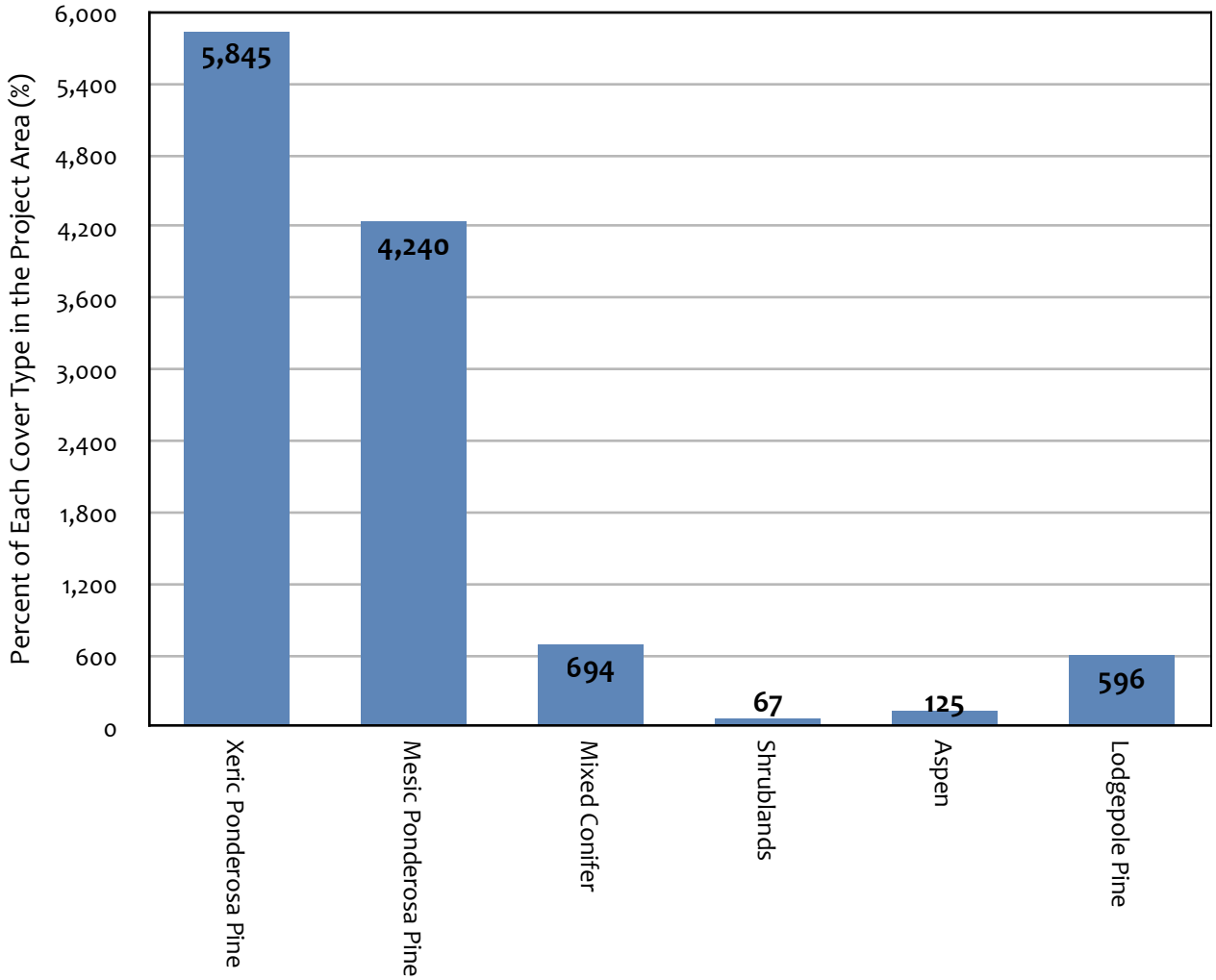

Figure 2. Estimated Distribution of Vegetation Types in Project Area

Vegetative communities result from complex interactions of climate, soils, topography, disturbance and time. The most important natural disturbances affecting forest succession in the montane zone of the Colorado Rockies are fire, insect outbreaks and windstorms (Veblen and Donnegan, 2005). Humans have affected the forest vegetation of the region through logging, livestock grazing and fire suppression. In their discussion of historical fire regimes of the ponderosa pine forest of the area Kaufmann, Veblen, and Romme (Kaufmann et al., 2006) divide the montane zone into the lower montane and upper montane zones. Table 4 is based on

Veblen and Donnegan (2005) who describe the historical vegetation of the National Forests of the Colorado Front Range and compares the current forested landscape with conditions found from 1500 to 1850 AD.

Table 4. Comparison of the Current Forested Landscape to the Range of Landscape Variation Expected2

Zone and Main Cover Types	Historical Landscapes	Current Landscapes
Lower Montane Ponderosa pine	**Pattern**: Open woodlands of ponderosa pine, extensive grasslands, riparian forests, small dense patches of ponderosa, shrublands. **Mechanisms**: Moderately frequent low-severity fires maintained open pine woodlands; patches of higher severity fires resulted in openings or dense regeneration of pines or shrubs.	**Pattern**: More continuous forest cover and generally denser pine stands than occurred historically. Extreme conversion and fragmentation of natural landscape. **Mechanisms**: 20th century fire exclusion, late 19th and early 20th century grazing and logging conducive to ponderosa pine establishment. Widespread exurban development.
Mid and Upper Montane Ponderosa pine Douglas-fir / mixed conifer	**Pattern**: Heterogeneous landscape mainly of ponderosa pine dominated patches of variable sizes and ages, Douglas-fir on more mesic sites, openings consisting of grasslands and severely burned former forest sites. **Mechanisms**: A variable severity fire regime in which forest structure was shaped mainly by severe fires; low-intensity fires were less significant in forested areas but probably important in meadows.	**Pattern**: Still highly heterogeneous landscape in relation to site conditions influencing stand densities and composition, but much less heterogeneous forest stand ages mostly dating from c. 1850 to 1920. Meadows persist but show limited tree encroachment. Relative dominance of ponderosa pine and Douglas-fir not significantly changed from the historic landscape. **Mechanisms**: Major influence of severe, widespread fires of the 2nd half of the 19th century reflected in even-aged post-fire stands; relatively young stands also triggered by logging and other anthropogenic disturbances. Substantial exurban development.
Subalpine Lodgepole pine Aspen Spruce-fir	**Pattern**: Very large patches of even aged forests varying in composition from pure lodgepole pine or aspen to spruce-fir. **Mechanisms**: Infrequent, high severity fires followed both by successional replacement of species or recovery to the same dominant tree species according site conditions and seed/sprout availability.	**Pattern**: Relatively unchanged from the historical patterns except where logging or exurban development has affected limited areas. **Mechanisms**: Fire regimes have not changed significantly from the historic fire regime of large fires occurring at highly variable intervals.

[2] from Veblen and Donnegan 2005

5.1 Xeric Ponderosa Pine

Xeric Ponderosa pine is the most abundant cover type within the Project Area occupying 5,845 acres. These stands are predominately mid-aged (Structural Stage 4) but there are also some sapling-pole (Structural Stage 3) and mature trees (Structural Stage 5). Small areas with seedling cover (Structural Stage 2) are also present (Figure 3). Within the mid-aged class (Structural Stage 4), stands with more than 40 percent canopy cover are slightly more abundant. Only three percent of the xeric ponderosa pine exists as openings (grass/forbs). While there is some variety of structural stages within the existing ponderosa pine cover type, the historic landscape most likely would have had a greater proportion of area with less than 40 percent crown cover and more openings (Structural Stage 1T&1M).

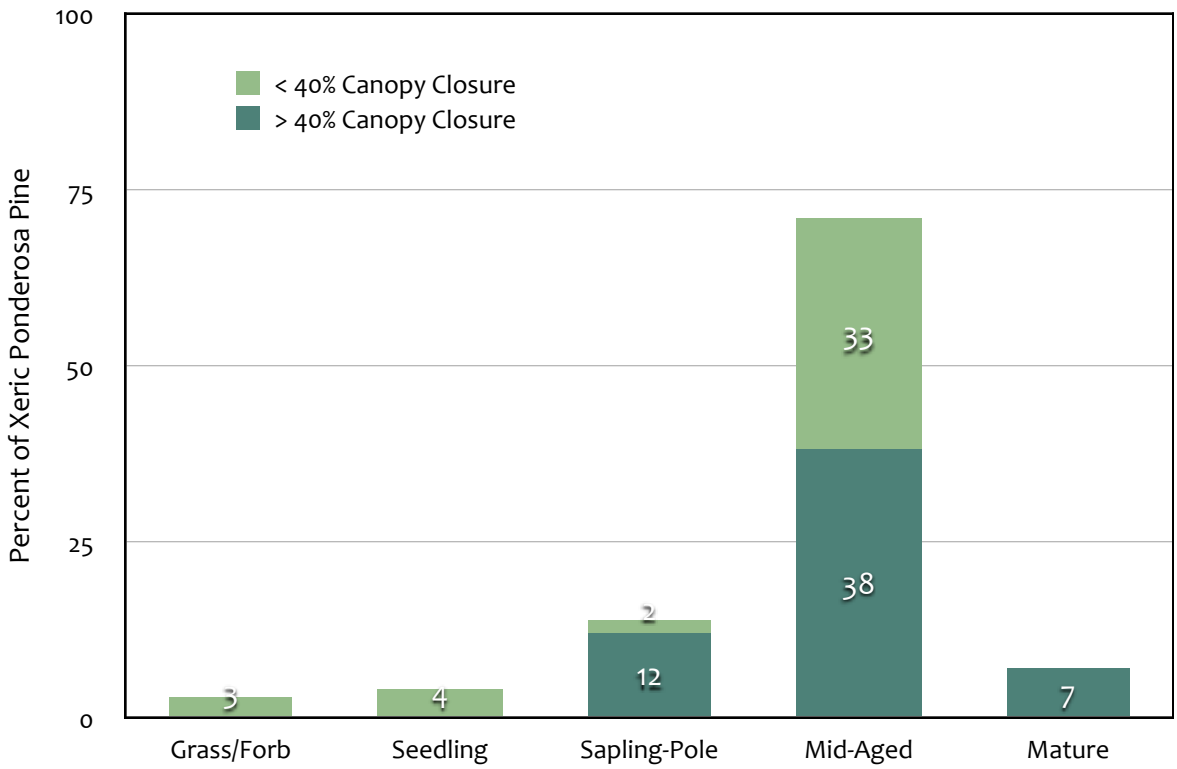

Figure 3. Existing Structural Stages for Xeric Ponderosa Pine.

5.2 Mesic Ponderosa Pine

Mesic ponderosa pine is the second most abundant cover type in the Project Area comprising 4,240 acres. Size and canopy distribution of mesic ponderosa pine stands resemble xeric ponderosa pine stands. Mid-aged stands (Structural Stage 4) are the most abundant and 42 percent of these stands have more than 40 percent canopy cover. Sapling-pole sized (Structural Stage 3) and mature trees (Structural Stage 5) are also present as

are small areas with seedlings (Figure 4). Like the xeric ponderosa, only three percent of the mesic ponderosa pine cover type area exists as openings (grass/forbs).

The denser ponderosa pine stands found within the Project Area create conditions suitable for large stand-replacing fires to occur. Denser canopies with small understory trees help fires reach the crown level. Because of this shift in stand conditions, large stand-replacement fires within this cover type in the region have become more common in recent years (USDA Forest Service 2002a).

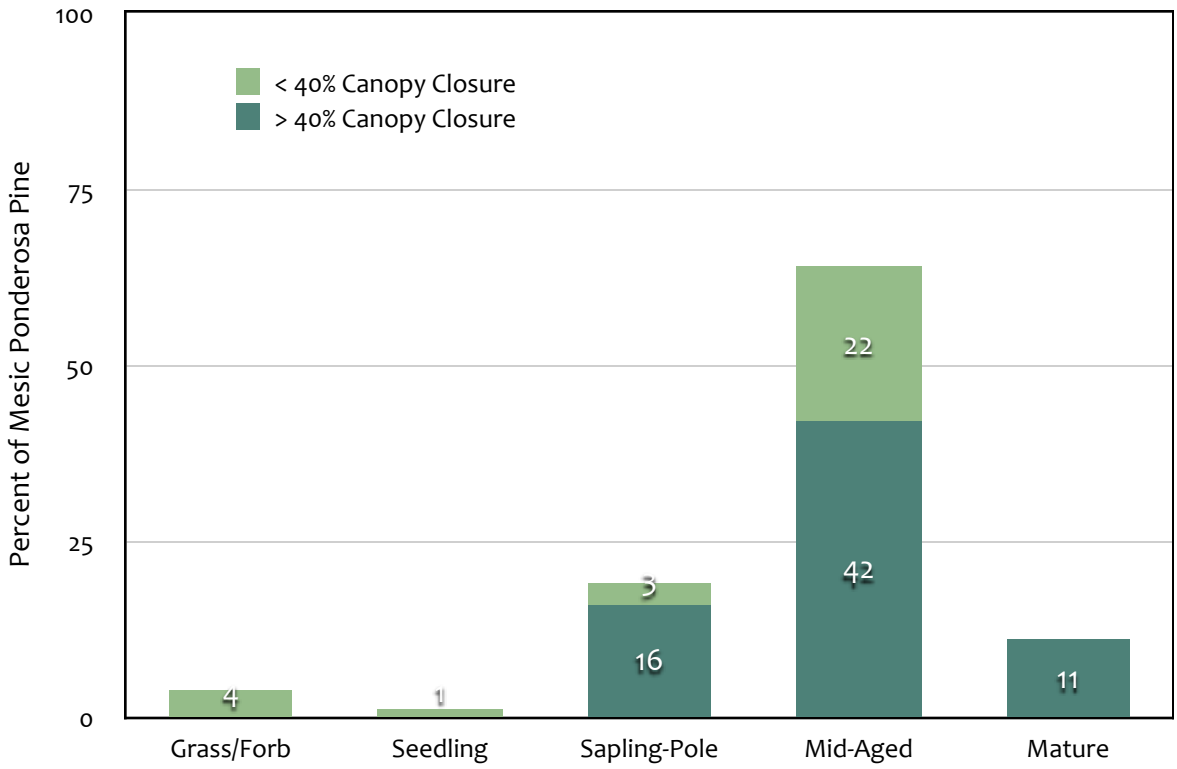

Figure 4. Existing Structural Stages for Mesic Ponderosa Pine.

5.3 Mixed Conifer

The mixed conifer cover type occupies 694 acres, or approximately 6 percent of the National Forest System lands in the Project Area. Mixed conifer areas are generally composed of Douglas-fir, white fir, ponderosa pine, bristlecone pine and limber pine. Most trees are in the sapling-pole (Structural Stage 3) or mid-aged class (Structural Stage 4) with 80 percent of this community having more than 40 percent canopy cover. Openings comprise 13 percent of the mixed conifer cover type treatment area. Figure 5 illustrates habitat structural stages and crown cover for the mixed conifer zone.

Historically, the disturbance regime for mixed conifer stands of the area was mixed-severity fires with a fire recurrence interval of 30-100 years (Crane 1982). Therefore, a mosaic of conditions composed of structural stages ranging from young to old trees was typical of the mixed conifer areas of the montane zone. Stands were variable but generally uneven-aged and open, with occasional patches of even-aged structure. Denser tree conditions existed in some locations such as north facing slopes and valley bottoms. It is likely that a greater proportion of the mixed conifer forest within the Crossons-Longview Project Area today have higher densities (crown cover) than would have existed under the historic disturbance regimes.

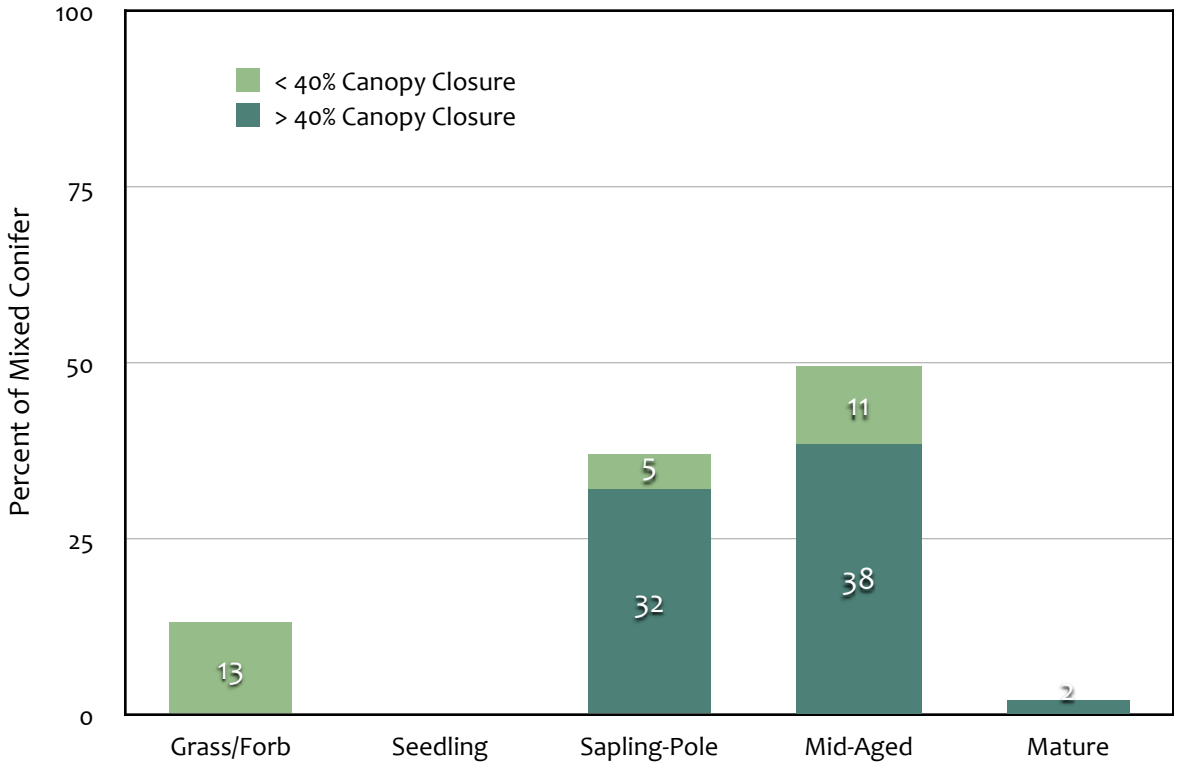

Figure 5. Existing Structural Stages for Mixed Conifer.

5.4 Lodgepole Pine

There are 596 acres of the lodgepole pine cover type in the treatment area, or five percent of the National Forest System lands in the Project Area. All of these lodgepole pine stands have greater than 40 percent canopy closure. Lodgepole pine stands are either sapling-pole (Structural Stage 3) or mid-aged trees (Structural Stage 4) as shown in Figure 6. There are no mature or seedling lodgepole stands in the Project Area. There are also no openings in the lodgepole cover type.

Lodgepole pine grows on a wide range of sites, typically between 7,500 and 10,000 feet and can occur in pure or mixed stands (Shepperd and Alexander 1983). In mixed stands at lower elevations, it can occur with

Douglas-fir and ponderosa pine. At higher altitudes, mixed stands consist of Engelmann spruce, subalpine fir and limber pine. Lodgepole is mostly shade intolerant and exists as a seral species where environmental change such as fire has occurred.

