FOREST MANAGEMENT PLAN

Indian Mountain Park

265 Acres

September 2024

Prepared for:

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ACKNOWLEDGEMENTS

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SECTION 1.0 INTRODUCTION

This Forest Management Plan is designed to assess the existing conditions of the forested portions of Indian Mountain Park, while also outlining and recommending possible future actions including wildfire hazard reductions and forest health improvements. The goals of the plan are as follows:

Forest Evaluation Goals:

Goal 1: Collect and analyze forest inventory data to help identify management priorities for the forested portions of Indian Mountain Park.

- Complete a forest inventory that has less than a 20% sampling error.
- Ensure inventory captures the variability that exists in each of the inventoried vegetation types.

Goal 2: Identify any forestry resource concerns that exist for the Park.

- Identify major insect and disease activity.
- Identify locations with excessive forest density issues that can be addressed.
- Identify existing wildfire hazards.

Goal 3: Evaluate the necessity and feasibility of wildfire hazard reduction activities.

- Determine areas that could benefit from fuels/density reduction work.
- Identify these locations through GIS mapping.

Goal 4: Evaluate the necessity and feasibility of completing forest health improvements.

- Determine areas that need work completed to improve forest health.
- Identify these locations through GIS mapping.

Forest Management Activity Goals:

Goal 1: Conduct wildfire mitigation activities to help protect the Indian Mountain Park, neighboring communities, and the Indian Mountain watershed.

- Manage hazard trees in high use areas and along present roads and trails to maintain the safety of Park visitors.
- Decrease existing high densities in forest management units.
- Create mosaic structure on landscape scale.
- Break up the vertical and horizontal arrangement of forest fuels on the landscape in recommended work areas.

Goal 2: Promote forest health across Indian Mountain Park - especially in high use areas.

- Move forest management units towards appropriate forest density.
- Promote species and age class diversity to create a mosaic structure on the landscape.
- Monitor and treat tree insect and disease activity as necessary - especially the current western spruce budworm outbreak.
- Protect areas with old-growth and large growth form trees.

Goal 3: Recommend public education measures to help the local community understand proposed management activities.

- Encourage Park staff/District to help educate the community on future management activities that will help move the Park's forests to a healthy state.
- Use community education to help garner volunteer activities on the Park.
- Create/install quality signage for community education where needed.

Goal 4: Recommend forest management work that respects the multiple uses of Indian Mountain Park.

- Design forest management actions to improve and maintain habitat diversity for wildlife.
- Maintain aesthetic forest conditions while reaching other goals.
- Ensure that proposed work can be completed while meeting the State's Best Management Practices (**BMP**) regarding water quality and forest management activities (BMP's can be found in Appendix 12.0)

SECTION 2.0 GENERAL DESCRIPTION

2.1 Property Location

Indian Mountain Park is 265 acres and is located southeast of Como and east of Fairplay, Colorado. The Park is dominated by its namesake, Indian Peak, which is the high point of the Park at 10,368 feet.

From Hwy 285 south of Como, the Park's Comfort Station building can be reached by driving south on Elkhorn Road (CR 15) for 4 miles until reaching the turn for Albino Road. Turn left onto Albino Road (CR 687) and proceed for 3.8 miles until reaching a 4-way intersection. Albino Road becomes Arrowhead Drive at this junction. Proceed straight ahead on Arrowhead Drive for 0.9 miles until reaching the turn for Chief Trail. Turn left onto Chief Trail and proceed for 2.2 miles until reaching the turn for Indian Mountain Park. Turn right (south) onto the Park entrance road and follow it for 0.1 miles passing the Indian Mountain Park entrance sign (**Figure 1**) ultimately reaching the parking lot adjacent to the Comfort Station. Refer to the **Location Map** in **Section 6.0.**

Figure 1: The main entrance to Indian Mountain Park is located just off Chief Trail southeast of Como, Colorado.

2.2 *Topography, Climate & Hydrology*

The Park's elevation ranges from 9,475 feet along the western finger of road at the north end of the Park to 10,368 feet at the summit of Indian Peak. Refer to the **Topographic Map** in **Section 6.0**. Slopes vary from flat and operable to steep and inoperable. Indian Mountain Park occupies multiple ecotones mainly along two distinct aspect gradients: a predominantly north-facing Spruce-Fir forest, and a predominantly south-facing Mixed Conifer forest dominated by differing pine species (see **Aspect Map** in **Section 6.0**).

No specific climate data is available for the Park. The closest available current meteorological data is for Fairplay, CO. The precipitation on Indian Mountain Park is likely fairly similar given the similar elevation present at the Park. Fairplay's associated climate data is listed below (**Figure 2**).