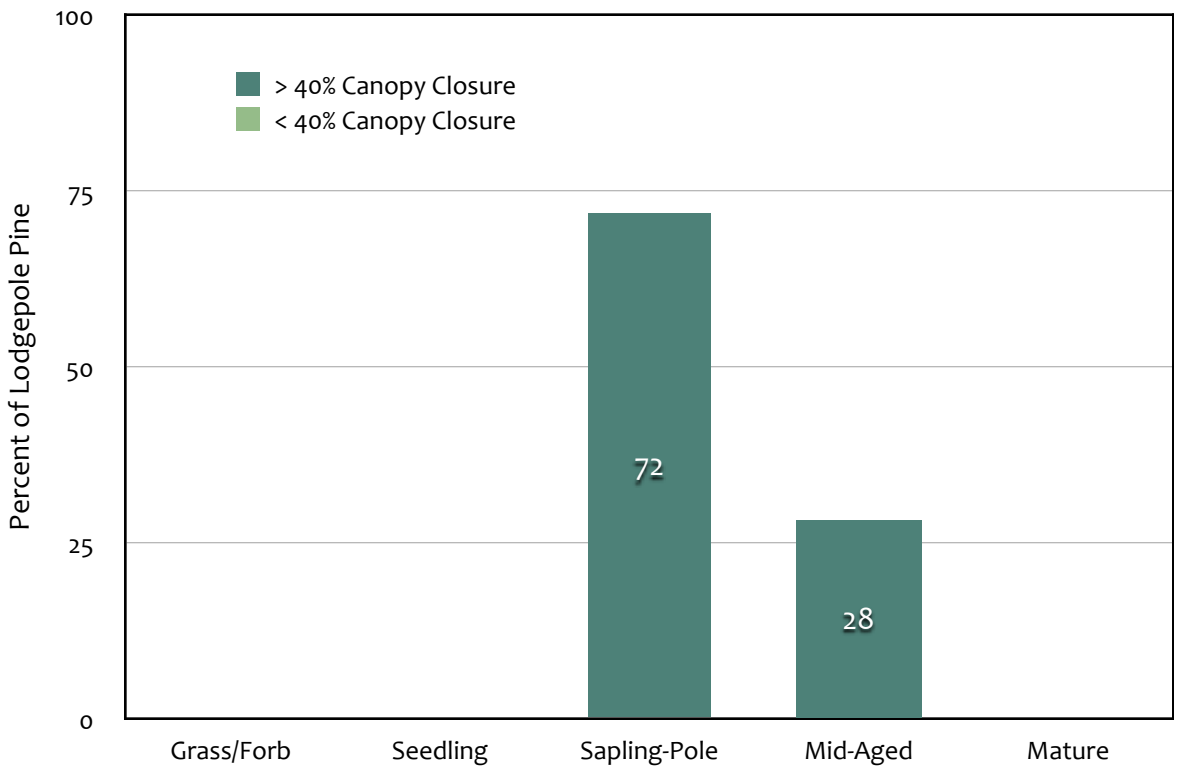

Figure 6. Existing Structural Stages for Lodgepole Pine.

5.5 Aspen

There are 125 acres of aspen in the Project Area. Aspen stands are found either as sapling-pole of mid-aged stands, most of which have canopy closure that is 40 percent or greater (Figure 7). There are no stands of mature or seedling aspen in the Project Area.

Quaking aspen is the most widely distributed tree in North America. Quaking aspen grows on a variety of sites including moist upland woods, dry mountainsides, high plateaus, and along riparian corridors. Climatic conditions vary widely throughout their range, but aspen generally occur where annual precipitation exceeds evapotranspiration. In the Rocky Mountains, altitude plays an important role in its distribution. At higher elevations, quaking aspen is stunted and grows bent or prostrate. This species is not shade tolerant and typically has open canopies with high light levels in the understory. This high light level allows for the establishment of conifers on many sites. On these sites aspen is seral to conifers and in the absence of disturbance may be replaced by conifers over time. On other sites aspen is self-replicating. Aspen reproduces

from seed, but rationing, or suckering, is the most common mode of regeneration. Aspen form clones that are connected by a common parental root system; this characteristic allows it to sprout vigorously after burning or cutting.

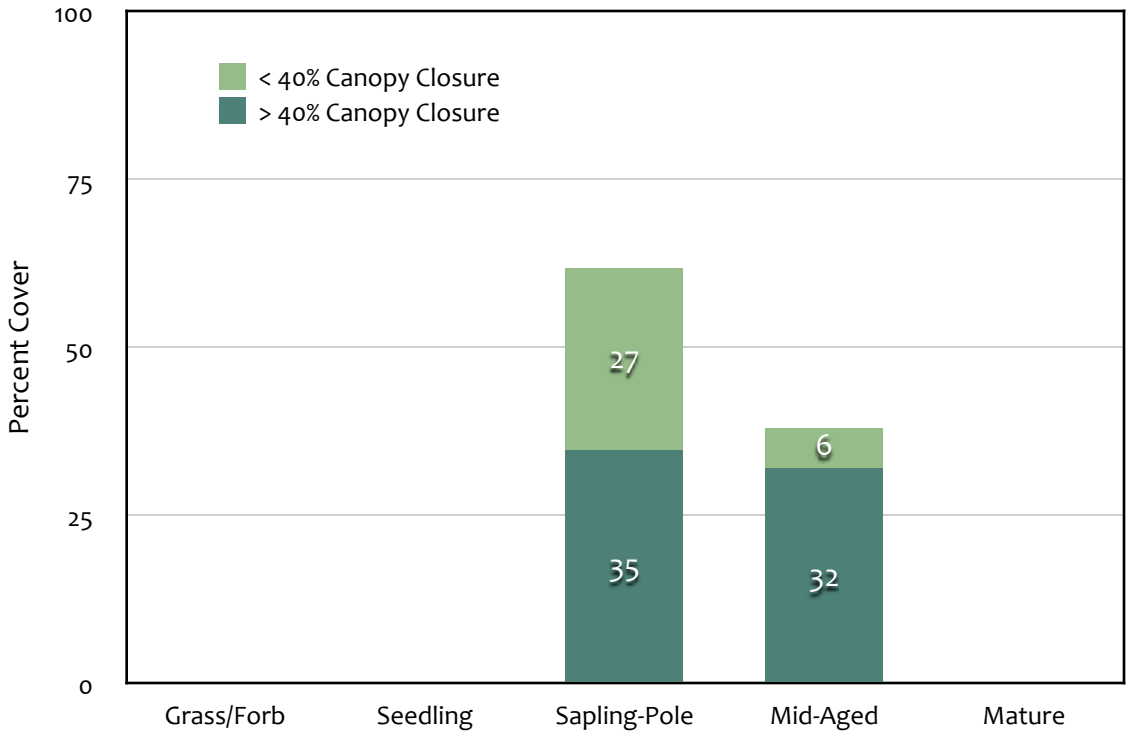

Figure 7. Existing Structural Stages for Aspen.

Aspen provides many benefits to the landscape, including natural fuel breaks, species diversity and important wildlife habitat. Aspens are unique in their ability to stabilize soils and provide habitat for many bird and mammal species. Aspen stands are important nesting and hiding grounds for grouse, doves, warblers, and juncos. Deer and elk browse on aspen year-round, but are especially dependent upon it during fall and winter when aspen protein levels are high relative to other browse species. Aspen communities are described as the major "deer-producing forest type".

Fire suppression impacts aspen regeneration. In the absence of periodic burning, aspen would succeed to conifers or other vegetative types (Jones et al. 1985). Recent data has shown a 50 to 96 percent decline in aspen in the western United States, with a 49 percent decline in Colorado (Bartos 2000). For these reasons, aspen restoration should be given top priority throughout the west (Bartos 2000). Aspen is susceptible to numerous pathogens, many of which are positively correlated with stem injury caused by ungulate browsing

(Romme et al. 1995). Disturbance regimes in aspen, where they are seral to conifers, are similar to the conifer stands that are next to them (Veblen and Donnegan 2005).

Aspen is principally found on the southwest portion of the Project Area and is adjacent to grass / forb / shrub dominated areas, ponderosa pine, lodgepole pine and riparian communities. In the montane zone aspen is adjacent to ponderosa pine and mixed conifer forests that have mixed severity fire regimes with fire return intervals of between 30 and 100 years. Therefore, aspen stands in this zone have likely experienced fewer disturbances in the past 100 years due to fire suppression. Where aspen occurs near lodgepole pine the stand replacing fires occur every 50 to 200 years while mixed severity fires occur every 40 to 500 years.

5.6 Shrublands

There are two types of shrublands within the Crossons-Longview Project Area including Gambel oak (*Quercus gambelii*) dominated and true mountain mahogany (*Cercocarpus montanus*) dominated. There are 67 acres of shrubland within the Project Area that are classified as habitat structural stage 2.

Gambel oak is a tall shrub or short tree where it occurs on the Pike and San Isabel National Forest. This species is limited at lower elevations by moisture stress and at higher elevation by competition with other species. It is probable that this cover type experienced infrequent stand replacing fires under the historic conditions (Veblen and Donnegan 2005). This shrub re-sprouts after fire from rhizomes and can recover rapidly following fire. The Gambel oak communities in the Crossons-Longview Project Area have become decadent over time in the absence of fire. Gambel oak becomes denser as it ages and shades out grasses and other ground cover. In southern and southwestern Colorado, Gambel oak occupies a secondary successional stage in ponderosa pine and Douglas-fir (*Pseudotsuga menziesii*) stands removed by fire or logging (Brown, 1958; Harrington, 1964). It is a persistent subclimax to conifers or a climax species of foothill ranges (Dixon, 1935, Engle et al. 1983, Hayward, 1948, Lull and Lincoln 1950). Gambel oak generally increases with disturbance or thinning of ponderosa woodlands. Gambel oak is a fire-adapted species (McKell, 1950). It responds to fire by vegetative sprouting from the lignotuber and rhizomes, often vigorously in the first season following fire (Brown, 1958; McKell, 1950).

True mountain-mahogany is a deciduous shrub. In Colorado it occurs on dry slopes, hills, ridges, mesas, desert foothills, and rocky outcrops between 4,000 and 8,500 feet of elevation (Harrington 1964). It grows best in full sun (Kitchen, 2004), tolerates early-seral site conditions, and is dominant in several late-seral or climax communities (Zacek et al., 1997). Often true mountain-mahogany is top-killed by fire; however, it quickly recolonizes burned sites through root crown or rhizome sprouts (Cronquist et al. 1997). The fir return interval for mountain mahogany when in a Gambel oak scrub community ranges between less than 35 to less than 100

years and 2–30 years when in interior ponderosa pine (Arno, 2000). The fire return interval varies widely. Numerous authors report that true mountain-mahogany seedlings are rare in the early postfire years (Keeley and Keeley, 1988) and that seedling establishment is most typical in mature stands (Halsey, 2005). Mountain mahogany provides forage and habitat for diverse wildlife species and most types of livestock (Reynolds, 1964).

6. Forest Effects

This section describes the effects of Alternative A (No Action), Alternative B (Proposed Action) and Alternative C on the vegetation of the Crossons-Longview Project Area. As discussed above in *Analysis Methods*, the term Project Area refers only to National Forest System lands within the Project Area boundaries.

6.1 Effects Common to All Alternatives

Under all alternatives, there would be forest stands that would not be treated. These untreated stands would include much of the subalpine zone as well as forests on steep slopes, areas set aside to meet fish and wildlife management objectives, and to protect riparian areas and water quality. In the absence of disturbance, these untreated stands would continue to mature and succeed to more shade tolerant species over time. A number of wildfires have burned within or near the Project Area including the Lower North Fork (2012), Snaking (2002), High Meadow (2000) and Buffalo Creek (1996). These fires burned with varying intensity altering habitat structural stages and fuel loads. In many places, forests of varying densities and canopy closures have been converted to grassy meadows which alter the behavior of future fires.

6.2 Alternative A (No Action)

6.2.1 Direct and Indirect Effects

Alternative A (No Action) would have no direct short-term effects on the forest structure of the Crossons-Longview Project Area. Since no new vegetation treatments would be implemented under this alternative, the forest structure would not be directly altered. However, Alternative A could have significant indirect effects on forest structure over time. In the absence of disturbance, open early successional habitats would continue to decline as seral habitats progress toward later seral stages. This trend toward a more homogenous landscape would have the greatest impact on the vegetation of the montane zone.

Xeric and Mesic Ponderosa Pine

The dry ponderosa pine treatment area includes those areas that would have historically been characterized by very open stand conditions with frequent low severity fires. Under Alternative A (No Action) the trend toward more closed stand conditions would continue on some of these sites. In the absence of disturbance more of these areas would progress to the mature stage and develop a crown cover of greater than forty percent. Openings which are transient features of the landscape would eventually be colonized by trees, further diminishing landscape heterogeneity. Wooded areas would likely become increasingly dense in the absence of fire or vegetation treatment. Without periodic fires, seedlings that develop in the more open areas would grow and develop into saplings and pole size trees. These denser, multi-storied stands may be more susceptible to hot fast moving crown fires due to the ladder fuels provided by the smaller under story trees. Trees within these denser stands would be under additional stress due to increased competition for site resources. This additional stress can make these stands more susceptible to injury from insects, disease, and drought.

The potential changes over time within the more mesic ponderosa pine stands would be similar to the drier (xeric) sites of ponderosa pine. However, the mesic stands would have had more variation under the historic disturbance regimes than was present on the dryer sites. Under Alternative A (No Action), younger sapling-pole stands would progress into the mature stage. Without disturbance most of these stands would develop a crown cover over 40 percent. Over-time, these mesic stands would become more homogenous with less variation in density and structural stage.

The risk of loss due to mountain pine beetles would likely increase in both xeric and mesic ponderosa pine stands over-time as they increase in density and average stand diameter. If populations of mountain pine beetles were to increase in the area, high rates of mortality would be expected within the higher risk stands.

Mixed Conifer

Under Alternative A (No Action), the mixed conifer stands within the montane zone would continue to mature. The amount of Douglas-fir would be expected to increase on these sites as the less shade tolerant limber pine and ponderosa pine die out and are replaced by the more shade tolerant firs. In the absence of disturbance, younger stands would not be initiated and the forest stands would become more homogenous.

Although Alternative A (No Action) would have no direct short-term effect on the forest structure of mixed conifer stands,, it could have a profound indirect effect on the long-term disturbance regimes of the montane zone in the Project Area. Under Alternative A (No Action), forest stands of the montane zone would continue to become more homogenous with fewer and fewer openings and higher stand densities. This type of forest structure is at greater risk to large-scale disturbances either by large wildfires or extensive insect and disease

outbreaks. This type of disturbance regime, where large areas of forest are disturbed by high intensity and large-scale events, is not typical of the historical pattern in the montane zone (Kaufmann et al. 2006, Veblen and Donnegan, 2005). This type of disturbance regime creates large, contiguous blocks of homogeneous habitat structural stage, rather than a mosaic of stand ages and structures. Although historically, insects played a role in these forests, fire appears to have been the dominant disturbance agent. By maintaining the current stand conditions and suppressing wildfire, insects and disease may become the major disturbance agent. A long-term effect of Alternative A would be to perpetuate a trend towards a "boom and bust" cycle of disturbance between insects and disease and fire in the forests of the montane zone. This type of disturbance regime and the resulting landscape pattern is much different from the historical landscape. Landscape heterogeneity and wildlife habitat would diminish.

Lodgepole Pine

Barring any disruptive event such as fire, lodgepole is typically succeeded by more shade tolerant species such as Douglas-fir, subalpine fir and Engelmann spruce (Schmidt 1989). This process would also occur in the absence to treatment under Alternative A. It is also possible that a large, stand-replacing fire could occur reverting the system to an early seral lodgepole pine stand.

Aspen

Under Alternative A (No Action) the amount of aspen within the Crossons-Longview Project Area would likely decline over time. Some of the aspen stands have an established conifer component. In the absence of fire or conifer removal, these sites would eventually convert to conifers as aspen is shaded out. On sites where aspen is self-replicating, sudden aspen decline may result in more open grass or shrub dominated communities developing. As the older aspen die out and new aspen sprouts are not produced; shrubs and grasses may become the dominant vegetation in these areas. All aspen stands are susceptible to persistent disease infestations in the absence of fire or mechanical thinning would contribute to decline across the Project Area.

Shrublands

Without treatment or fire, Gambel oak communities in the priority treatment area would become decadent over time. Oak stands are likely to persist in the absence of fire or thinning but would become denser with age and shade out grasses and other ground cover. Under the Alternative A (No Action) these communities would continue to fill in and the oak shrubs would dominate these sites. These shrub dominated areas do not provide the variety of vegetation that more seral communities do and they may be more prone to hotter wildfires due to greater volumes of woody fuels.

Mountain mahogany communities would persist in the absence of fire or be colonized by trees in the long term. Habitat value would not be adversely impacted in Alternative A but shrub communities form a less effective fuel break than herbaceous communities.

6.2.2 Cumulative Effects

The cumulative effects analysis covers a period of time starting with settlement of the area by Euro-Americans and extending 10 years into the future. The cumulative effects analysis area includes the Crossons-Longview Project Area as well as adjacent private and National Forest lands where on-going or foreseeable future vegetation management projects could affect the forest vegetation of the Crossons-Longview Project Area.

The existing condition of the vegetation within the Crossons-Longview Project Area is largely the result of past and present human activities. The Euro-American settlement of the Pikes Peak area began in the mid-1800s and brought with it mining, logging, road construction, grazing, non-native plant and animal species, human-caused fires, suppression of natural fires, and many other activities that affected the vegetation of the area. All these activities have altered the natural disturbance regimes of the forest. Several large fires are reported to have burned in the area between 1850 and 1890. Some of these where thought to have been human caused. In addition, intensive logging during this time had removed much of the commercial forests in the Woodland Park area. By the turn of the century much of the original forest vegetation had been altered through mining, timber harvesting, large wildfires, and livestock grazing. This period of extraction was followed by the establishment of the Pike and San Isabel National Forest and an emphasis on watershed protection and reestablishing the forested landscape. Tourism also increased in the area as visitors came to drive the road or ride the cog train to the top of Pikes Peak. In the twentieth century active fire suppression became another emphasis of the USDA Forest Service. The policy of suppressing wildfires over the last 100 years has resulted in many forests developing denser vegetation that would have historically been reduced by more frequent, low-intensity and mixed severity fires.

Historically fires regulated tree density, species composition, reduced the amount of dead biomass, maintained clearings, and promoted nutrient cycling (Covington and Moore, 1992; Covington and Moore, 1994; Covington and Sackett, 1984; Covington and Sackett, 1988; Fulé et al., 1997; Mast, 1993; Swetnam and Betancourt, 1990). Fire suppression and cattle grazing, introduced by Euro-American settlement in the late 1800s, have caused major changes in the spatial pattern and ecological processes of ponderosa pine ecosystems. These changes have increased tree density and reduced the frequency of natural fires (Covington, 1994; Weaver, 1961). As a result, trees are colonizing clearings normally maintained by fire and new clearings are not being created. Open savannas of high herbaceous content have changed into dense forests with closed canopies and reduced nutrient cycling rates (Covington and Moore, 1992; Covington and Sackett, 1988; Fulé et al. 1997; Swetnam and

Betancourt, 1990). Fire suppression and grazing facilitated a significant increase in the amount of Douglas-fir trees (Kaufmann et al., 2000). Grazing contributed to increased tree densities by reducing herbaceous cover and breaking fuel continuity on the forest floor. Tree seedlings proliferated in the absence of fire and competition from grasses (Harrington and Sackett, 1992). Thick organic layers on the forest floor and dense pine canopies have suppressed herbaceous vegetation in the rangeland (Sackett et al., 1993). Increased pine density decreased individual tree vigor resulting in greater mortality from insects, disease and drought. In the absence of fires, surface fuel loads and vertical fuel continuity increased to unprecedented levels creating ideal conditions for crown fires (Covington and Moore,1992; Covington and Sackett, 1988; Fulé et al., 1997; Swetnam and Betancourt, 1990). Prolific dead and down materials (fuel loading) increase fire line intensity and make forest fires difficult to extinguish. These changes have caused deterioration in forest ecosystem integrity (Dahams and Geils, 1997).