Fairplay, Colorado

Average Annual Maximum Temperature (°F):	50.0
Average Annual Minimum Temperature (°F):	26.0
Average Annual Precipitation (in.):	14.81
Average Total Snowfall (in.):	84.0

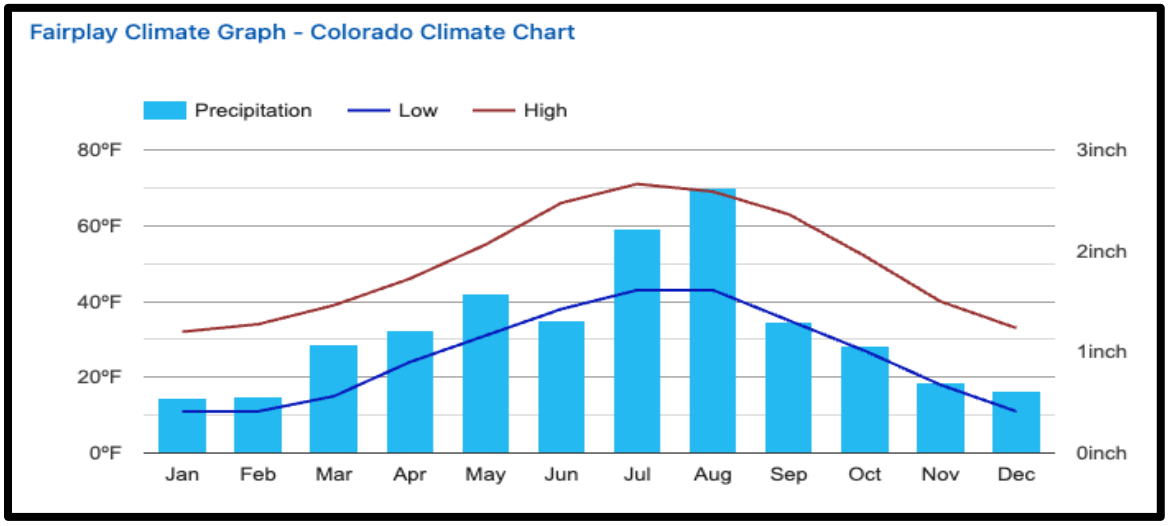


Figure 2: Annual precipitation and temperature data from nearby Fairplay, Colorado.

As mentioned in the 2024 Indian Mountain Subdivision Community Wildfire Protection Plan (CWPP 2024), Indian Mountain is in the Tarryall Creek Drainage. An unnamed intermittent stream flows downhill through the northeast end of the Park eventually making its way down to nearby Swigler Gulch. Swigler Gulch flows east into Tarryall Creek. Tarryall Creek flows generally southeast and eventually into the South Platte River. Ephemeral drainages are also present within the Park. Any work completed in riparian areas and drainages should follow *Best Management Practices to Protect Water Quality in Colorado*, which is provided in the **Section 12.0 Management Actions Appendix**.

2.3 Neighbors

Forest management on this Park under a forest management plan should not adversely affect any neighbors. Managing the forests on this Park will benefit the surrounding private properties by implementing prescriptions to mitigate tree insect and disease outbreaks, as well as the threat of wildfire while improving forest health.

Indian Mountain Park is surrounded by many private properties (**Figure 3**). The bulk of the private properties are 10 acres or less in size and are rural/residential. Below is a list of several of the ownerships that border the Park. Refer to the **Aerial Map** in **Section 6.0** to see where these neighbors are in relation to the Park boundaries.

- North – 10 Private Lots
- East – 12 Private Lots
- South – 11 Private Lots
- West – 5 Private Lots

Working and coordinating with neighboring landowners is key to good landscape scale natural resource management.

Figure 3: Neighboring private property on the southwestern edge of the Park.

2.4 Past Forest Management

The Park saw minimal active forest management prior to 2024 when a hazard fuels reduction project on the northwest end of the Park was completed by VM West in addition to targeted thinning along the Park's roads and trails by Pine Brothers.

The Park property most likely had some logging and prospecting activity in the past. Old stumps were seen across the Park during the 2024 forest inventory (**Figure 4**). It is most certain that the property was historically utilized for fuelwood and timber for the local gold/silver mines.

Figure 4: Old stumps were seen across Indian Mountain Park during the 2024 forest inventory.

Fire scars were also noted across the Park during the 2024 forest inventory (**Figure 5**). It is unclear when this fire occurred or if multiple fires occurred.

Figure 5: Evidence of past fires were seen across Indian Mountain Park during the 2024 inventory.

The recently treated area on the northwest end of the Park (North Fuelbreak Management Unit) encompasses three adjacent work area blocks that previously contained a large amount of dead/dying spruce and fir. This thinning treatment area comprises approximately 9.6 acres total, and has reduced hazardous fuels within this northwest end of the Park while also allowing improved fire engine access to the Park. Forest management work in this North Fuelbreak MU was completed primarily by mastication equipment (**Figure 6**). Mitigation work was also completed on 20 feet of either side of the majority of the Park's roads and trails in addition to widening of Trail B from a single track to a width that can now provide emergency vehicle access. Refer to the **Treated Areas Map** in **Section 6.0** to view the North Fuelbreak MU project boundary.

Figure 6: Hazard fuels reduction completed in the North Fuelbreak MU on the Park in 2024.

Hazard Tree Treatment – Trails & Roads

Hazard trees along the Park's trail and road system in addition to the disc golf course will need ongoing maintenance and attention. Hazard tree removal typically focuses on removing dead or damaged trees that are within 1.5 times tree height from any area to be protected/provide for public safety (**Figure 7**).

There are five areas where hazard trees will continue to be a concern: 1) trail corridors, 2) along roads/parking areas, 3) around structures, 4) around stationary high use areas like picnic areas, and 5) within recreation areas. As the Park's road/trail system continues to see recreational usage year round, regularly scheduled hazard tree treatments in these areas will continue to be paramount to protect user safety (see **Roads & Trails Map** in **Section 6.0**).

Figure 7: Hazard tree treatment along trails, roads, and recreation areas is paramount.

SECTION 3.0 INVENTORY AND PRESENT CONDITIONS

3.1 Forest Resources

The forested portions of the Park were inventoried in September 2024 using variable plot sampling. Using Geographic Information System (GIS) technology, sampling plot locations were randomly placed into three main forested vegetation types: south-facing Mixed Conifer forest (VT1), north-facing Spruce-Fir forest (VT2), and into the Spruce-Fir forest that was recently treated (VT3) utilizing an aerial map of the Park. One additional vegetation type is present in the lower portion of the Park (Aspen & Grasslands – VT4) and it received an ocular review, but was not formally inventoried given its importance as a stand-alone recreation area. A total of 35 sample plots were established throughout inventoried forested areas of Indian Mountain Park. Each plot was surveyed for species composition, tree density, tree regeneration, forest health, and other factors in order to gain insight on overall forest resources.

In the inventoried areas, a prism with a basal area factor (BAF) of 20 was used at each sample plot to calculate the basal area of trees greater than 5 inches DBH (diameter at breast height 4.5 feet above the ground). At each sample plot, prism-captured trees greater than 5 inches DBH were recorded as tally trees. Trees measuring less than 5 inches in diameter were sampled using a 1/100th acre fixed plot to estimate total tree regeneration.

The collected plot data was used as a representative sample, since many areas were not accessible due to steep slopes and/or difficult access. As mentioned above, the inventory area covered the entire Park; however, inventory plots were strategically located by vegetation type and future management access (see **Forest Inventory Map** in **Section 6.0**). The USFS statistical software "Forest Vegetation Simulator" was used to process the data from the forest inventory. The basal area sampling error for the Park's inventoried vegetation types were all below 20% error: VT1 (14.3%), VT2 (8.2%), and VT3 (18.5%). The inventory, summary and output data is located in the **Section 9.0 Appendices.**

A descriptive narrative of these vegetation types, and a Forest Characteristics Table (**Table 1**) is found in this section. Refer to the **Vegetation Type Map** in **Section 6.0** for locations.

Forest Characteristics Table

This table summarizes the forest characteristics of the inventoried forested vegetation types on Indian Mountain Park. Non-forested vegetation types were not included in the following table.

Table 1: This table organizes all of the forest characteristics for the inventoried areas on Indian Mountain Park (Tree species codes = ES-Engelmann Spruce, DF-Douglas Fir, PP-Ponderosa Pine, BC-Bristlecone Pine, LM-Limber Pine, AS-Aspen).

Vegetation Type Name	VT1: Untreated Mixed Conifer	VT2: Untreated Spruce-Fir	VT3: Treated Spruce-Fir
Total Acres	87.3 Acres	146.5 Acres	9.6 Acres
Composition (Trees per Acre)	AS 63.6% LM 17.4% PP 7.6% DF 4.9% BC 4.2% ES 2.3%	DF 46.0% ES 40.8% AS 7.6% LM 4.4% BC 1.2%	ES 52.7% AS 38.4% DF 8.2% LM 0.7%
Composition without Regeneration (Trees per Acre) Trees >5" Dbh	LM 37.8% PP 32.0% DF 20.5% ES 9.7%	DF 51.8% ES 39.8% LM 5.0% AS 2.4% BC 1.0%	ES 61.9% DF 35.4% LM 2.7%
Trees per Acre	62.5 > 5" 262.5 with Regeneration	287.7 > 5" 787.8 with Regeneration	32.8 > 5" 141.9 with Regeneration
Basal Area per Acre (ft^2)	Total: 62.5 Live: 55.6 Dead: 6.9	Total: 143.3 Live: 102.3 Dead: 41.0	Total: 28.3 Live: 26.5 Dead: 1.8
Mortality	26.9% composition, which makes up 11.0% of basal area.	37.2% composition, which makes up 28.6% of basal area.	0.7% composition, which makes up 6.4% of basal area.
Average Tree Diameter (inches)	12.9 w/o Regen (DBH) 7.3 with Regen (DBH)	9.0 w/o Regen (DBH) 6.2 with Regen (DBH)	12.1 w/o Regen (DRC) 5.9 with Regen (DRC)
Average Tree Height (feet)	32.6	39.9	45.9
Cubic Foot Volume per Acre (Merchantable)	799.4 ft^3	1,702.6 ft^3	483.0 ft^3
Board Foot Volume per Acre	3,416.2	6,030.2	2,176.5
Site Index	40	37	N/A
Avg. Slope %	25	37	27
Elk Hiding % Cover at 200ft	92.6	86.1	29.4