Current ponderosa pine forests (including those present in the Project Area) have large fuel loads, are prone to insect outbreaks, and are more susceptible to large, high intensity wildfires (Covington, 1994; Covington and Moore, 1992; Kaufmann et al., 1998; Rapport et al., 1998). Nearly all ponderosa pine forests have been altered significantly by human activities, and current forest structures often bear little resemblance to historical forests (Fulé et al., 1997). Current fire behavior is beyond historical norms in terms of frequency, severity and size. The Hayman Fire, for example, burned with complete tree mortality on about 95% of the landscape. Tree age data from this area indicate that the size of area burned with complete mortality was unprecedented over the last five centuries (Huckaby et al., 2001). Large scale, stand-replacing fires can result in erosion, sedimentation, and flooding that impact watersheds and threaten human health (Bruggink et al., 1998).

Following the period of intensive logging and wildfires in the late 1800s, there was increased erosion and a reduction in water quality as sediment from the recently logged and burned areas reached the streams and rivers. With the establishment of the municipal watersheds, the management emphasis for the lands within the Crossons-Longview Project Area was one of maintaining forest vegetation and minimal disturbance. Because of this emphasis on maintaining water quality very few vegetation treatments or logging was conducted on the National Forest or the adjacent lands managed by the utilities. However in more recent years, some vegetation treatments been initiated to reduce the wildfire hazard in the area.

Under Alternative A, there would be no additional vegetation treatments on National Forest lands in the Crossons-Longview Project Area. While the recent and on-going vegetation treatments on private lands within the Crossons-Longview Project Area would help to reduce stand densities and create a more diverse landscape. Without any treatments on National Forest System lands, a large portion of the Crossons-Longview Project

Area would be characterized by relatively dense stands of ponderosa pine and mixed conifer. Lodgepole pine stands would be replaced by mixed conifer stands until stand replacing fire resets the system.

Contemporary projects within the South Platte Ranger District include the Big Turkey Trailhead recreational management, Devils Head Communication Site Lease, Douglas County Public Works weather stations, IREA Spring Creek Ranch Powerline Rebuild, Kenosha Pass Communications Site Lease and the Platte Canyon Powerline Rebuild and Reauthorization. The cumulative effect of the past, present and reasonably foreseeable future actions on the condition of the forest vegetation in the Crossons-Longview Project Area under Alternative A (No Action), is an area dominated by forest stands that are generally healthy but relatively homogenous in age and structure and increasingly at risk to insects, disease, and wildfire.

In the absence of forest management, these trends would continue. The long-term result would be a greater departure from the historical norms which sustained the ecosystem and the values societies depend upon including water supply.

6.3 Alternative B (Proposed Action)

6.3.1 Direct and Indirect Effects

The Proposed Action includes the treatment of 9,564 acres and construction of temporary roads to facilitate forestry operations.

<u>Xeric Ponderosa Pine Treatment Areas</u>

Alternative B would break up the homogeneity of the xeric ponderosa pine stands in the Project Area. The proposed action would treat 4,581 acres, or approximately 78 percent, of the xeric ponderosa pine in the Project Area. These treatments would convert 25 percent of the treated area to openings (grass/forbs). Post-treatment, 84 percent of the treated area would have a canopy closure less than 40 percent. Mechanical treatments would create a diversity of habitat structural stages to resemble historical conditions that were maintained by natural disturbance regimes prior to Euro-American settlement. Figure 8 illustrates how Alternative B would change the structure of the xeric ponderosa pine community on National Forest System lands within the Project Area boundaries.

Proposed treatments would include a combination of thinning and created openings. Where possible, opportunities would be taken to remove damaged and diseased individuals or pockets of disease or insect damage. Stands would be thinned to between 10 to 35 percent canopy closure. Most treated areas would have post-treatment canopy closure of 25 to 30 percent. Areas with canopy closure greater than 40 percent would still exist but would be reduced from approximately 57 percent of the xeric ponderosa pine in the Project Area

to only 17 percent (Figure 8). In thinned stands, the spacing of thinning would be variable, retaining natural clumpiness. Pockets of dwarf mistletoe would be targeted for removal and pockets of older, platy barked trees would be leave clumps. The targeted basal area in thinned stands would be 20 to 80 square feet per acre.

Treatments would create openings ranging from 1 to 40 acres in size. Currently, across the Project Area, just three percent of this community exists as clearing (grass/ forb dominated 1T&1M) (Figure 3), but post-treatment 15 percent of the xeric ponderosa pine cover type would exist as openings. Some of these openings would not have any trees and others would have a canopy closure from 1 to 10 percent. Large and mature dominant and subdominant trees would generally be retained except when these trees are damaged, diseased or declining.

Prescribed burning after thinning activities would remove seedlings and smaller trees as well as reduce woody fuels. The resulting stands would support a variety of structural stages where patches of trees and clearings intermingle in a landscape mosaic.

Open forests resulting from treatment would facilitate the development of grasses (1T&1M), shrubs (2T&2S) and fine fuels that could carry low intensity ground fires without torching of tree crowns. If ground fires are permitted to burn through these stands occasionally, a heterogeneous landscape (which does not support large-scale, high intensity wildfire in most cases) could be maintained by discouraging ingrowth of small diameter trees. However, if fire is suppressed or mechanical means are not utilized to maintain open conditions, stands would revert to the dense conditions that currently exist.

There would likely be an increase in the diversity of understory plants within many of the treated pine stands. The reduction in canopy cover would increase the amount of sunlight reaching the ground, and increase the availability of moisture and nutrients for understory vegetation, allowing a greater diversity and larger populations of understory grasses, forbs and shrubs. Disturbance created by prescribed fire would help stimulate the growth of some of the less shade tolerant plant species within these stands. Inclusions of aspen and oak would benefit from these treatments. A comparison of post-treatment structural stages for xeric ponderosa pine for both Alternative A and Alternative B is shown in Figure 8. The comparison displays a shift of acres from mid-aged to grass/forb stages under Alternative B.

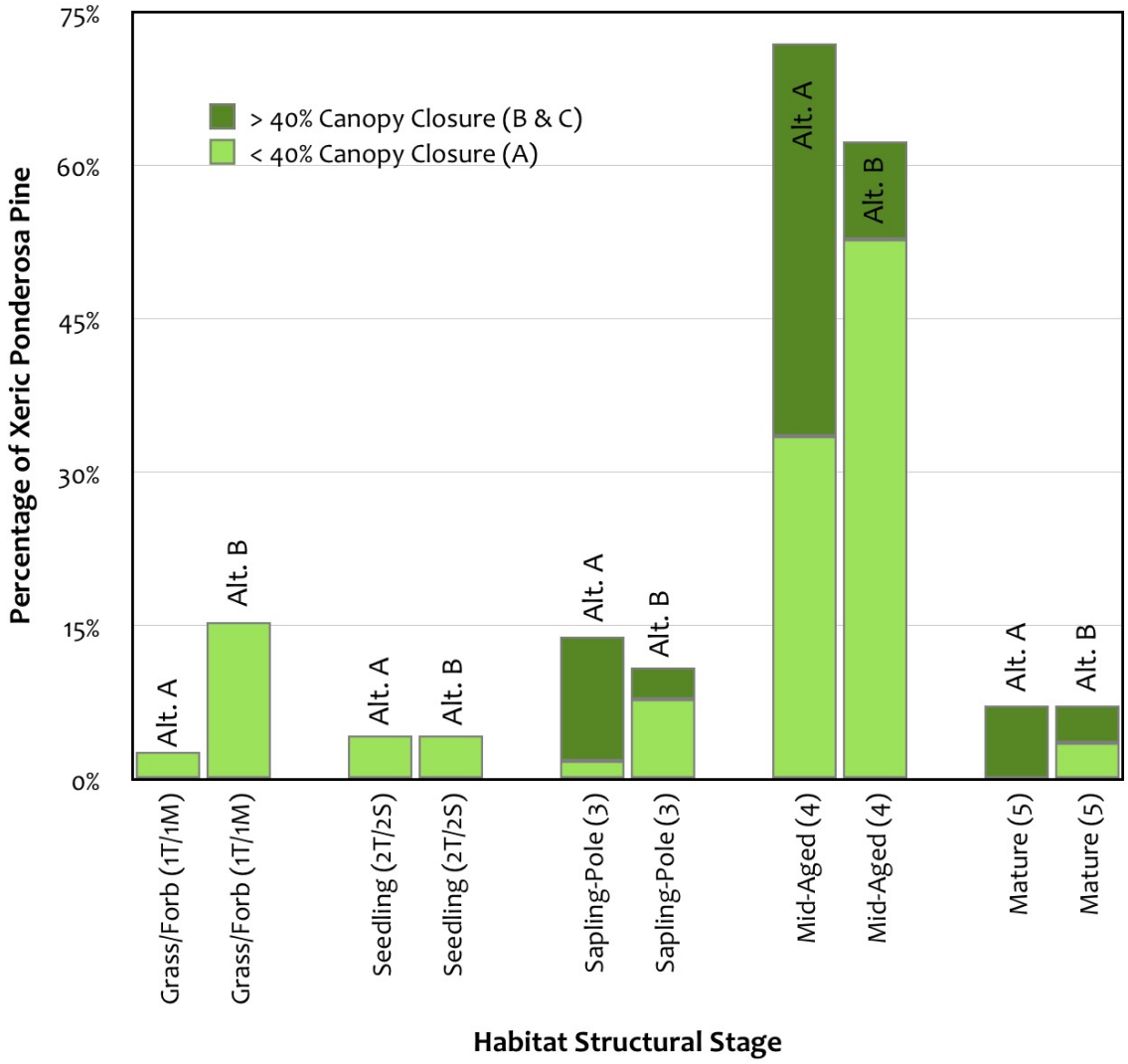

Figure 8. Comparison of Alternative A to Alternative B Structural Stages for Xeric Ponderosa Pine.

Mesic Ponderosa Pine Treatment Areas

Like in xeric ponderosa pine stands, Alternative B would alter the structure of mesic ponderosa pine stands by treating 3,684 acres, or 87 percent of the mesic ponderosa pine in the Project Area, with a combination of thinning and created openings. The existing structure of mesic ponderosa pine stands are similar to those of xeric stands with a preponderance of mid-aged trees and dense stands, with 70 percent of the area having canopy closure greater that 40 percent; clearings comprise just 4 percent of the area for this cover type. The management treatments discussed under xeric ponderosa pine also apply to mesic stands with two exceptions:

1. Thinned stands would have a larger residual basal area than in the xeric stands with overall densities ranging between 40 and 120 basal area square feet per acre.
2. Created openings would be smaller than in the xeric stands, ranging from 0.5 to 20 acres in size.

As in the xeric ponderosa pine, Alternative B would break up the homogeneity of the treated mesic ponderosa pine stands. These treatments would convert 25 percent of the treated area to openings (grass/forbs). Post-treatment, across the Project Area, the percent of mesic ponderosa pine that exists as openings (grass/forb) would increase from 4 percent to 19 percent. The area of mesic ponderosa pine in highly dense stands (canopy closure greater than 40 percent) would decrease from 70 percent to 20 percent, leaving 80 percent of the mesic ponderosa pine in stands with less than 40 percent canopy closure. Mechanical treatments would create a diversity of habitat structural stages to resemble historical conditions that were maintained by natural disturbance regimes prior to Euro-American settlement. Figure 9 illustrates how Alternative B would change the structure of the xeric ponderosa pine community on National Forest System lands within the Project Area boundaries.

Effects of the thinning and created openings would be the same as discussed for xeric ponderosa pine. A comparison of structural stages for mesic ponderosa pine for both Alternative A and Alternative B is shown in Figure 9. The comparison displays a shift of acres from mid-aged (Structural Stage 4) to grass/forb stages (Structural Stages 1T&1M) under Alternative B.

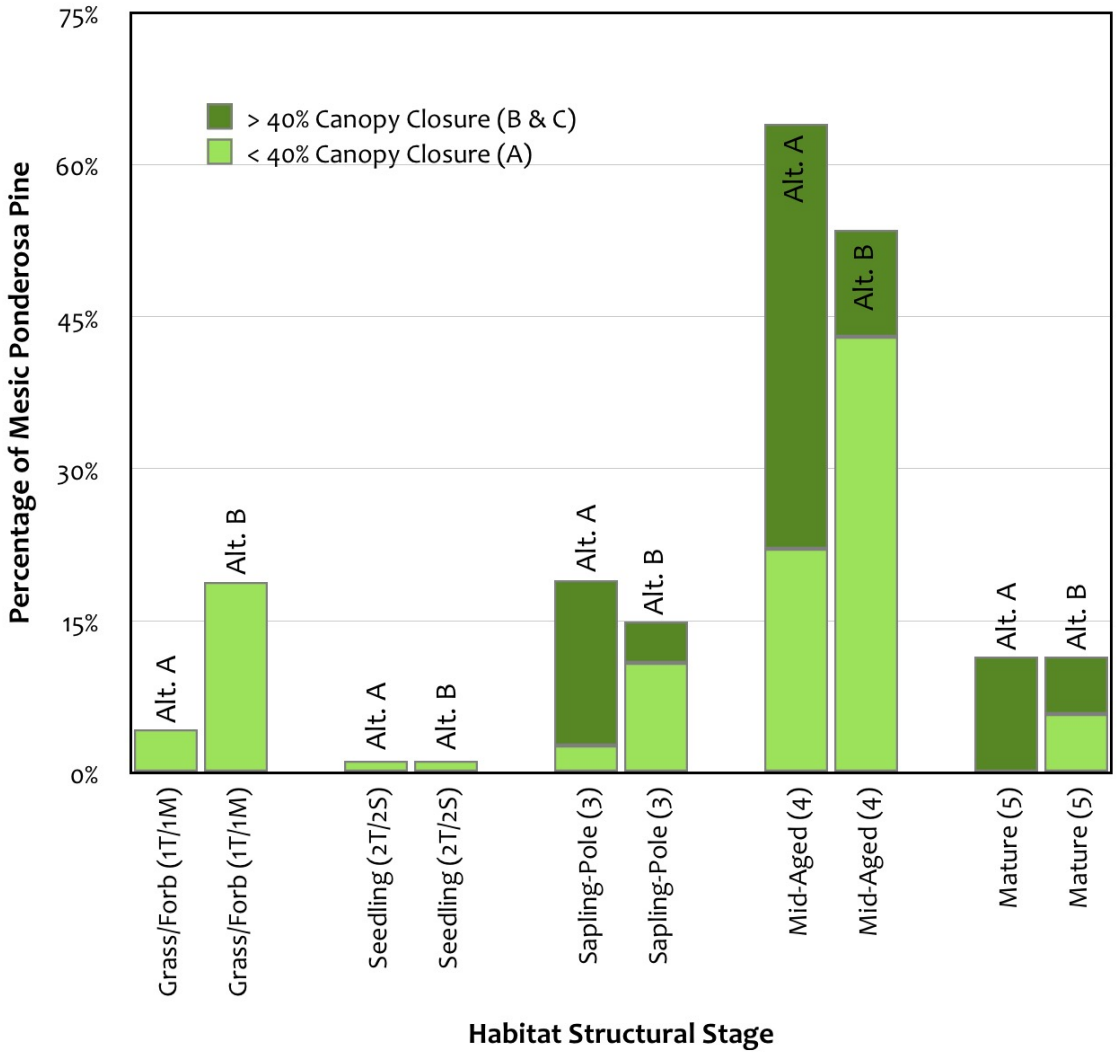

Figure 9. Comparison of Alternative A to Alternative B Structural Stages for Mesic Ponderosa Pine.

Mixed Conifer Treatment Areas

Alternative B would treat approximately 603 acres, or approximately 87 percent, of the mixed conifer forest in the Project Area with a combination of thinning and created openings. Where possible, opportunities would be taken to remove damaged and diseased individuals or pockets of disease or insect damage. Post-treatment, openings in mixed conifer would increase from 13 percent to 27 percent. The area with canopy closure greater than 40 percent would be reduced from 72 percent to 22 percent. Figure 10 illustrates how Alternative B would change the structure of the mixed conifer community on National Forest System lands within the Project Area boundaries.

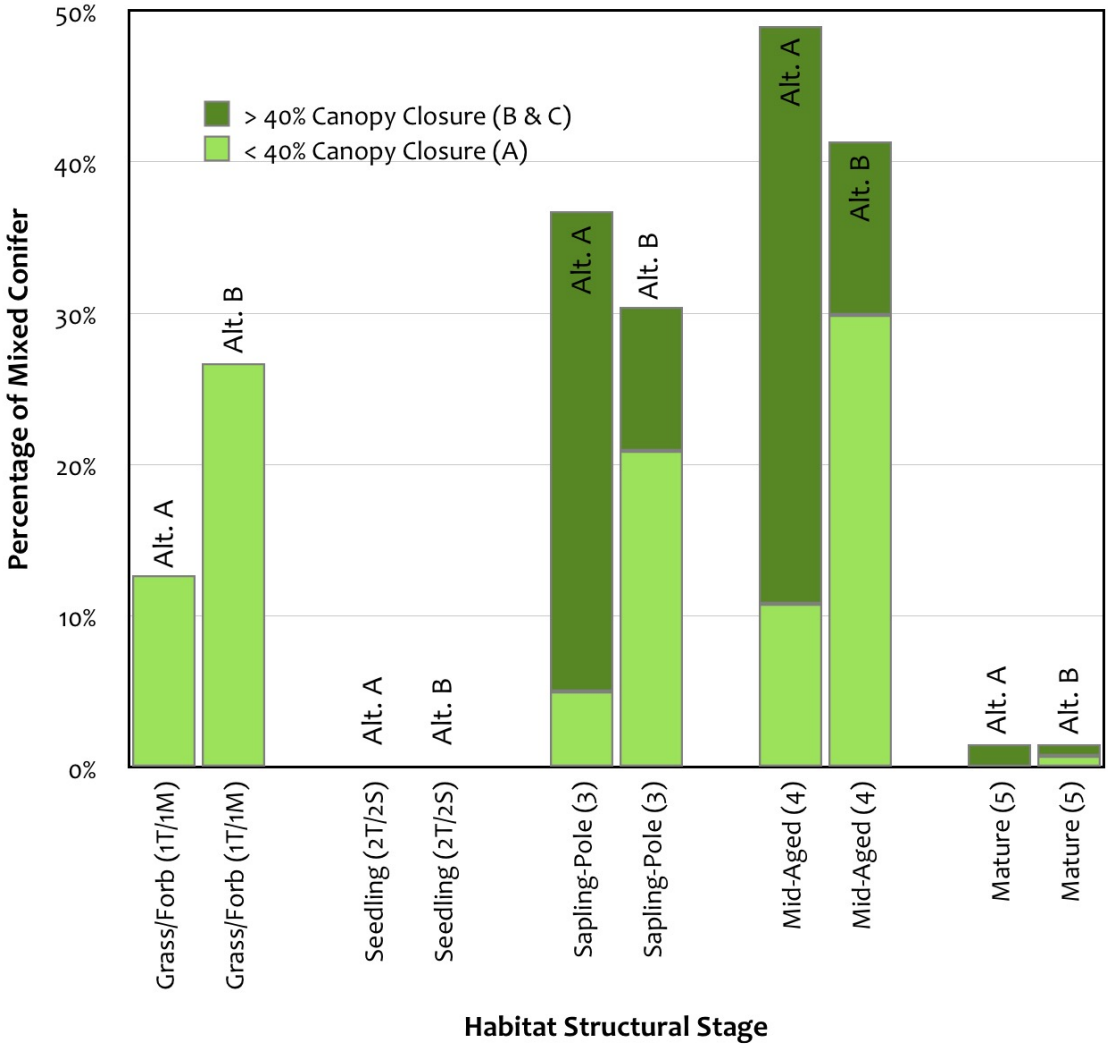

Figure 10. Comparison of Alternative A to Alternative B Structural Stages for Mixed Conifer.