Vegetation Type 1 (VT1): Mixed Conifer Forest (Untreated)

There are 87.3 acres found in the Mixed Conifer vegetation type on Indian Mountain Park. Access to VT1 is through the existing trail and road system. Slopes in the inventoried acres of VT1 average approximately 25%, and aspect is typically south-facing. Refer to the **Vegetation Type Map** for locations of VT1 (**Section 6.0**).

VT1 averages 62.5 trees per acre that are 5 inches DBH or greater in size. The average DBH of this vegetation type is estimated at 12.9 inches. Regeneration plots estimate that there are approximately 200.0 trees per acre that are 5 inches DBH or less. Including the regeneration data brings VT1 up to 262.5 trees per acre total and brings down the average tree diameter to 7.3 inches. Tree heights averaged 32.6 feet within VT1.

While trees per acre can provide a good indicator for having too many trees on a property, it is not a good measure of density since it does not take into account the diameters of the trees (i.e. 300 1-inch trees is not as dense as 300 10-inch trees). **Basal area** is a better measurement of **density** since it takes into account both the number of trees as well as the tree diameters. The representation of basal area is best described as the surface area of all tree stump faces if the trees were all cut at "breast height" (4.5 feet above the ground) (**Figure 8**). The basal area per acre of VT1 is 62.5 ft^2. This is an ideal density for this type of pine-dominated Mixed Conifer forest type. Live tree basal area was tallied at 55.6 ft^2 per acre while standing dead trees account for 6.9 ft^2 per acre of basal area. Mortality makes up 26.9% of the composition and 11.0% of the basal area.

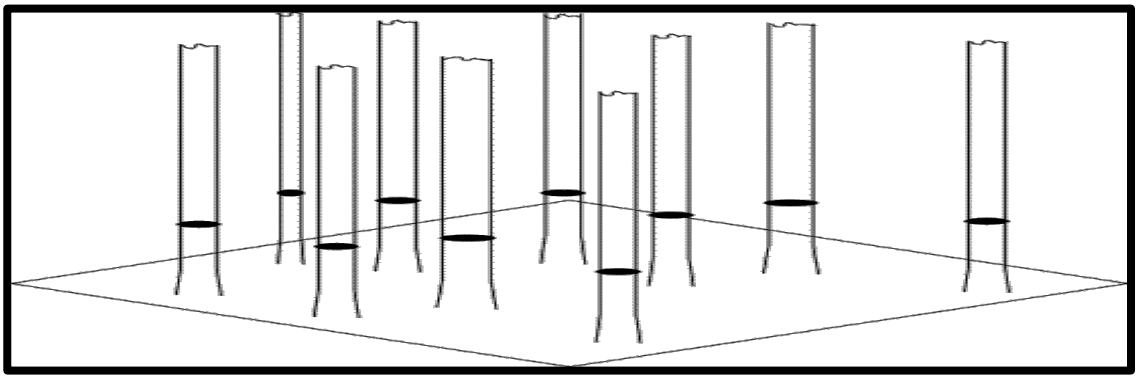


Figure 8: The black ellipses in the above photo show the surface area of hypothetical tree stump faces at 4.5 feet above ground (DBH) representing basal area.

When looking at trees >5" DBH, VT1 composition is dominated by limber pine (*Pinus flexilis*) (37.8%), and ponderosa pine (*Pinus ponderosa*) (32.0%). Douglas-fir (*Pseudotsuga menziesii*) (20.5%), and Engelmann spruce (*Picea engelmannii*) (9.7%) make up the remainder. Including trees <5" DBH shows a strikingly different tree species distribution: Small-diameter aspen (*Populus tremuloides*) (63.6%) dominates. Limber pine (17.4%), ponderosa pine (7.6%), Douglas-fir (4.9%), bristlecone pine (*Pinus aristata*) (4.2%), and Engelmann spruce (2.3%%) make up the remainder. **Figure 9** shows the species distribution for VT1.

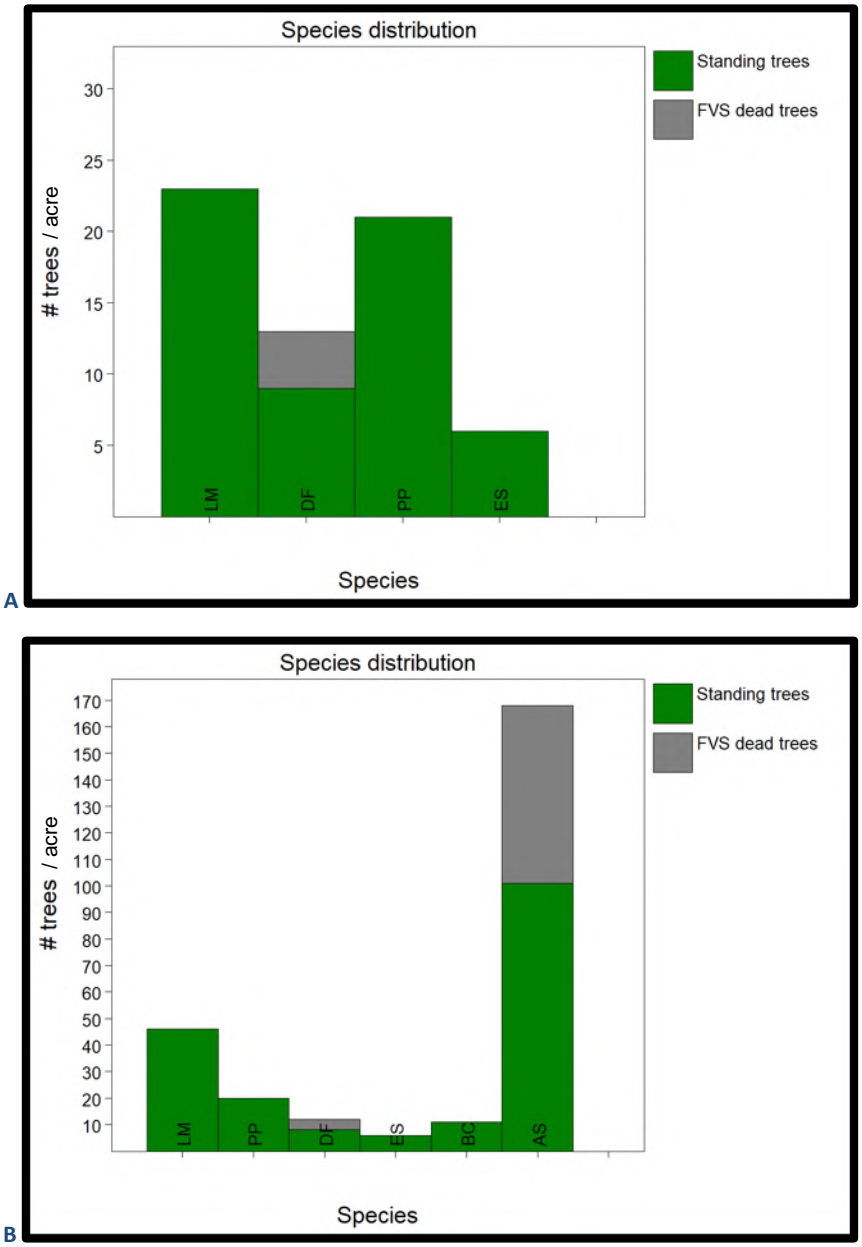


Figure 9: Species distribution for VT1. A) When trees >5" DBH are examined, limber pine and ponderosa pine dominate the overall composition. B) When regeneration sized trees (<5") are included, species distribution changes to include a significant amount of smaller diameter aspen.

The diameter class distribution chart below breaks down the Park by 2-inch diameter classes (**Figure 10**). The 2-inch diameter class ranges from 1.0 to 2.9 inches, and each diameter class follows suit (i.e. the 4-inch diameter class ranges from 3.0 to 4.9 inches, etc.). The diameter class distribution of VT1 demonstrates a forest that primarily has uneven-aged qualities as indicated by the inverse J-shaped curve (black curve) below. The simplest way to describe this structure is the following: as the oldest age class of trees dies, the preceding age class becomes the oldest age class and regeneration (newest age class) fills the vacated space. This replacement can happen in pockets of mortality or as individual tree replacement.