Stands would be thinned to a residual stand basal area ranging from 60 to 120 square feet per acre. This is a higher basal area than for other vegetation types because mixed conifers have smaller root systems and therefore a greater dependency on surrounding trees for support. Areas that have understory trees that could provide ladder fuels could be thinned from below removing the more flammable understory trees and leaving more or less even-aged stands of the larger cohorts.

In other areas, patchy openings would be created to encourage regeneration and provide an increase in age class diversity. Areas with evidence of disease or insect infestation (i.e., dwarf mistletoe, white pine blister rust, spruce budworm or bark beetles) would be priority areas for creating these openings. Openings would range in size from a quarter acre up to 40 acres with most being less than 10 acres. Small clumps of trees may be left

scattered across the larger (greater than 1 acre) openings to create structural diversity and provide seed for natural regeneration.

The result of these proposed treatments would be to increase the age and spatial diversity of the mixed conifer stands within the treatment areas. A comparison of structural stages for mixed conifer for both Alternative A and Alternative B is shown in Figure 10. The comparison displays a shift of acres from mid-aged (Structural Stage 4) and sapling pole (Structural Stage 3) to grass/forb (Structural Stage 1T&1M) stages under Alternative B.

Lodgepole Pine Treatment Areas

Alternative B would treat 588 acres, or approximately 93 percent, of the lodgepole pine in the Project Area. Like other treed cover types, the treatments would include thinning and creation of openings in the forest canopy. Currently, all of the lodgepole pine stands in the Project Area have a canopy closure greater than 40 percent and all existing stands are sapling-pole or mid-aged trees. There are no mature or seedling stands and no areas of grass/forb openings. Post-treatment, the lodgepole pine in the Project Area with canopy closure greater than 40 percent would be reduced from 100 to 25 percent and 25 percent of the lodgepole pine cover type would exist as openings. Figure 11 illustrates how Alternative B would change the structure of the lodgepole pine community on National Forest System lands within the Project Area boundaries.

Lodgepole pine is more susceptible to windthrow than other forest types in the Project Area, and therefore, thinning would be limited. Sanitation thinning would be implemented in areas of insect and disease such as dwarf mistletoe, gall rust and mountain pine beetle. There would also be some thinning from below to remove most small diameter regeneration that is less than 6 inches DBH. A limited amount of regeneration of all size classes would be retained in thinned stands if available.

Openings would be created of irregular size and shape and would range from between 0.25 to 30 acres in heavily infested or insect damaged areas. Lodgepole pine trees would also be removed from places that support aspen trees for the benefit of this species.

A comparison of structural stages for mixed conifer for both Alternative A and Alternative B is shown in Figure 11. The comparison displays a shift of acres from mid-aged (Structural Stage 4) to grass/forb (Structural Stage 1T&1M) stages under Alternative B.

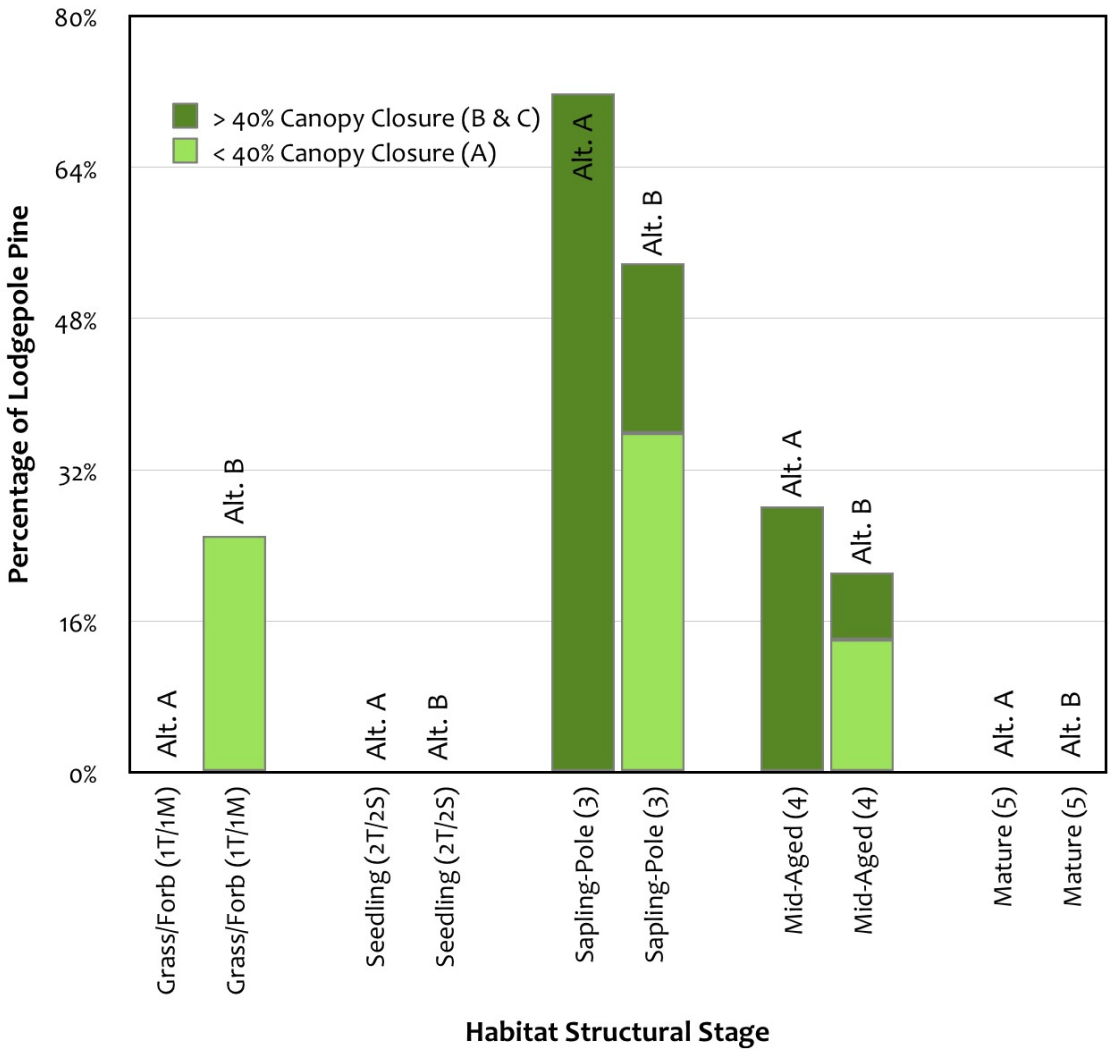

Figure 11. Comparison of Alternative A to Alternative B Structural Stages for Lodgepole Pine.

Forest Insects and Disease

The proposed actions would have an effect on the occurrence and spread of many forest insects and disease in the treated areas including mountain pine beetles. A few years after treatment, trees in the thinned areas would be under less competitive stress and therefore, less susceptible to attack by insects and disease. Insect and disease mortality would likely be limited in extent by the mosaic of structural stages, the increased vigor of the trees due to lower stand densities, and the larger number of openings. Over time, as the trees within the thinned areas grow, stand densities and average diameters would increase. Long-term, these stands could again develop conditions which would increase their risk to bark beetles. Maintaining openings and more open stand conditions through periodic fire would reduce this effect.

There may also be a short period of increased risk of insect attack in the residual trees following treatment. The ground disturbance from the thinning and the heat from the burning can put the trees that remain on-site under stress and more susceptible to bark beetle attack. This effect can last up to two years following treatment.

Aspen Treatment Areas

Alternative B would treat 121 acres, or 93 percent of the aspen stands, to improve the health and extent of aspen in the Project Area. There would likely be additional treatment areas in conifer stands that include an aspen understory component. Therefore, the actual extent of lands managed for the health and propagation of aspen could be much larger than the 121 acres of identified aspen. The intent of treatment in pure clones is to restore health and vigor to sudden aspen decline, or SAD. The intent of treatment where aspen is an understory component it to increase landscape heterogeneity and overall distribution of the species.

The treatments would include the removal of competing conifer trees and some cutting of aspen to encourage new growth. In areas with SAD, coppice (clear cutting) may be used to promote propagation of new suckers. By reducing competition and propagating younger trees, the health and vigor of the stands would be improved and the remaining and new aspen would have increased resistance to insects and disease. Where there are inclusions of aspen within conifer stands that would be treated, the conifers would be removed from the perimeter of these inclusions to encourage the expansion of aspen clones. The preservation and expansion of these aspen inclusions would maintain some species diversity within these conifer dominated stands. Aspen provides many benefits to the landscape, including natural fuel breaks, species diversity and important wildlife habitat.

The effect of these treatments would be to maintain and, in some areas, increase the amount of aspen across the landscape. This result would be achieved by cutting aspen trees in some stands, which would represent a short term decrease in the abundance of aspen, followed by an increase in abundance within several years. Under proposed management clearings amount to approximately 20 percent (24.8 acres) of the landscape would be created within aspen stands. In most cases, these areas would regenerate as healthy aspen. Reductions in canopy density would also occur as a result of sanitation thinning.

Shrubland Treatment Areas

The objectives of shrubland treatments on 28 acres, or 42 percent of the existing scrublands in the Project Area, would be to create fuel breaks and improve the vigor and palatability of plants used as forage for wildlife species. Mastication and hand thinning would be used to thin or remove shrubs stimulate grass and other ground cover. These treatment areas would function as fuel breaks. The proposed treatments would need

periodic maintenance to retain their effectiveness as fuel breaks. Treatment areas would be more open and likely support greater herbaceous production and diversity.

6.3.2 Cumulative Effects

This section presents the potential cumulative effects of Alternative B (Proposed Action) including past, present and future foreseeable actions in and adjacent to the Project Area on the composition and condition of the forest vegetation. The cumulative effects analysis covers a period of time starting with Euro-American settlement and extends 10 years into the future. The cumulative effects analysis area includes the Crossons-Longview Project Area as well as adjacent private and public lands where on-going or foreseeable future vegetation management projects could affect the forest vegetation of the Project Area.

Existing conditions with the Crossons-Longview area is largely the result natural and anthropogenic disturbances. Humans had a large influence during the mid to late 1800's. This period is characterized by widespread logging, settlement and wildfire followed by a period of fire suppression and reduced logging as is further described in Alternative A, Cumulative Effects.

There have been several large and intense wildfires as described in the Effects Common to all Alternatives Section and, in recent years, vegetation treatments have been initiated to reduce wildfire hazards in the area.

Urban development is expected to continue in the vicinity of the Project Area on private lands. This may fragment habitat, isolate species populations, and increase the risk of weed invasion and the incidence of high intensity wildfire.

The proposed actions under Alternative B The proposed timber operations and prescribed fire treatments in the Crossons-Longview Project Area under Alternative B would occur on approximately 2.2 percent of the South Platte Ranger District. Proposed treatments would reduce the density of treated forest stands and improve landscape heterogeneity reversing changes that have resulted from decades of fire suppression. They would reduce the risk of large-scale, high intensity wildfire as well as insect and disease infestations in the vicinity of the Project Area. Current and proposed treatments within and adjacent to the Project Area would have a positive effect on forest vegetation.

6.4 ALTERNATIVE C

6.4.1 Direct and Indirect Effects

Alternative C proposes the treatment of 6,326 acres and no construction of temporary roads to facilitate forestry operations. Forest management activities under this Alternative would treat approximately half the area of Alternative B but the nature of activities applied on the ground would be the same. Figure 12 illustrates

differences in the areas treated under both alternatives for all vegetative types. Discussions of effects provided under Alternative B apply here with the only noteworthy difference being the amount of land that is managed.

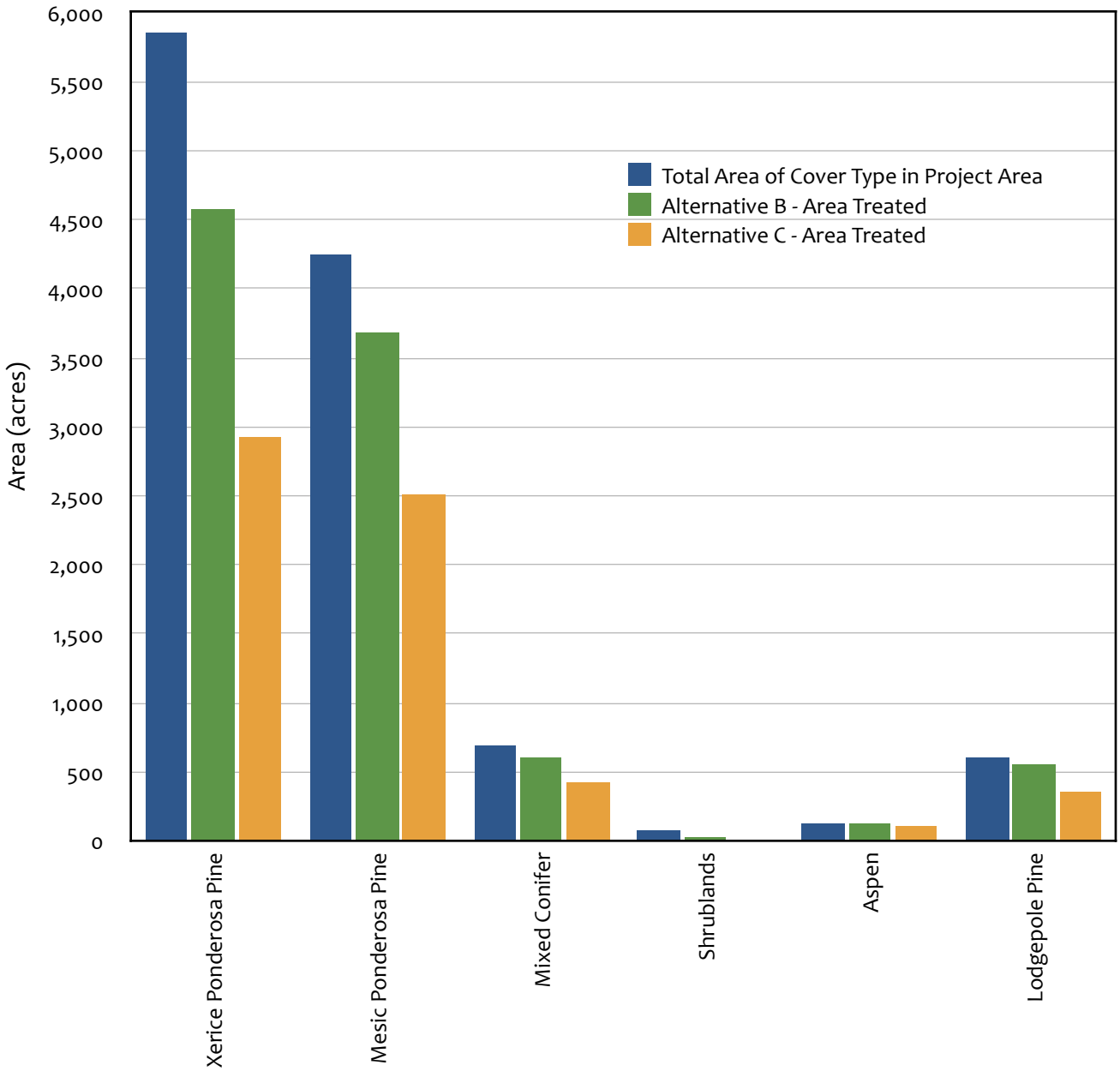

Figure 12. Comparison of the Area of each Cover Type to Areas Treated by Alternative.

Xeric Ponderosa Pine Treatment Areas

Alternative C, like Alternative B, would break up the homogeneity of the xeric ponderosa pine stands in the Project Area, but to a lesser degree. Alternative C would treat 2,919 acres, or approximately 50 percent, of the xeric ponderosa pine in the Project Area. These treatments would convert 25 percent of the treated area to

openings (grass/forbs). Post-treatment, across the Project Area, the percent of xeric ponderosa pine that exists as openings (grass/forb) would increase from 3 percent to 11 percent. The area of mesic ponderosa pine in highly dense stands (canopy closure greater than 40 percent) would decrease from 70 percent to 37 percent, leaving 69 percent of the mesic ponderosa pine in stands with less than 40 percent canopy closure. Mechanical treatments would create a diversity of habitat structural stages to resemble historical conditions that were maintained by natural disturbance regimes prior to Euro-American settlement. Figure 13 illustrates how Alternative C would change the structure of the xeric ponderosa pine community on National Forest System lands within the Project Area boundaries.

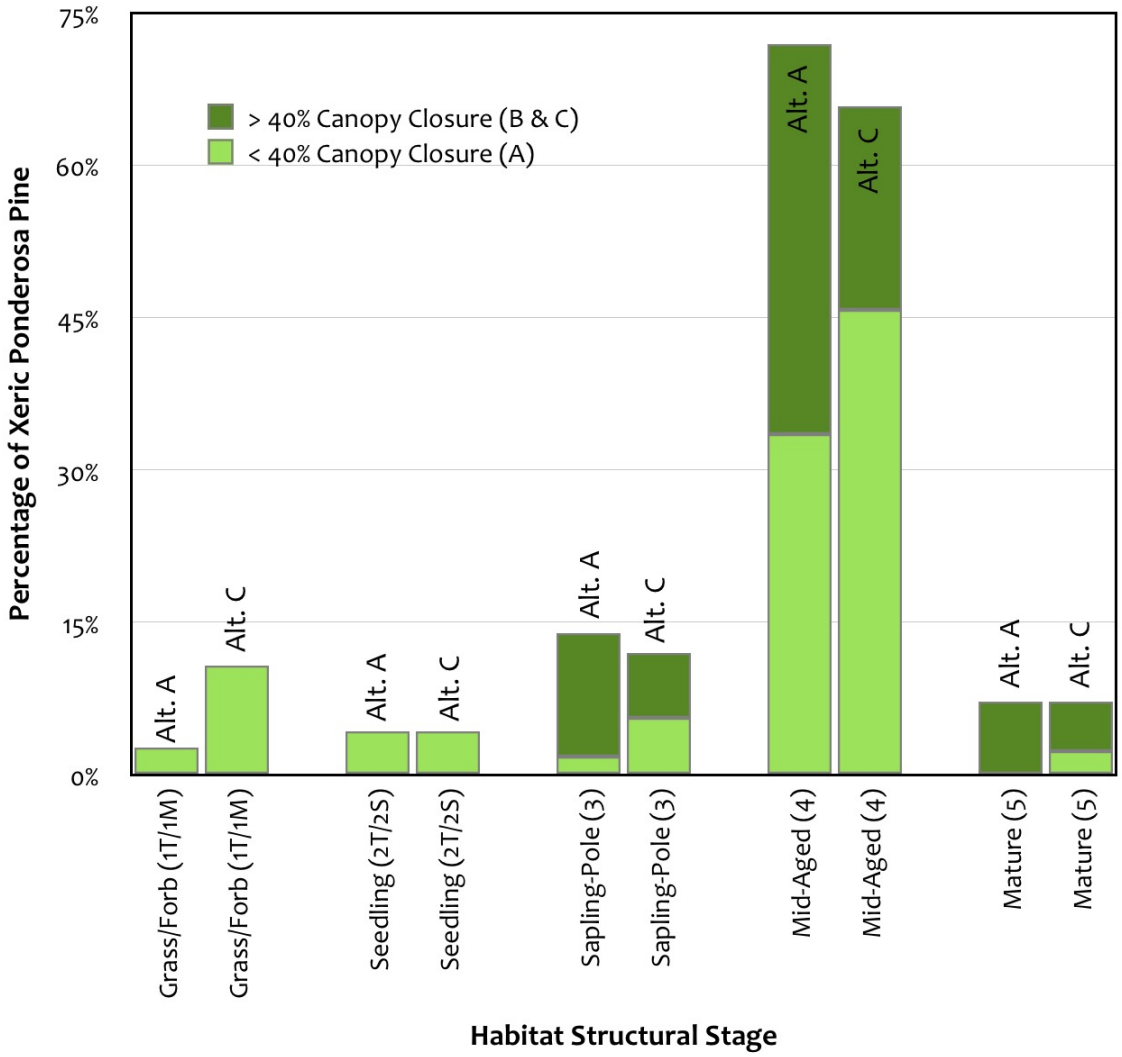

Figure 13. Comparison of Alternative A to Alternative C Structural Stages for Xeric Ponderosa Pine.