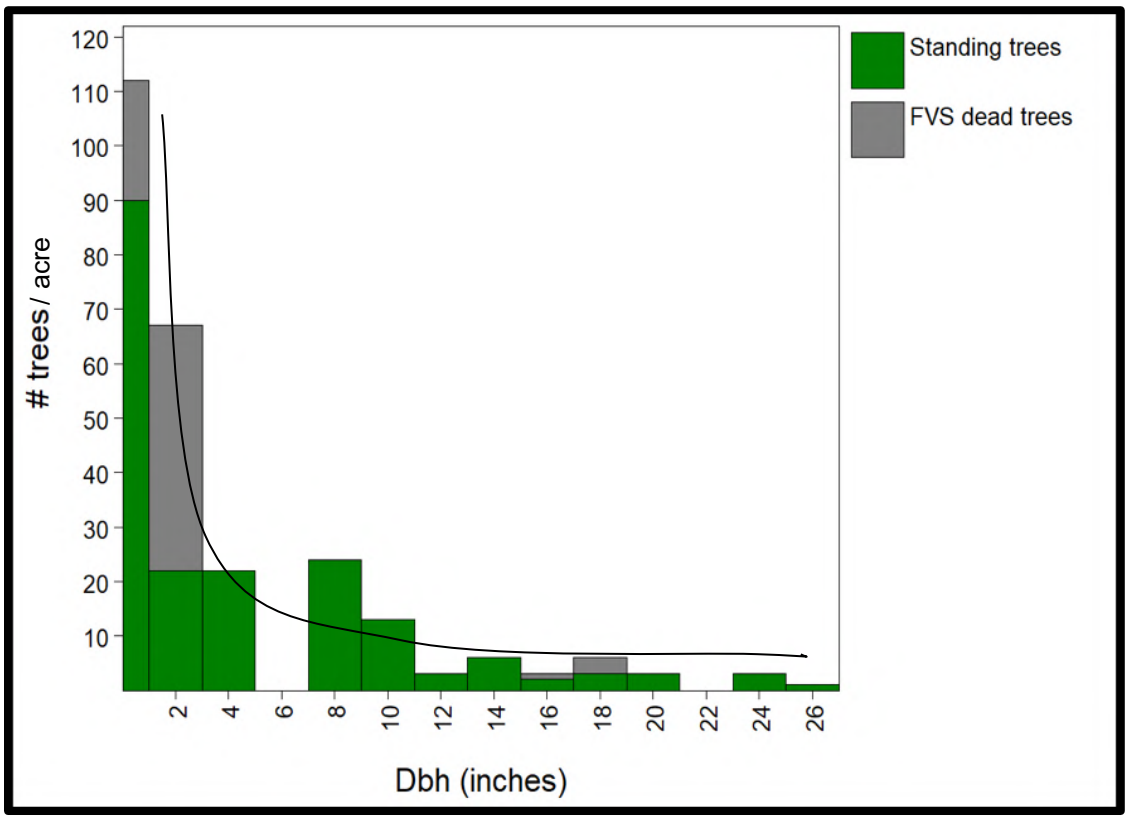


Figure 10: VT1 has areas of uneven-aged aspen, limber pine, ponderosa pine, Douglas-fir, bristlecone pine, and Engelmann spruce.

VT1 has approximately 3,416.2 board feet per acre, and 799.4 merchantable cubic feet per acre. These are low to moderate merchantable values, but not surprising given the low basal area present, and wide residual tree spacing. The highest percentage of volume is from ponderosa pine trees in the 26" diameter class, limber pine in the 14" diameter class, and Douglas-fir in the 20" diameter class. Stand and Stock tables are located in **Section 9.0**.

The estimated average site index for ponderosa pine in VT1 is 40 based on a 100-year scale. Site index on a 100-year scale is a measure of how tall a species of tree can grow on a particular site under ideal conditions in 100 years. This value is determined by measuring the average total height and age of dominant, open grown, species-specific trees within the vegetation type and using a site index curve to determine the site index. A site index of 40 suggests that at 100 years of age a dominant, open grown ponderosa pine within the vegetation type would be expected to be 40 feet tall. **Figure 11** below is a simulated image of how an average acre might look within the vegetation type, although large variations may actually be present on the Park. **Figure 12** shows actual photos of the vegetation type.

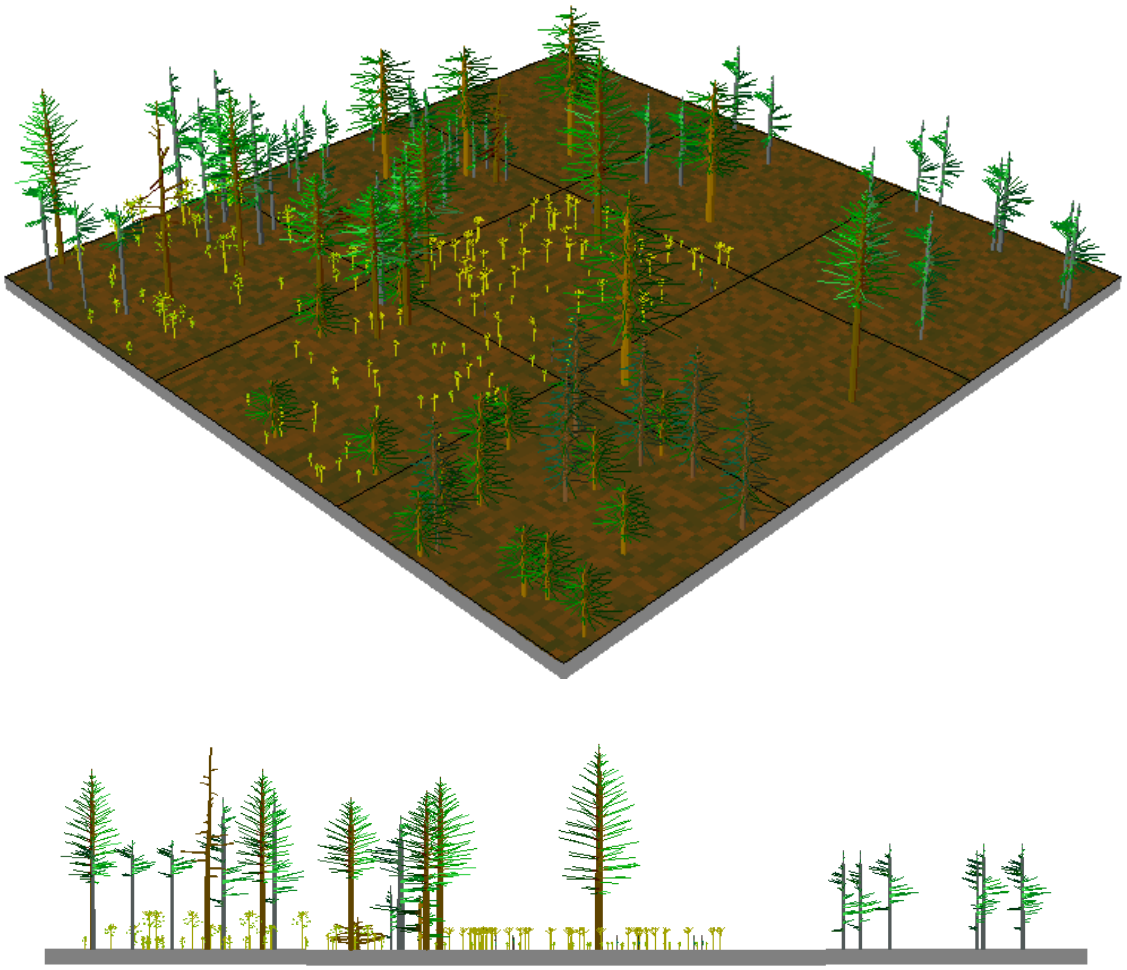


Figure 11: A visual output of an average acre in VT1 on Indian Mountain Park produced by Forest Vegetation Simulator. This simulation shows a low forest density.

Figure 12: VT1 on Indian Mountain Park. Limber pine and ponderosa pine dominates the overstory while aspen is the most prolific small diameter tree species.

The understory of VT1 was composed of grasses, forbs, shrubs, downed woody debris and aspen seedlings/sprouts, along with a lesser amount of ponderosa pine and bristlecone pine seedlings. Typical understory shrub species found include wax currant (*Ribes cereum*), white sagebrush (*Artemisia ludoviciana*), common juniper (*Juniperus communis*), and red osier dogwood (*Cornus sericea*); bunchgrasses were seen and likely include Idaho fescue (*Festuca idahoensis*), western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*Poa pratensis*), and some *Bromus* species.

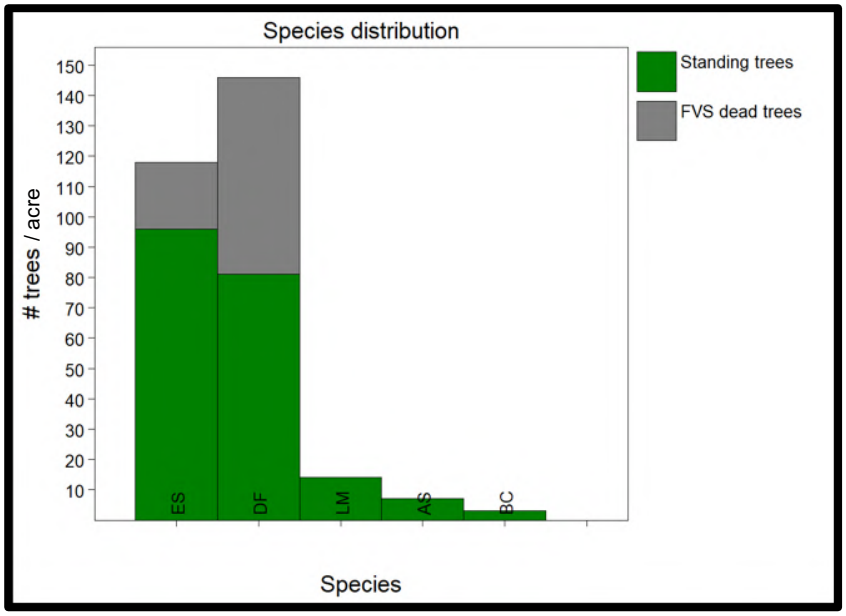
Vegetation Type 2 (VT2): Spruce-Fir Forest (Untreated)