Proposed treatments would include a combination of thinning and created openings. As in Alternative B, where possible, opportunities would be taken to remove damaged and diseased individuals or pockets of disease or insect damage. Treatment specifications within treated stands, and the effects of these treatments, would be the same as discussed for Alternative B. However, although Alternative C would make progress towards improving the resiliency of the xeric ponderosa stands in the Project Area to insects, disease and wildfire, it would be to a lesser degree than Alternative B. The risk of a large-scale, high intensity wildlife would be reduced but to a lesser degree than Alternative B.

Mesic Ponderosa Pine Treatment Areas

Alternative C would break up the homogeneity of the xeric ponderosa pine stands in the Project Area, but to a lesser degree than Alternative B. Alternative C would treat 2,500 acres, or approximately 59 percent, of the mesic ponderosa pine in the Project Area. These treatments would convert 25 percent of the treated area to openings (grass/forbs). Post-treatment, across the Project Area, the percent of mesic ponderosa pine that exists as openings (grass/forb) would increase from 4 percent to 14 percent. The area of mesic ponderosa pine in highly dense stands (canopy closure greater than 40 percent) would decrease from 70 percent to 36 percent, leaving 64 percent of the mesic ponderosa pine in stands with less than 40 percent canopy closure. Mechanical treatments would create a diversity of habitat structural stages to resemble historical conditions that were maintained by natural disturbance regimes prior to Euro-American settlement. Figure 14 illustrates how Alternative C would change the structure of the mesic ponderosa pine community on National Forest System lands within the Project Area boundaries.

Proposed treatments would include a combination of thinning and created openings. As in Alternative B, where possible, opportunities would be taken to remove damaged and diseased individuals or pockets of disease or insect damage. Treatment specifications within treated stands, and the effects of these treatments, would be the same as discussed for Alternative B. However, although Alternative C would make progress towards improving the resiliency of the mesic ponderosa stands in the Project Area to insects, disease and wildfire, it would be to a lesser degree than Alternative B. The risk of a large-scale, high intensity wildlife would be reduced but to a lesser degree than Alternative B.

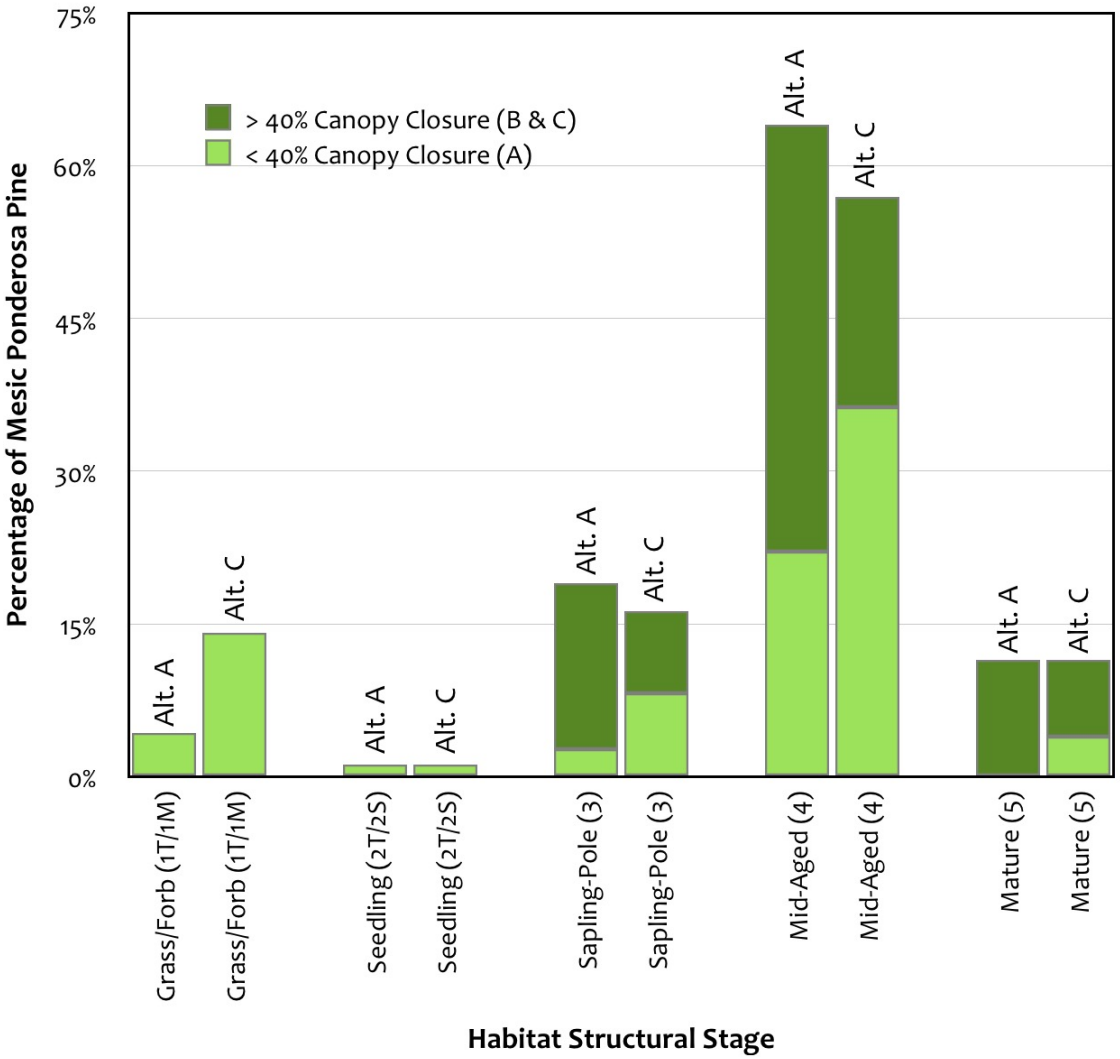

Figure 14. Comparison of Alternative A to Alternative C Structural Stages for Xeric Ponderosa Pine.

Mixed Conifer Treatment Areas

Alternative C would treat approximately 422 acres, or approximately 61 percent, of the mixed conifer forest in the Project Area with a combination of thinning and created openings. Where possible, opportunities would be taken to remove damaged and diseased individuals or pockets of disease or insect damage. Post-treatment, openings in mixed conifer would increase from 13 percent to 22 percent. The area with canopy closure greater than 40 percent would be reduced from 71 percent to 37 percent, leaving 63 percent of the mesic mixed conifer stands with less than 40 percent canopy closure. Figure 15 illustrates how Alternative C would change the structure of mixed conifer on National Forest System lands within the Project Area boundaries.

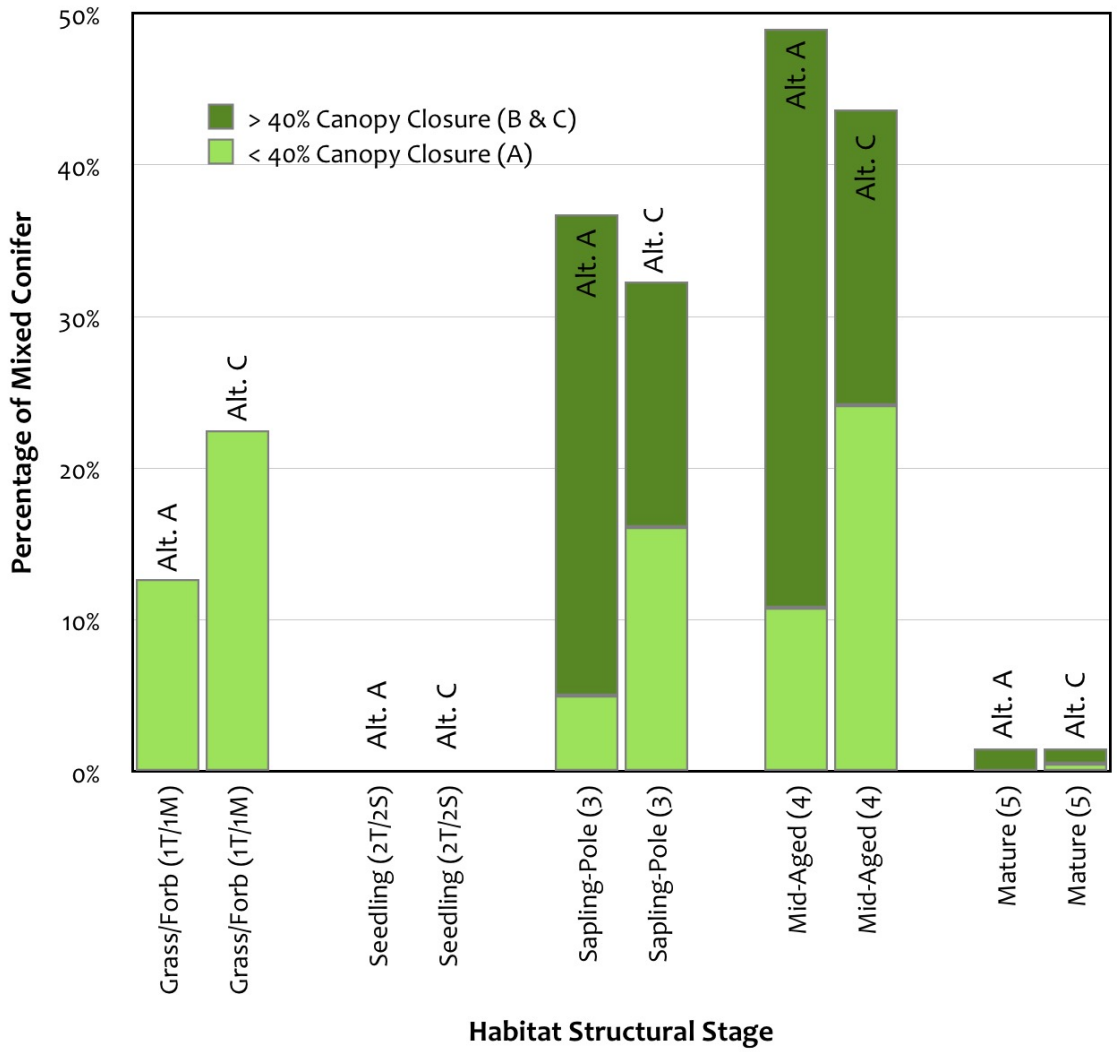

Figure 15. Comparison of Alternative A to Alternative C Structural Stages for Mixed Conifer.

Treatment specifications within treated stands would be the same as discussed for Alternative B. The effects of these treatments would be generally the same as discussed for Alternative B. However, although Alternative C would make progress towards improving the resiliency of the mixed conifer stands in the Project Area to insects, disease and wildfire, it would be to a lesser degree than Alternative B.

Lodgepole Pine Treatment Areas

Alternative C would treat 354 acres, or approximately 59 percent, of the lodgepole pine in the Project Area. Like other treed cover types, the treatments would include thinning and creation of openings in the forest canopy. Currently, all of the lodgepole pine stands in the Project Area have a canopy closure greater than 40 percent and all existing stands are sapling-pole or mid-aged trees. There are no mature or seedling stands and

no areas of grass/forb openings. Post-treatment, the lodgepole pine in the Project Area with canopy closure greater than 40 percent would be reduced from 100 to 52 percent and 16 percent of the lodgepole pine cover type would exist as openings. Figure 16 illustrates how Alternative C would change the structure of the lodgepole pine community on National Forest System lands within the Project Area boundaries.

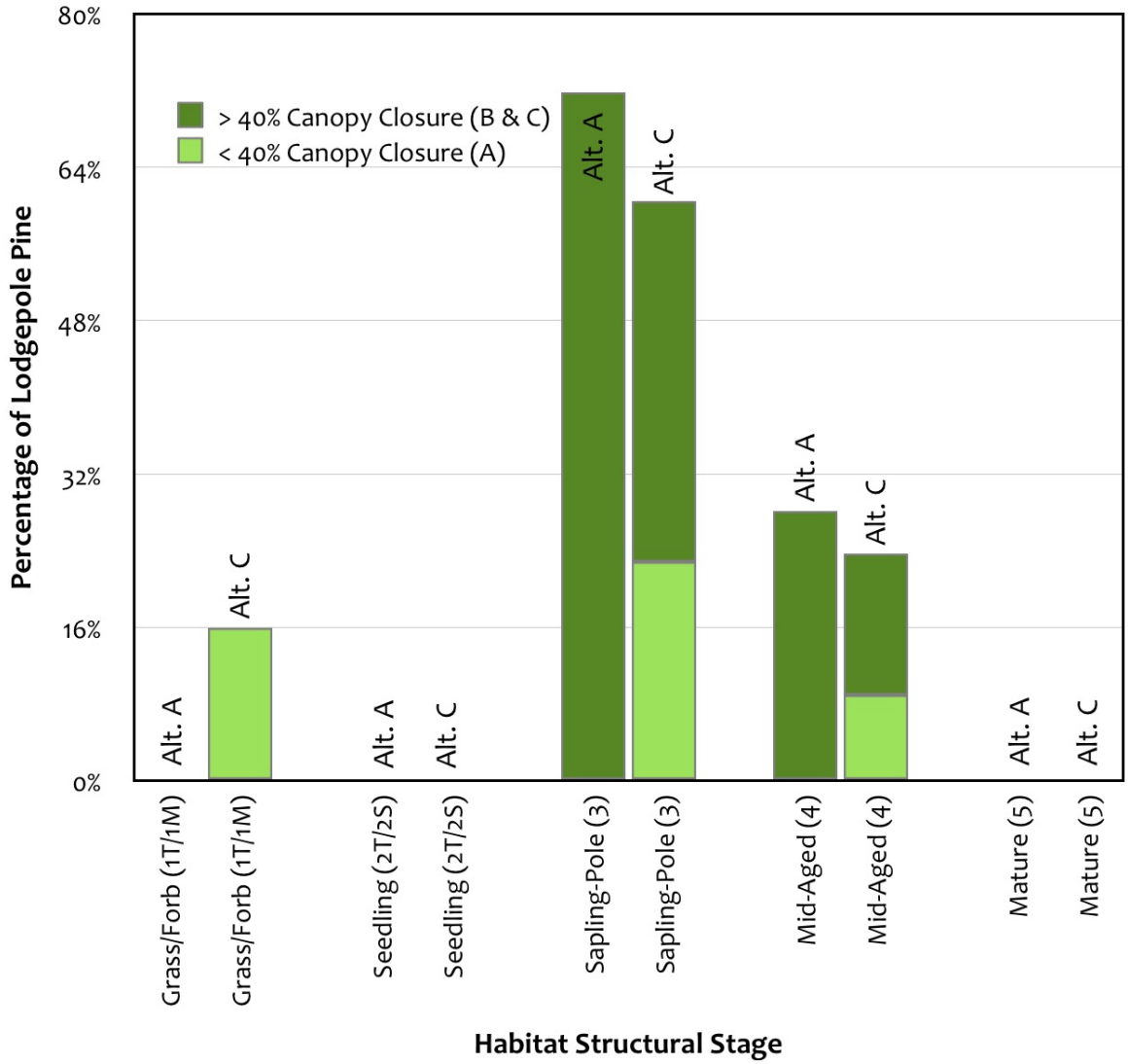

Figure 16. Comparison of Alternative A to Alternative C Structural Stages for Lodgepole Pine.

Treatment specifications within treated stands would be the same as discussed for Alternative B. The effects of these treatments would be generally the same as discussed for Alternative B. However, although Alternative C would make progress towards improving the resiliency of the lodgepole pine stands in the Project Area to insects, disease and wildfire, it would be to a lesser degree than Alternative B.

Forest Insects and Disease

The effects on forest insects and disease in treated areas would be the same as discussed for Alternative B. Across the Project Area, the reduced amount area of treatment would result in a smaller improvement of the resiliency of the forested area to insects and disease as compared to Alternative B.

Aspen Treatment Areas

Alternative B would treat 115 acres, or 92 percent of the aspen stands, to improve the health and extent of aspen in the Project Area. As in Alternative B, there would likely be additional treatment areas in conifer stands that include an aspen understory component. Therefore, the actual extent of lands managed for the health and propagation of aspen could be larger than the 115 acres of identified aspen. The treatment specifications and effects on treated areas would be the same as discussed for Alternative B. However, the lower amount of treatment of conifer stands would reduce the opportunities to encourage the expansion of aspen where they exist as inclusions in conifer.

Shrubland Treatment Areas

The objectives of shrubland treatments on 16 acres, or 24 percent of the existing scrubland, would be to create fuel breaks and improve the vigor and palatability of plants used as forage for wildlife species. Mastication and hand thinning would be used to thin or remove shrubs stimulate grass and other ground cover. These treatment areas would function as fuel breaks. The proposed treatments would need periodic maintenance to retain their effectiveness as fuel breaks. Treatment areas would be more open and likely support greater herbaceous production and diversity.

6.4.2 Cumulative Effects

Cumulative effects under Alternative C are similar to those under Alternative B except approximately half as much area would be treated. Because fewer acres are treated under this alternative, the risk of large-scale, high intensity wildfire would be reduced from the existing condition but to a lesser degree than Alternative B. There would also be less improvement in the resiliency of the forested areas to insect and disease. The risk of large-scale disturbances from all of these factors is higher than Alternative B but an improvement as compared to Alternative A.

6.5 Short-term Uses and Long-term Productivity

Alternative B (Proposed Action) would show a short-term reduction in the amount of standing timber volume in the area following the proposed commercial timber harvest. The decrease in density would improve the vigor of the remaining trees making them less susceptible to wildfires and attack by insect and disease. In the

long-term, the forest within treated areas is likely to have greater value as the average diameter would increase and the annual increment would increase.

Forest thinning operations would create minor damages in the area where treatments occur. These disturbances include soil scarification, minor damage to some residual trees, propagation of some noxious weeds and short term disruption of forest habitats. These effects would be short-term, insignificant or potentially beneficial, as in the case of soil scarification.

6.6 Irreversible and Irretrievable Commitments of Resources

The proposed vegetation treatments would not cause any irreversible commitments of forest resources.

6.7 Other Required Disclosures

There are no other required disclosures.

6.8 Consistency with Forest Plan

The 1976 National Forest Management Act (NFMA) requires that site-specific projects must be consistent with the Forest Plan. Forest Plan goals and objectives guide the identification and selection of potential agency projects. The determination of whether or not an individual project is consistent with the Forest Plan is based on whether or not the project adheres to forest-wide and management area goals and standards. The 1984 Land and Resource Management Plan for the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands (Forest Plan) provides management guidelines, standards and goals. Forest Plan goals that are relevant to the forest vegetation assessment include:

- Practice vegetation management to provide multiple benefits using a comprehensive timber management program as a tool (III-4).
- Provide for increased production and productive use of wood fiber while maintaining or improving other resource values (III-4).
- Improve age class and species distribution of tree stands forest-wide (III-4).
- Perpetuate the aspen type (III-4).
- Improve the health and vigor of all vegetation types (III-4).

The Forest-wide management requirements set the baseline conditions that must be maintained in order to implement the Forest Plan as it was intended. They establish the environmental quality and natural resource requirements that apply to all areas of the Forest(s).

The no action alternative would not help foster any of the Forest plan goals stated above.

Alternative B (Proposed Action) and Alternative C are consistent with these broad Forest-wide goals. Many of the vegetation treatments employed would not be commercial operations. Although some commercial timber may be harvested, the most likely products from these treatments would be the sale of some of the cut trees as firewood and woody biomass.

7. Special Status Plants

The Regional Forester has identified sensitive species for Region 2, and the Pike and San Isabel National Forests, and Cimarron and Comanche National Grasslands (PSICC) have further refined this list, to include only those species with the potential to occur within its administrative boundaries. The elevation range is 6,096 to 9,128 feet with the bulk of the study area falling between 7,500 and 8,500 feet. The threatened, endangered, and RFSS list for the Pike and San Isabel National Forest was used to identify those species that could occur in the Crossons-Longview Project Area. Based on review of the list and research of other records (e.g., Colorado Natural Heritage Program 2009), it was determined that the habitat in the Crossons-Longview Project Area could be suitable for 11 sensitive plant species (Table 5).

Rare plant species habitats within the Crossons-Longview Project Area were identified using USDA Forest Service vegetation data and the USDI Fish and Wildlife Service Information, Planning, and Conservation System (IPaC).

7.1 Special Status Plants Existing Conditions

The effects analysis focused on the 11 plant species listed in Table 5 and described below. Potential habitat for these species is illustrated in Appendix A.

Table 5. Federally listed and Regional Forester Sensitive Species (RFSS) Plants.

Scientific name Common name	Habitat	Status	Species Present?	Habitat present?
Aquilegia chrysantha Rydberg's golden columbine	Montane and subalpine meadows, rocky ravines along streams, in Douglas-fir forests	RFSS	Yes	Yes
Botrychium lineare Narrowleaf grapefern	Deep forb and grass meadows, sagebrush, cirqueland, riparian transitional vegetation associated with aspen, on coarse decomposed granite	RFSS		Yes
Cypripedium parviflorum Lesser yellow laddy's-slipper	Variety of habitats in the lower montane including aspen groves and moist ponderosa pine/ Douglas-fir forests, and in subalpine wetlands, often on cool, shaded, northfacing slopes	RFSS		Yes
Eriophorum gracile Slender cottongrass	Fens, subalpine wet meadows, usually on peaty, acidic substrates	RFSS	Yes	Yes
Malaxis brachypoda Adder's-mouth	Montane wetlands	RFSS		Yes
Mimulus gemmiparus Rocky Mountain monkeyflower	Montane and subalpine, moist, seepy areas, usually on ledges or under overhangs at the base of cliffs, on thin soils	RFSS		Yes
Penstemon degeneri Degener's beardtongue	Pinyon-juniper woodlands, ponderosa pine parklands with oak brush and bunchgrasses, montane meadows	RFSS		Yes
Potentilla rupincola Rock cinquefoil	Cracks in granite outcrops, montane to subalpine	RFSS		Yes
Salix serissima Autumn willow	Montane and alpine fens, marshes, bogs, streambanks	RFSS		Yes
Spiranthes diluvialis Ute ladies'-tresses	Early- to mid-seral, moist to wet conditions, where competition for light, space, water, and other resources is low due to periodic or recent disturbance on alluvial banks, river floodplain habitats, shores of lakes and reservoirs	ESA-T	Yes	Yes
Viola selkirkii Selkirk's violet	Montane to subalpine cold mountain forests, moist woods and thickets near alders	RFSS		Yes

7.1.1 Rydberg's Golden columbine

Rydberg's Golden columbine (*Aquilegia chrysantha* Gray var. rydbergii Munz) is a perennial herb in the buttercup family (*Ranunculaceae*), flowering from June through July, and fruiting in July (Ladyman 2005). It is likely to be pollinated by hawkmoths (Ladyman 2005). Golden columbine is found in montane and subalpine mountains, particularly in rocky ravines along streams (Ladyman 2005) in Douglas-fir forests. It frequently occurs on northwest-facing slopes. Tree cover in these areas varies from 20 to 60 percent, and shrub cover ranges from 10 to 80 percent (Ladyman 2005). Extant populations of golden columbine are on the Pikes Peak batholith and the Fountain Formation. Soils are of the Legault-Rock outcrop complex where golden columbine is known. It occurs at elevations from 5,200 to 8,500 feet (Colorado Natural Heritage Program 2009). This variety of golden columbine is endemic to central Colorado (Ladyman 2005). It has been documented in El Paso County. There are two documented occurrences on the South Platte Ranger District along with at least one additional record nearby (Ladyman 2005). Golden columbine is ranked as G4T1Q by NatureServe (2014). It is tracked by the Colorado Natural Heritage Program and is ranked S1. There are potential threats to some populations from recreational uses along roads and trails, and from invasive species.

7.1.2 Narrowleaf grapefern

Narrowleaf grapefern (*Botrychium lineare* W.H. Wagner), also called narrow-leaved moonwort, is a perennial herb in the adder's-tongue fern family (*Ophioglossaceae*). Spores are produced in June and July (Spackman et al. 1997). Narrowleaf grapefern is found in deep grass and forb meadows, sagebrush, cirqueland, and potentially other habitats (Beatty et al. 2003). It has been found among the riparian transition vegetation associated with aspen at Pikes Peak. The known sites of narrowleaf grapefern are over the Pikes Peak granite formation. Locally, it occurs in coarse, decomposed granite. The soils of the Pikes Peak narrowleaf grapefern site are aquolls. This species is found at elevations ranging from 7,900 to 11,000 feet (Beatty et al. 2003). Narrowleaf grapefern ranges from Washington and Montana south to California and Colorado (NatureServe 2014). Local distribution includes two recorded sites El Paso County along the Pikes Peak toll road (Colorado Natural Heritage Program 2009). Sites for narrowleaf grapefern are in the Fountain Creek Headwaters watershed. Narrowleaf grapefern is ranked G2 by NatureServe (2014). It is tracked by the Colorado Natural Heritage Program and is ranked S1. It is rare range-wide with only nine known populations. Narrowleaf grapefern is small and easily over-looked, and may not be present every year. It may be threatened by recreational activities, but more by potential noxious weed encroachment. Narrowleaf grapefern typically occurs in areas of past disturbances, so it is possible that it could appear in many parts of the Crossons-Longview Project Area, including priority treatment areas. The proposed activities could provide improved habitat conditions 20 to 50 years following the proposed treatments.

7.1.3 Lesser yellow lady's-slipper

Lesser yellow lady's-slipper (*Cypripedium parviflorum* Salisb.) is a perennial herb in the orchid family (*Orchidaceae*). It flowers from May to July. Fruiting occurs from June to August (Spackman et al. 1997). It inhabits a wide variety of habitats in the lower montane including aspen groves and moist ponderosa pine/ Douglas-fir forests, and in subalpine wetlands (Spackman et al. 1997). It is most often on cool, shaded, northfacing slopes (Mergen 2006). This species has been found in association with a variety of geological formations including Pikes Peak batholith. Locations are known on moist sites in Sphinx soils. It occurs at elevations of 7,400 to 8,500 feet (Spackman et al. 1997). Lesser yellow lady's-slipper ranges across most of North America, south to California, New Mexico, Arkansas, and Georgia (NatureServe 2014). Lesser yellow lady's-slipper is ranked G5 by NatureServe (2014). It is tracked by the Colorado Natural Heritage Program and is ranked S2. It is listed in the CITES Appendix II list, restricting international trade. Threats include over-collecting, timber harvest operations, fire suppression, unregulated recreation, and invasive species. Lesser yellow-lady's-slipper may also respond favorably to light disturbances. There is a single site for C. parviflorum within the Project Area boundary, near the southwestern corner, dating from 1998; the site is a couple of miles in diameter (Steve Olsen, personal communication). Yellow lady's-slipper habitat is more widespread in the Crossons-Longview Project Area, including moist aspen stands with graminoid-dominated understories. Removal of encroaching conifers and opening of tree canopy would improve conditions for this orchid.

7.1.4 Slender Cottongrass

Slender cottongrass (*Eriophorum gracile*) is a perennial graminoid in the sedge family (*Cyperaceae*). It fruits in late spring–mid summer and occurs in meadows, bogs, shores, usually peaty, acidic substrates; it occurs at elevations up to 13,000 feet (Flora of North America 2014). It is known from mountainous areas of Colorado and Wyoming and the Sandhills region of north-central Nebraska and southern South Dakota. Thirty-six documented occurrences include 15 on National Forest System lands in Colorado and Wyoming. Its global rank is G5 and in Colorado it is classified S2 (Nature Serve 2014). In Colorado it is typically found in fens and subalpine wet meadows with saturated soils and occurs at elevations of 7,000 to 11,140 feet (Decker et. al. 2006). Probable threats to this species include hydrologic alterations, grazing, motorized vehicle use, peat mining, invasive species, and global climate change (Decker et. al. 2006).

7.1.5 Adder's-mouth

Adder's-mouth [*Malaxis brachypoda* (Gray)] is a perennial herb in the orchid family (*Orchidaceae*). It flowers in July and fruits in August (Spackman et al. 1997). It is typically found in wetland sites, including bogs, mires, swamps, swales, and wet meadows (Catling and Magrath 2002). Populations are typically small. The local site for adder's-mouth is over granite of the Pikes Peak batholith. Adder's-mouth records occur in Legault-Rock

outcrop complex and Legault family soils. It is found in montane areas at elevations ranging from 7,200 to 8,000 feet (Spackman et al. 1997). Adder's-mouth ranges across Alaska and Canada south to Minnesota, Illinois, and New Jersey, but there are outlying populations in California and Colorado (NatureServe 2009). It is tracked by the Colorado Natural Heritage Program and is ranked S1. The local population is disjunctive from the major part of the species range. The primary threats to adder's-mouth include effects of small population size, hydrologic alterations, residential and commercial development, collection, fire, recreation, timber harvest and fuels reduction, road construction and maintenance, livestock grazing and herbivory, exotic species invasion, climate change, and pollution; specific threats vary for each occurrence (Anderson 2006).

7.1.6 Rocky Mountain monkeyflower

Rocky Mountain monkeyflower (*Mimulus gemmiparus* W.A. Weber) is an annual herb in the figwort family (*Scrophulariaceae*). It is a unique annual species because it reproduces predominantly with asexual propagules. It is a regional endemic species and occurs at elevations of 8,400 to 11,120 feet in montane to subalpine environments. It grows in moist, seepy areas, usually on ledges or under overhangs at the base of cliffs. Soils are generally thin (Beatty et. al. 2003). Its range is limited to eight known locations in the mountains along Colorado's Front Range. The Middle Fork of the Saint Vrain holds the only extant population where stable metapopulation dynamics may occur. Three of the eight known locations are on National Forest System lands, two of those are in Pike National Forest: Guanella Pass and Hankins Gulch (Beardsley and Steingraeber 2013). Because most known locations of monkeyflower occur next to trails or roads, the primary threat is trampling by hikers and trail maintenance; populations are also susceptible to disturbances that could alter soil conditions, affect hydrology, or increase competition with other species. Ecological disturbances could include succession, wildfire, drought, rock fall, flash flood, erosion, global warming, tree blowdown, and invasion of exotic plants (Beatty et. al. 2003).

7.1.7 Degener's Beardtongue

Degener's beardtongue (*Penstemon degeneri* Crosswhite) is a perennial herb in the family figwort (*Scrophulariaceae*). It is typically 0.5 to 1.5 feet tall, with 2 to 10 tubular, blue flowers on the top portion of the stems (Natureserve 2014). It occurs at elevations of 6,000 to 9,500 feet in pinyon-juniper woodlands, ponderosa pine parklands with oak brush and bunchgrasses, and montane meadows. It is known only from Fremont, Custer and Chaffee counties (Colorado Rare Plant Guide 2014). Of the 14 occurrences of in USDA Forest Service Region 2, five are in Pike-San Isabel National Forest (Beatty et. al. 2004c). Motorized recreation is considered to be the primary threat to the species (Rondeau et al. 2011). Depending on intensity and frequency, other threats may include non-native plant invasion, grazing and trampling, extensive herbivory, succession, and global environmental changes (Beatty et. al. 2004c).

7.1.8 Rock cinquefoil

Rock cinquefoil (*Potentilla rupincola* Osterhout) is a perennial herb in the rose family (*Rosaceae*). It flowers from mid-June to August (Spackman et al. 1997). It is known from 23 occurrences in four counties in north-central Colorado. It is found primarily in cracks on granite rock outcrops between 6,500 and 10,900 feet in elevation. Eight occurrences are known from lands administrated by the USDA Forest Service Region 2, including seven on the Roosevelt National Forest and one on the Pike National Forest (Anderson 2004). It is ranked G2 by NatureServe (2014). The primary threats to rock cinquefoil are exotic species invasion, residential and commercial development, secondary impacts of grazing, right-of-way management, off-road vehicle use and other recreation (Anderson 2004).

7.1.9 Autumn willow

Autumn willow [*Salix serissima* (L.H. Bailey) Fernald] is a perennial shrub in the willow family (*Salicaceae*). It flowers from early June to early July. It occurs in wet thickets, fens, brackish marshy strands, lakeshores, treed bogs, gravelly stream banks, and lakeshores at elevations up to 9,900 feet (Flora of North America 2014). It is found from Alberta to Newfoundland and south to Minnesota and New York, with disjunctive populations in the Black Hills of South Dakota, southeastern Wyoming, and north-central Colorado (NatureServe 2014). Autumn willow is most often associated with areas of permanently saturated soils where peat is present. In Region 2, these areas are classified as calcareous or rich fens. Such habitats are scarce in Region 2, and so occurrences of S. serissima are also rare. Although it appears in peatlands, it is not clear that the species is entirely restricted to them (Decker 2006). Potential threats to the species include peat mining, recreational use, alteration of fire regimes, and competition from invasive plant species. Any activity that disrupts saturated soils and peat formation is likely to have a negative impact; the most serious threat is hydrologic alteration of peatland habitats (Decker 2006).

7.1.10 Ute ladies'-tresses

Ute ladies'-tresses (*Spiranthes diluvialis*) is a perennial herb in the orchid family (*Orchidaceae*). It flowers from July through August. It occurs at elevations of 4,200 to 6,000 feet in early- to mid-seral, moist to wet conditions, where competition for light, space, water, and other resources is normally kept low by periodic or recent disturbance events, such as alluvial banks, river floodplain habitats, shores of lakes and reservoirs, in mesic meadow-type vegetation maintained by lake level fluctuations or seasonal flooding of gravel bars, and human-developed dams, reservoirs, and irrigation ditches (NatureServe 2014). It is found in Colorado in Boulder, El Paso, Jefferson, Larimer, Moffat and Weld counties (Colorado National Heritage Program 2014). Habitat may be threatened by grazing or haying after flower production and invasion of sites by non-native plants.

7.1.11 Selkirk's violet

Selkirk's violet (*Viola selkirkii Pursh* ex Goldie) is a perennial herb in the violet family (*Violaceae*), flowering in May and June. Selkirk's violet grows in montane to subalpine cold mountain (aspen) forests, and in moist woods and thickets. The area where Selkirk's violet has been found is on the Pikes Peak batholith. Soils where Selkirk's violet has been located were wet and near the base of alders. Soils are of the Sphinx series. Elevations range from 8,500 to 9,100 feet (Spackman et al. 1997). Selkirk's violet ranges from British Columbia to Greenland, south to Washington and New Mexico. Distribution in Colorado includes Douglas County, where there are two recorded sites near Devil's Head on the South Platte Ranger District (Colorado Natural Heritage Program 2009). Selkirk's violet is ranked as G5 by NatureServe (2014). It is tracked by the Colorado Natural Heritage Program and is ranked S1. The Colorado populations of Selkirk's violet are disjunctive from the greater range of the species. Habitat may be threatened by unregulated motorized recreation.

7.2 Special Status Plants Effects

7.2.1 Effects Common to All Alternatives

All sensitive species are negatively impacted by noxious weeds, climate change, direct damage, collection and alteration to keystone ecosystem processes. Actions that create early seral states are most likely to facilitate spread and establishment of noxious species.

7.2.2 Alternative A (No Action)

<u>Direct and Indirect Effects</u>

Alternative A (No Action) would have no direct effects on the sensitive plants in the Crossons-Longview Project Area because no vegetation treatments would be implemented. However, Alternative A (No Action) could have indirect effects on sensitive plants and habitats over time. Without treatment, conifers would continue to encroach into the open areas where these sensitive plants could occur. This could eventually lead to a decline in habitat quality and loss of individuals as shading changes growing conditions on the site. This effect would be especially pronounced on Degener's beardtongue which requires woodland conditions.

Loss of tree canopy cover would continue in some areas due to the effects of insects and disease. This could improve conditions for sensitive plants. Habitat conditions for sensitive plants could decline with increased competition from other plants which also favor open canopied conditions, including several species of noxious weeds. The lack of fire would have a negligible effect on sensitive plants. They could benefit from the nutrient release from fire.

Cumulative Effects

Past and current activities have altered plant occurrences and their habitats. These activities have the potential to cumulatively affect plants and include: historic grazing, timber harvest and thinning, fire suppression, prescribed fire, mining, motorized and non-motorized recreational use, road and trail construction, urban development, and noxious weed infestation and treatment.

There would be continued maintenance of existing forest roads and trails in the Project Area. Other roads would be maintained by the state, county, and by private individuals. Development would continue to occur on private land in the area. Concurrent with these would be the likely increase in traffic on roads in the vicinity. Dispersed recreation use would also continue on National Forest System lands.

7.2.3 Alternative B (Proposed Action)

Direct and Indirect Effects

The Proposed Action includes the treatment of 9,574 acres and construction of temporary roads to facilitate forestry operations.

Temporary Roads

Temporary roads represent the greatest threat to community composition and rare plants as top soils would be removed, sub-soils would be compacted and roads would serve as a corridor for the spread of noxious weeds. It is anticipated that these effects, with the exception of weed infestations, would be short lived, as temporary roads would be restored at the conclusion of forestry operations.

Vegetation Treatments

Treatment activities can cause light to moderate ground disturbances to soils by displacement and compaction on skid trails and landings totaling up to 15 percent of the treatment area. These activities could burry, dislodge, damage or stress target species. The amount of disturbance to the soils and plants would vary considerably. The most heavily disturbed areas, such as log landings, process areas and the bottoms of skid trails would be the most disturbed, take the longest to recover and have the greatest potential for succession to an undesirable vegetative state. The least disturbed sites, such as the tops of skid trails, could recover quickly with minimal effects on community composition.

Treatments may also disturb needle-cast “mulch” where activities occur. In these areas, the potential of noxious weed encroachment is greater. Additionally, rare plants could be buried by tree chipping or mastication operations.

Fuel Break construction would cause some soil compaction, and may require soil disturbance in some situations. This could dislodge herbaceous plants and break stems of shrubs where the actions occur. In these areas, the potential of noxious weed encroachment is greater. Fuels management by mechanical or hand treatment can indirectly impact sensitive plants by causing changes in vegetation composition and successional pathways of that vegetation, changing local hydrologic patterns, changing the fire regime or by changing the soil characteristics of the habitat.

Prescribed Fire

Prescribed fire may cause some light ground disturbance, and some incidental soil compaction. Above-ground parts of plants, both herbaceous and woody, would be consumed, but root material would rarely be damaged enough to prevent their regrowth. The direct effect of fire is the potential scorching or mortality of individuals or populations from fire or heat. However, due to the timing of the prescribed fires, no plants would be actively growing at the time.Fire can lead to changes in forage condition, and this can cause changes in the foraging behavior of livestock and wildlife within the area.

Burning hand-piled slash also has the potential to eliminate the herbaceous layer below the pile for years after the pile has burned since high intensity fires could sterilize the soil. Mechanical treatment and hand treatment may directly impact sensitive species by trampling and crushing plants, displacing soil and plants, or smothering plants with slash, chips, or soil.

Fire could be detrimental to sensitive plants by facilitating the spread of noxious weeds. Conversely, fire may be beneficial to these species because growth of mycorrhizal associates may be stimulated by nutrient release after fire. Any undiscovered populations of the sensitive plants having appropriate habitat in the area would recover along with the remainder of the community. Because of nutrient release following the fire, their populations may expand. As a keystone ecosystem process in the forests of Colorado, fire can play an important role in maintain the distribution and composition of vegetative communities including rare plants.

Noxious Weeds

Noxious weed invasion potentially poses a negative impact to all plant habitats. The removal of vegetation in any circumstance creates an early seral state that is optimal for colonization by noxious species. Weed infestation following a burn has the potential to extirpate populations of uncommon plants. Noxious weeds, once established, could indirectly impact sensitive plant species through allelopathy (the production and release of plant compounds that inhibit the growth of other plants), changing the fire regime, or direct competition for nutrients, light, or water. Subsequent weed control efforts could also negatively impact sensitive plants. Noxious species known to be within the Project Area include Canada thistle (Cirsium arvense),

musk thistle (Carduus nutans), leafy spurge (Euphorbia esula) and hounds tongue (Cynoglossum officinale). In general, all sensitive species would be negatively impacted by direct disturbance or invasion by noxious species. Eight of the 11 sensitive species occur in riparian areas, near wetlands or on moist soils. Plant responses to increased light levels vary by species.

Any undiscovered populations of sensitive plants that are damaged would recover along with the remainder of the community.

Specific Effects by Sensitive Species

Rydberg's golden columbine may be threatened by the use of the use and maintenance of existing roads and trails. Proposed forest operations could improve habitat for the narrowleaf grapefern for 20 to 50 years as it typically occurs in areas of past disturbances. The lesser yellow lady's-slipper is threatened by timber harvest operations, fire suppression, unregulated recreation or the use of trails for forest operations. Lesser yellow-lady's-slipper may also respond favorably to light disturbances. Removal of encroaching conifers and opening of tree canopy would improve conditions for this orchid. Slender cottongrass is likely impacted by hydrologic alterations, grazing, motorized vehicle use which could increase along project roads. The primary threats to adder's-mouth include hydrologic alterations, residential and commercial development, fire, recreation, timber harvest and fuels reduction, road construction and maintenance and herbivory. Rocky Mountain monkeyflower is impacted by succession and wildfire. Degener's beardtongue is impacted by motorized recreation is considered to be the primary threat to the species. The primary threats to rock cinquefoil could be impacted by road construction and maintenance and recreation. Potential threats to autumn willow recreational use and alteration of fire regimes. Ute ladies'-tresses is early- to mid-seral species which requires moist to wet conditions, flooding and limited competition; project impacts on this species could be positive. Selkirk's violet habitat may be threatened by unregulated motorized recreation or use of trails for forest operations.

Cumulative Effects

Recreation is a frequent use of the Forest within the Analysis Area. Motorized touring is prevalent as are hunting, cycling, camping, hiking, and horseback riding during certain times of the year. Roads in particular increase soil erosion, increase sedimentation, and facilitate the spread of noxious weeds. Motorized and non-motorized recreational use has led to the development of non-system roads and trails, development of dispersed campsites, erosion, and ground disturbance.

Without proper noxious weed management during and after forest operations, the proposed action has the potential to facilitate establishment of noxious weeds throughout the Project Area. The potential for invasion by noxious weeds is especially high on skid trails, landings, process areas, along trails used for forestry

operations and temporary roads (when in use and subsequent to restoration). Once established, noxious weed populations can displace native vegetation, lower ecological value (such as forage) and alter fire regimes. Similar changes would occur throughout the Forest as treatments are implemented.

Several other current and proposed actions on the Forest, such as the Platte Canyon Powerline Rebuild and Reauthorization could result in cumulative impacts on species that are sensitive to recreational disturbances. Adder's mouth, Rocky Mountain monkey flower, rock cinquefoil, autumn willow and Selkirk's violet in particular are disturbed by recreational use. The above species may be found in places where there is recreation because they colonize early seral environments or desire stronger light that may be found along trails. Similar conditions exist along powerlines and maintenance activities could impact these same plants. It should be noted that the above species may occur in places where they could be impacted by recreational disturbances, or that these places are where they are most likely to be observed unlike less accessible areas. None of the identified species are critically imperiled. No adverse cumulative effects are expected.

7.2.4 Alternative C

Direct and Indirect Effects

The overall effect of forest treatments on special status plants would be similar in Alternative B and Alternative C; however, fewer acres would be affected under this alternative and temporary roads would not be constructed.

This alternative would be less detrimental to rare plants than Alternative B because there would be less soil disturbance and likely a lower incidence of weed introduction and spread. All rare plants are sensitive to disturbance. Adder's-mouth, Rocky Mountain monkeyflower, Degener's beardtongue, rock cinquefoil, autumn willow and Selkirk's violet are identified as also being sensitive to recreational use. These plants in particular would benefit from the restriction of road development under this Alternative.

Cumulative Effects

Cumulative effects under Alternative C are similar to those under Alternative B except approximately half as much area would be treated. Because less area is treated under this alternative, the risk of large-scale, high intensity wildfire within the region would increase.

Rare plants which are negatively affected by thinning via disturbance or competition by noxious species would benefit from the smaller impacts of Alternative C while conditions for species that respond favorably to increased light levels or early seral states would not benefit as much as under Alternative B.

7.2.5 Short-term Uses and Long-term Productivity

Special status plants could be damaged in the short-term but long-term productivity of these species should be minimal if guidelines are employed.

7.2.6 Unavoidable Adverse Effects

Some potential habitat for sensitive species might be disturbed during vegetation treatment activities.

7.2.7 Irreversible and Irretrievable Commitments of Resources

The proposed vegetation treatments would not critically imperil any special status species.

7.2.8 Other Required Disclosures

On August 26th, 2014 a species list was collected from the USDI Fish and Wildlife Service (USFWS) Information, Planning, and Conservation System (IPaC). This list was then used to determine whether any threatened and endangered species, designated critical habitat, proposed critical habitat, Migratory Birds of Conservation Concern, or other natural resources of concern may be affected by the Crossons-Longview project. Review of this list was completed and species with no potential or suitable habitat as well as species outside of their distributional range and/or elevation range were excluded from further review. The USFWS has identified three federally listed species as having part of their range on the Pike and San Isabel National Forest. These species are the threatened Colorado butterfly plant (Gaura neomexicana var. coloradoensis), the threatened Ute ladies' tresses (Spiranthes diluvialis) and the threatened Western prairie fringed orchid (Platanthera praeclara). There is no potential for Colorado butterfly plant in the Pike-San Isabel National Forest and western prairie fringed orchid would not be effected as there would be no water depletions associated with this project (Steve Olsen, personal communication 2/21/2014).

Consultation with the USFWS would be required for the Ute ladies' tresses orchid because the project would occur within the range of this plant (on elevations below 6'500 feet).

7.2.9 Consistency with Forest Plan

The 1976 National Forest Management Act (NFMA) requires that site-specific projects must be consistent with the Forest Plan. Forest Plan goals and objectives guide the identification and selection of potential agency projects. The determination of whether or not an individual project is consistent with the Forest Plan is based on whether or not the project adheres to forest-wide and management area goals and standards. For analysis of the Catamount project applicable management direction is provided in the 1984 Land and Resource

Management Plan for the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands (Forest Plan). Forest Plan goals that are relevant to the forest vegetation assessment include:

- Practice vegetation management to provide multiple benefits using a comprehensive timber management program as a tool (III-4).
- Provide for increased production and productive use of wood fiber while maintaining or improving other resource values (III-4).
- Improve age class and species distribution of tree stands forest-wide (III-4).
- Perpetuate the aspen type (III-4).
- Improve the health and vigor of all vegetation types (III-4).

The Forest-wide management requirements set the baseline conditions that must be maintained in order to implement the Forest Plan as it was intended. They establish the environmental quality and natural resource requirements that apply to all areas of the Forest(s).

The no action alternative would not help foster any of the Forest plan goals stated above.

Alternative B (Proposed Action) is consistent with these broad Forest wide goals. Many of the vegetation treatments employed would not be commercial operations. Although some commercial timber may be harvested, the most likely products from these treatments would be the sale of some of the cut trees as firewood and woody biomass.

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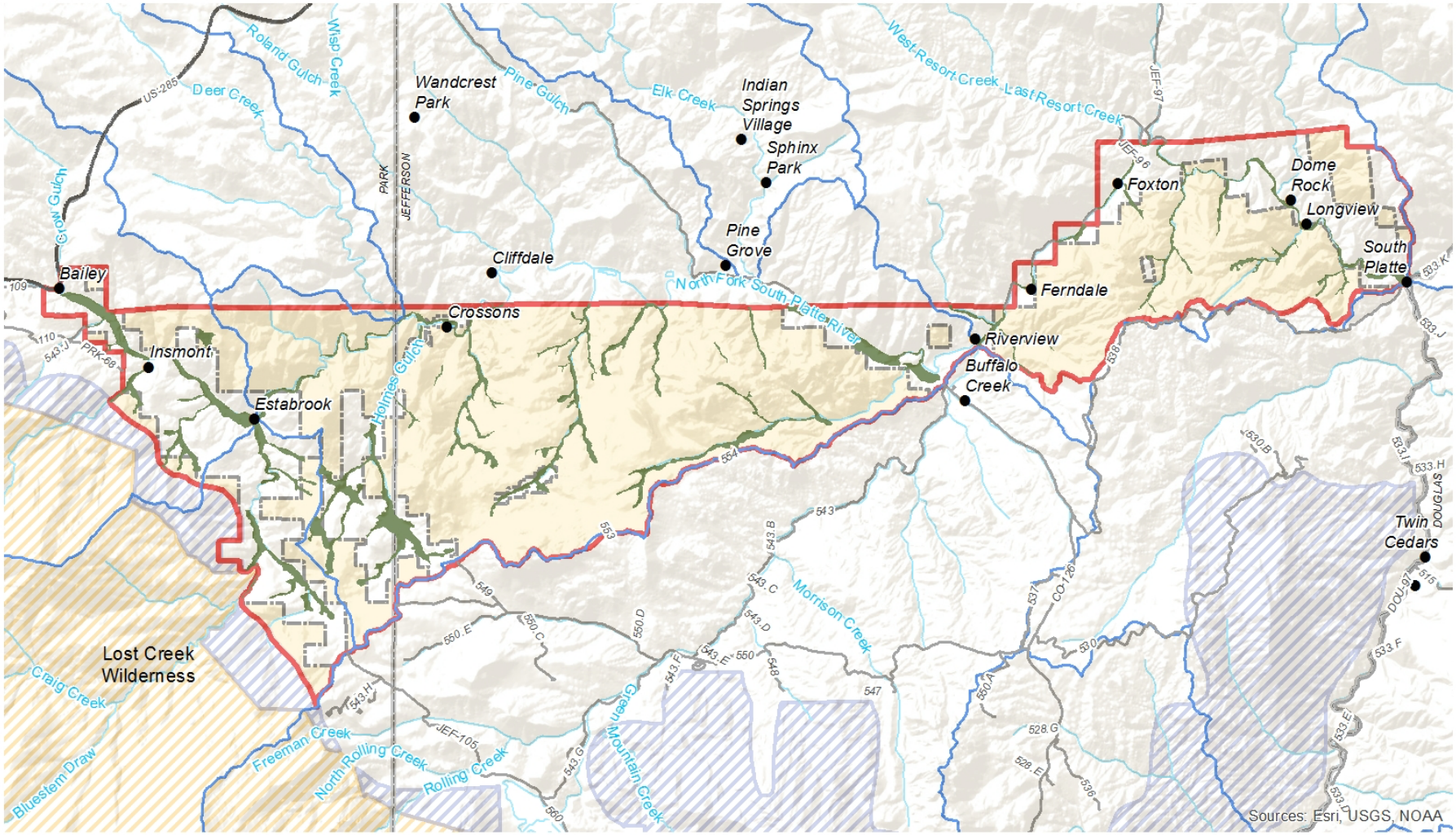
Appendix A - Special Status Plants Maps



Crossons-Longview Forest Restoration Area
USDA Forest Service Boundary within the Restoration Area
Wilderness Area
Inventoried Roadless Area
Populated Place
Roads
County Boundaries
Rivers and Streams
Watershed Boundaries

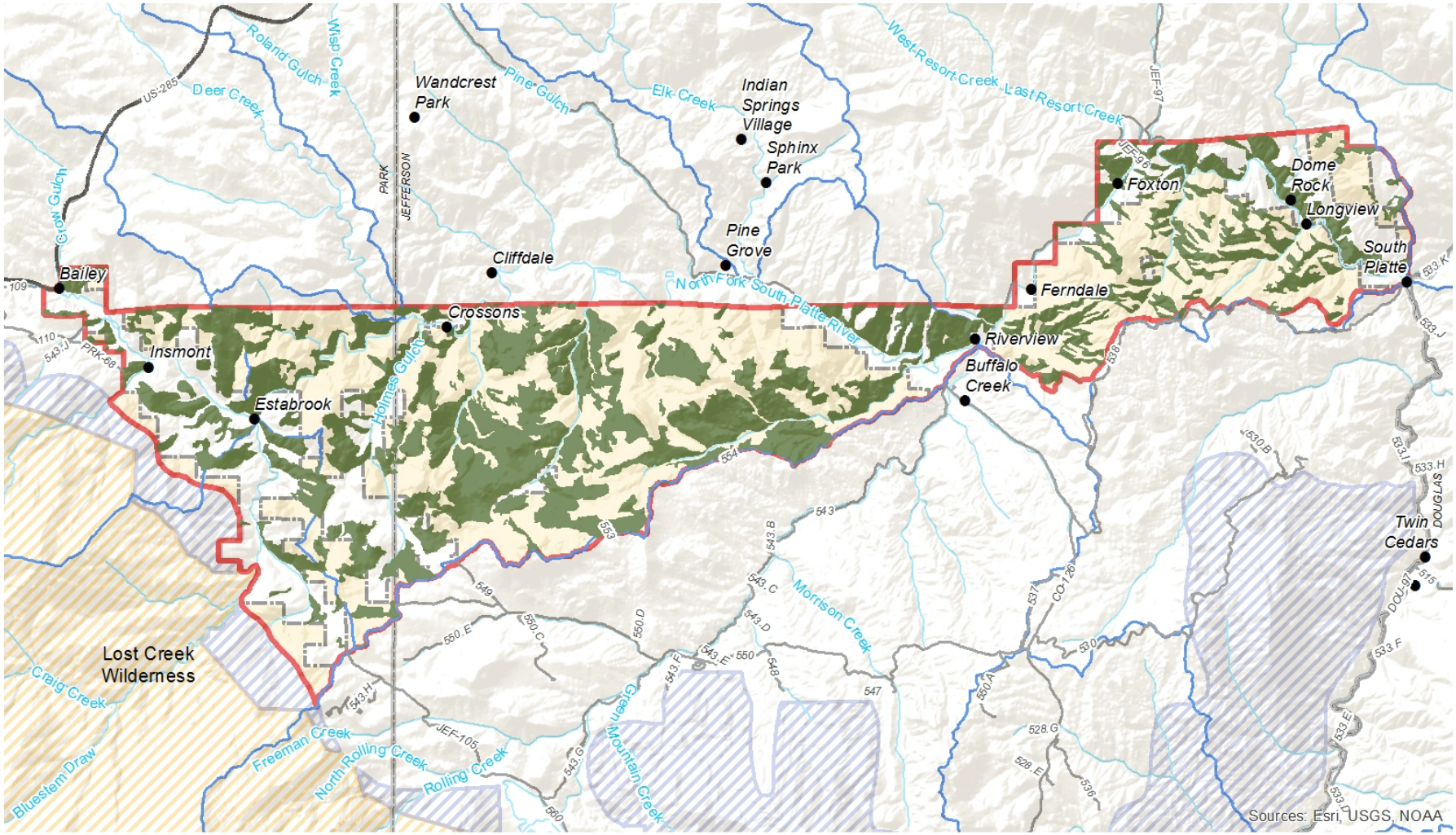
Potential Habitat 1759.43 acres
Agastache foeniculum
Gaura neomexicana spp. coloradensis
Hippochaete variegata
Malaxis brachypoda
Salix serissima
Spiranthes diluvialis

Potential Habitat for Selected Vegetation Species

JW Associates Inc.

0 0.5 1 2 Miles

Sources: CDOT, ESRI, NOAA, USFS, USGS
Coordinate System: NAD 1983 UTM Zone 13N



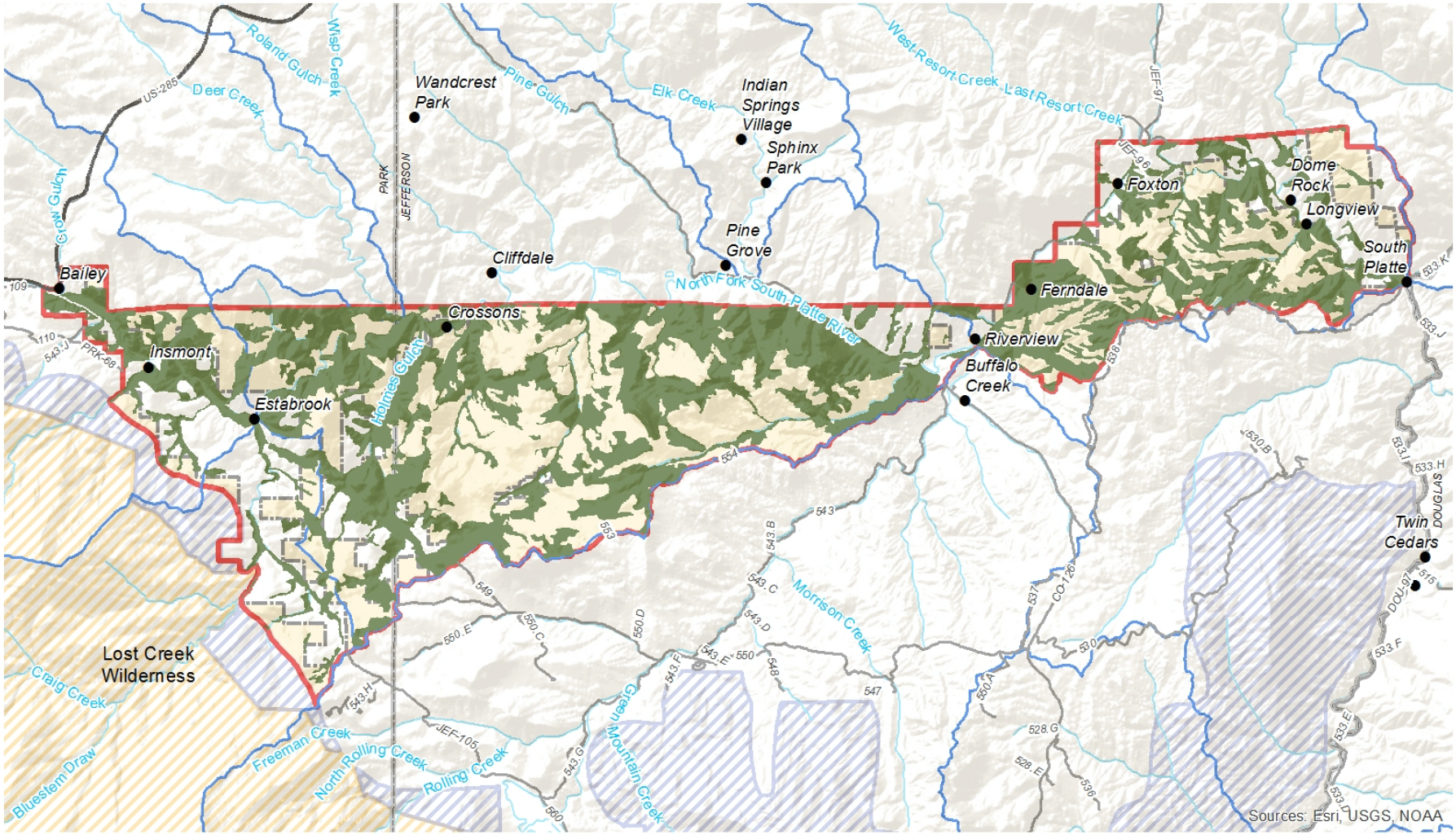
- Crossons-Longview Forest Restoration Area
- USDA Forest Service Boundary within the Restoration Area
- Wilderness Area
- Inventoried Roadless Area
- Populated Place
- Roads
- County Boundaries
- Rivers and Streams
- Watershed Boundaries
- Potential Habitat 8597.96 acres
  Penstemon degeneri

Potential Habitat for Selected Vegetation Species

JW Associates Inc.

0 0.5 1 2 Miles

Sources: CDOT, ESRI, NOAA, USFS, USGS
Coordinate System: NAD 1983 UTM Zone 13N



Crossons-Longview Forest Restoration Area
USDA Forest Service Boundary within the Restoration Area
Wilderness Area
Inventoried Roadless Area
Populated Place
Roads
County Boundaries
Rivers and Streams
Watershed Boundaries

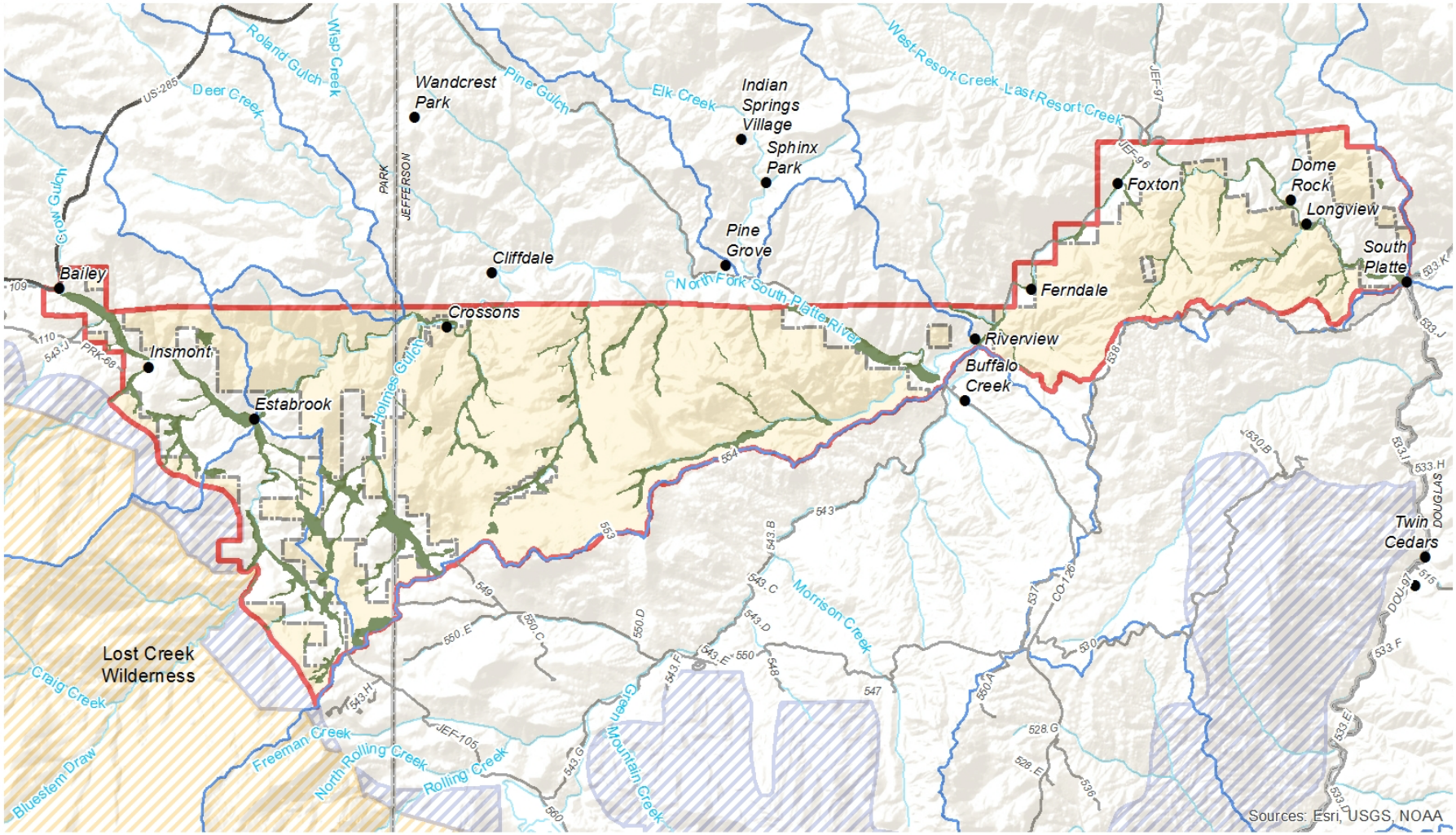
Potential Habitat 10,520.33 acres
Cypripedium parviflorum

Potential Habitat for Selected Vegetation Species

JW Associates Inc.

0 0.5 1 2 Miles

Sources: CDOT, ESRI, NOAA, USFS, USGS
Coordinate System: NAD 1983 UTM Zone 13N



Crossons-Longview Forest Restoration Area
USDA Forest Service Boundary within the Restoration Area
Wilderness Area
Inventoried Roadless Area
Populated Place
Roads
County Boundaries
Rivers and Streams
Watershed Boundaries

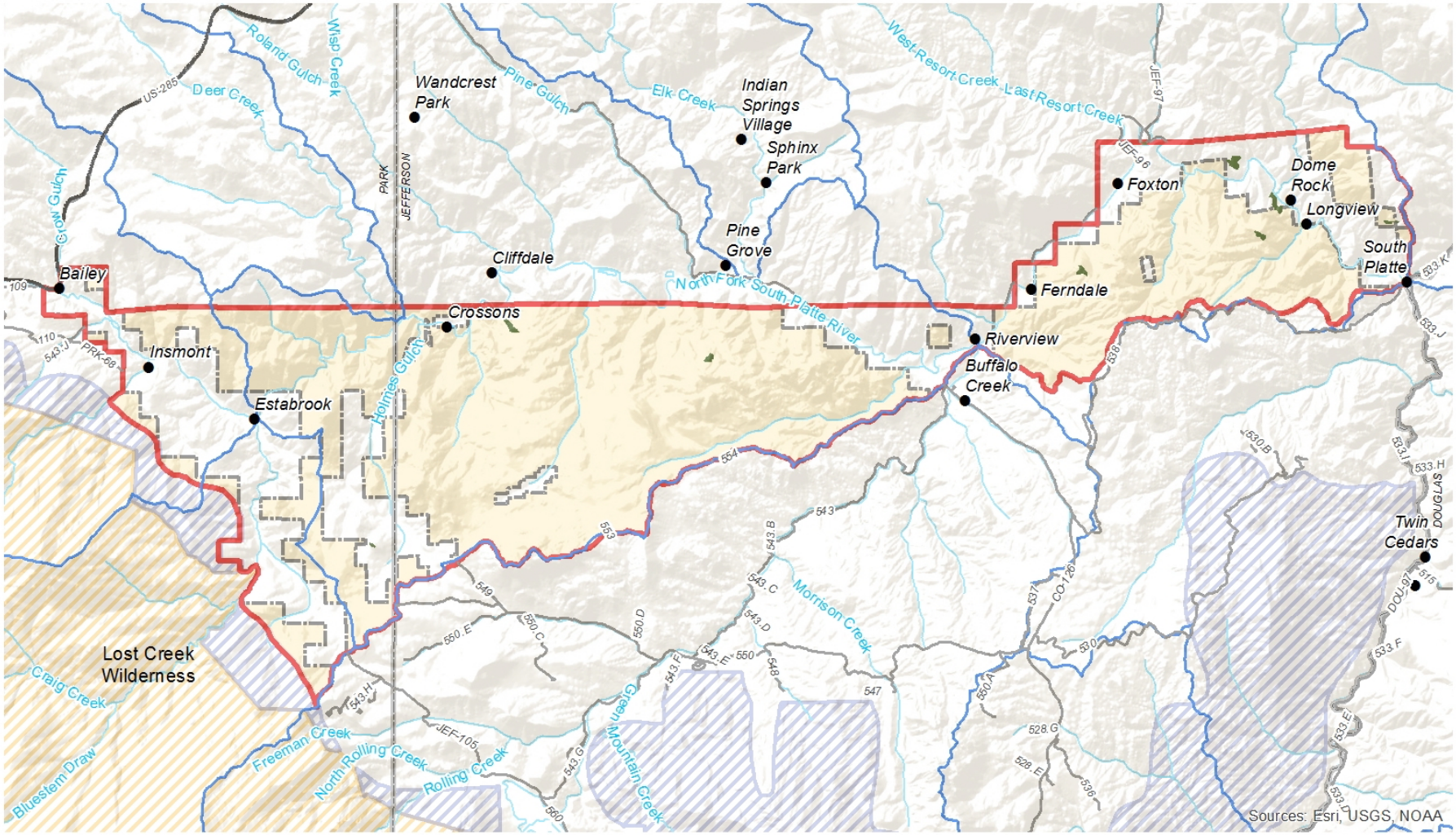
Potential Habitat 1965.82 acres
Botrychium lineare

Potential Habitat for Selected Vegetation Species

JW Associates Inc.

0 0.5 1 2 Miles

Sources: CDOT, ESRI, NOAA, USFS, USGS
Coordinate System: NAD 1983 UTM Zone 13N



Crossons-Longview Forest Restoration Area
USDA Forest Service Boundary within the Restoration Area
Wilderness Area
Inventoried Roadless Area
Populated Place
Roads
County Boundaries
Rivers and Streams
Watershed Boundaries

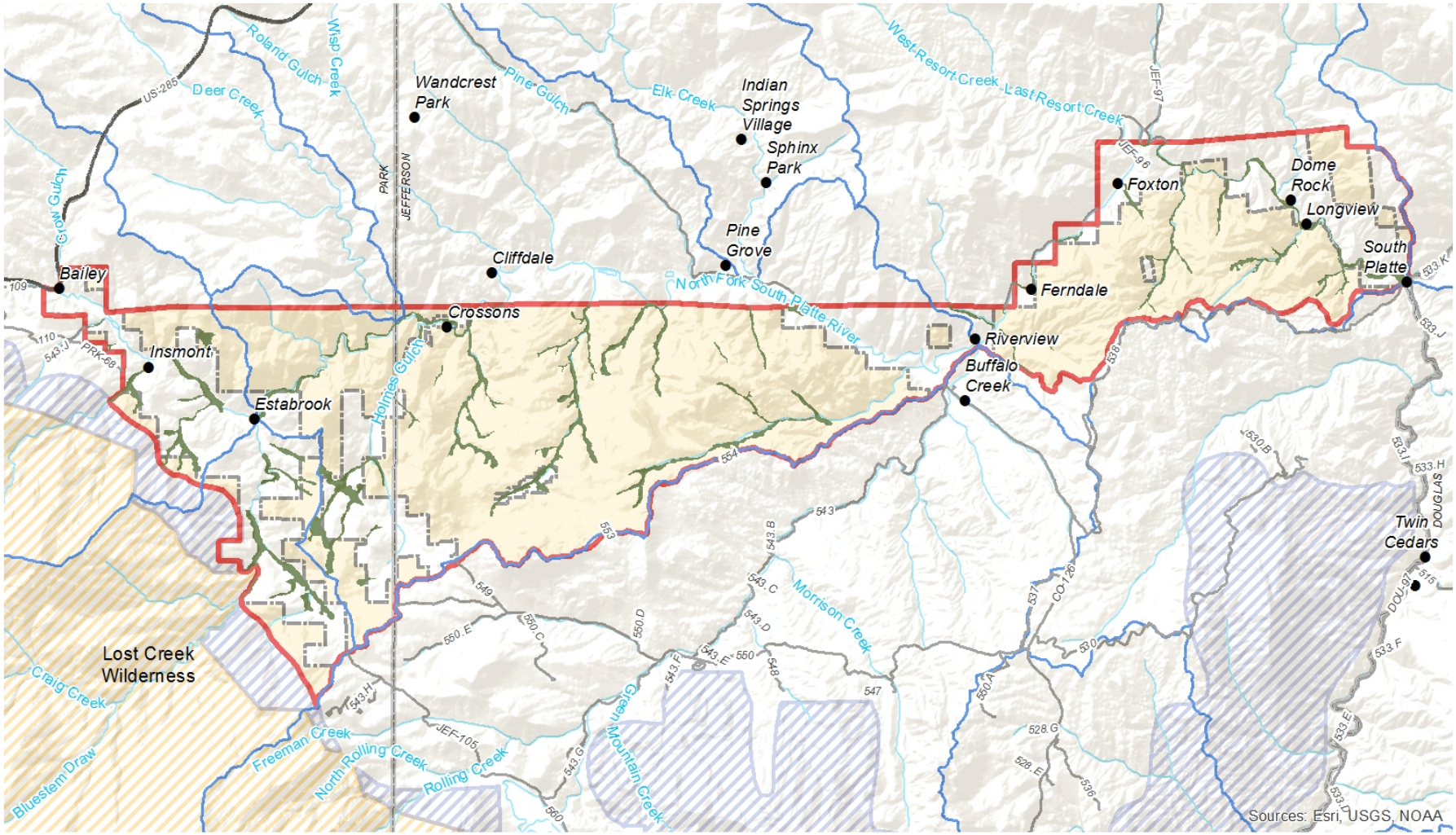
Potential Habitat 53.05 acres
Potentilla rupincola

Potential Habitat for Selected Vegetation Species

JW Associates Inc.

0 0.5 1 2 Miles

Sources: CDOT, ESRI, NOAA, USFS, USGS
Coordinate System: NAD 1983 UTM Zone 13N



Crossons-Longview Forest Restoration Area
USDA Forest Service Boundary within the Restoration Area
Wilderness Area
Inventoried Roadless Area
Populated Place
Roads
County Boundaries
Rivers and Streams
Watershed Boundaries

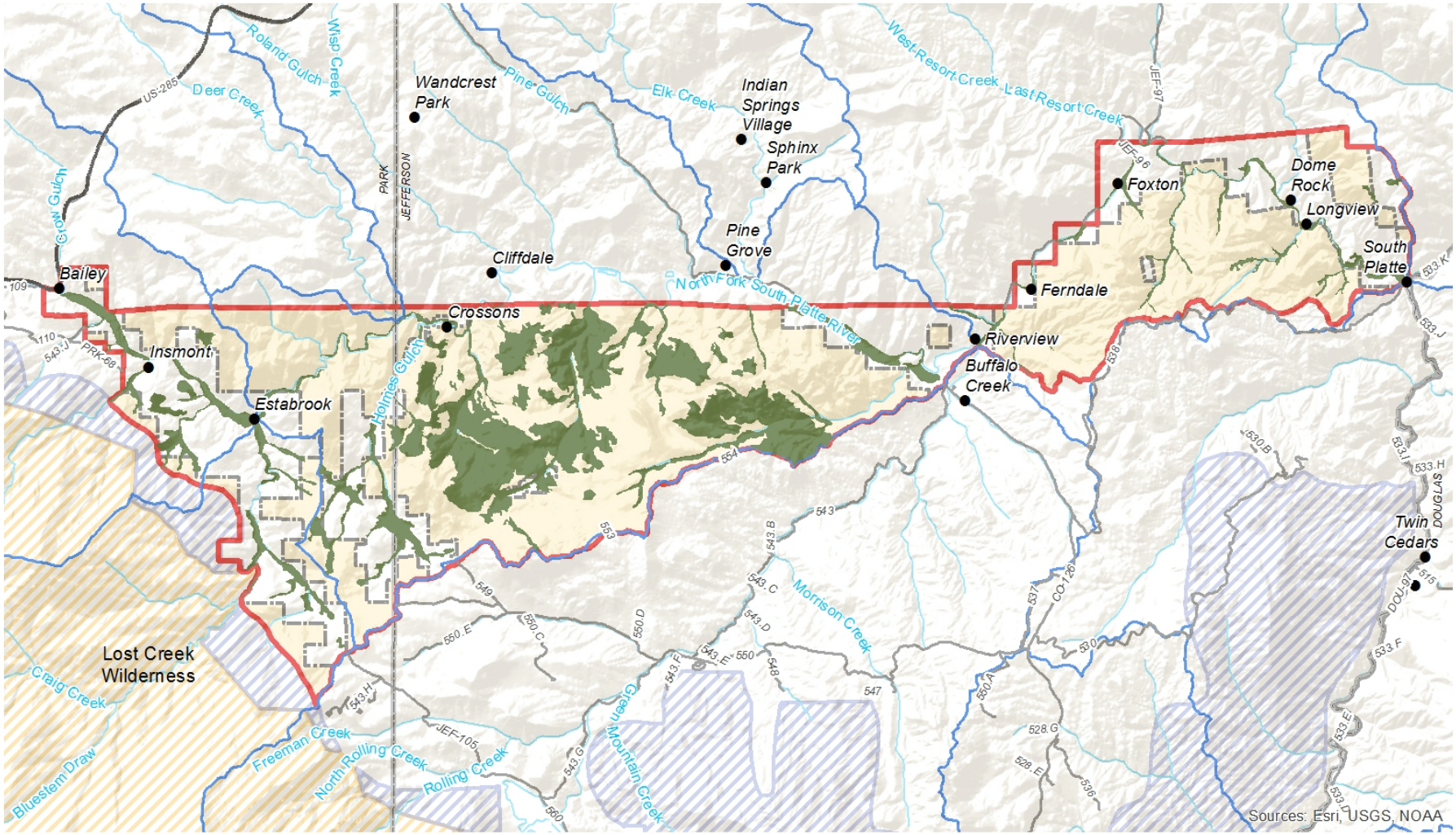
Potential Habitat 1276.12 acres
Aquilegia chrysantha

Potential Habitat for Selected Vegetation Species

JW Associates Inc.

0 0.5 1 2 Miles

Sources: CDOT, ESRI, NOAA, USFS, USGS
Coordinate System: NAD 1983 UTM Zone 13N



Crossons-Longview Forest Restoration Area
USDA Forest Service Boundary within the Restoration Area
Wilderness Area
Inventoried Roadless Area
Populated Place
Roads
County Boundaries
Rivers and Streams
Watershed Boundaries

Potential Habitat 4295.29 acres
Eriophorum gracile

Potential Habitat for Selected Vegetation Species

JW Associates Inc.

0 0.5 1 2 Miles

Sources: CDOT, ESRI, NOAA, USFS, USGS
Coordinate System: NAD 1983 UTM Zone 13N