There are 146.5 acres found in the untreated Spruce-Fir vegetation type on Indian Mountain Park. Access to VT2 is through the existing trail and road network. Slopes in the inventoried acres average approximately 37% within VT2, and aspect is typically north-facing. Refer to the **Vegetation Type Map** for locations of VT2 (**Section 6.0**).

VT2 averages 287.7 trees per acre that are 5 inches DBH or greater in size. The average DBH of this vegetation type is estimated at 9.0 inches. Regeneration plots estimate that there are approximately 500.1 trees per acre that are 5 inches DBH or less. Including the regeneration data brings VT2 up to 787.8 trees per acre total and brings down the average tree diameter to 6.2 inches. Tree heights averaged 39.9 feet within VT2.

The basal area per acre of VT2 is 143.3 ft^2. This is an elevated density. Live tree basal area was tallied at 102.3 ft^2 per acre while standing dead trees account for only 41.0 ft^2 per acre of this basal area. Mortality is high and makes up 37.2% of the composition and 28.6% of the basal area.

When looking at trees >5" DBH, VT2 composition is dominated by Douglas-fir (51.8%), and Engelmann spruce (39.8%). Limber pine (5.0%), aspen (2.4%), and bristlecone pine (1.0%) make up the remainder. Including trees <5" DBH shows a similar tree species distribution: Douglas-fir (46.0%), and Engelmann spruce (40.8%) still dominate. Aspen (7.6%), limber pine (4.4%), and bristlecone pine (1.2%) make up the remainder. **Figure 13** shows the species distribution for VT2.



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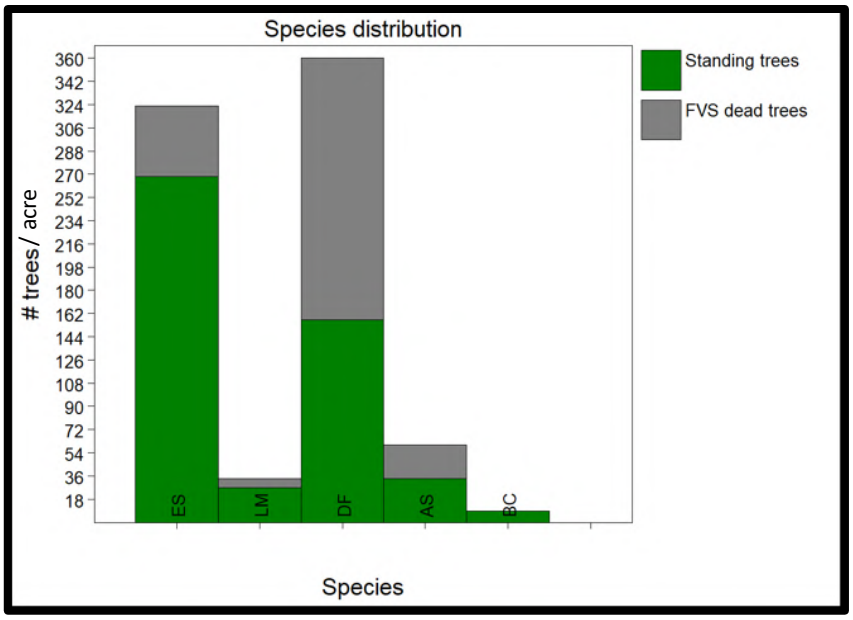

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Figure 13: Species distribution for VT2. A) When trees >5" DBH are examined, Douglas-fir and Engelmann spruce dominate the overall composition. B) When regeneration sized trees (<5") are included, species distribution stays relatively similar.

The diameter class distribution of this vegetation type (**Figure 14**) demonstrates a forest that most likely has even-aged qualities as evidenced by the orange bell-shaped curve below. In theory, even-aged forests form from a large initial disturbance such as fire, harvesting, blowdown, or a widespread insect and disease issue, which allows a new forest to get established in an area. The trees that get started are usually within the same age range (+ or – 15 years), and grow as a single cohort (group). Ultimately this vegetation type could be treated with both even-aged and uneven-aged techniques in order to reach a desired forest structure with lower density and wider residual tree spacing.

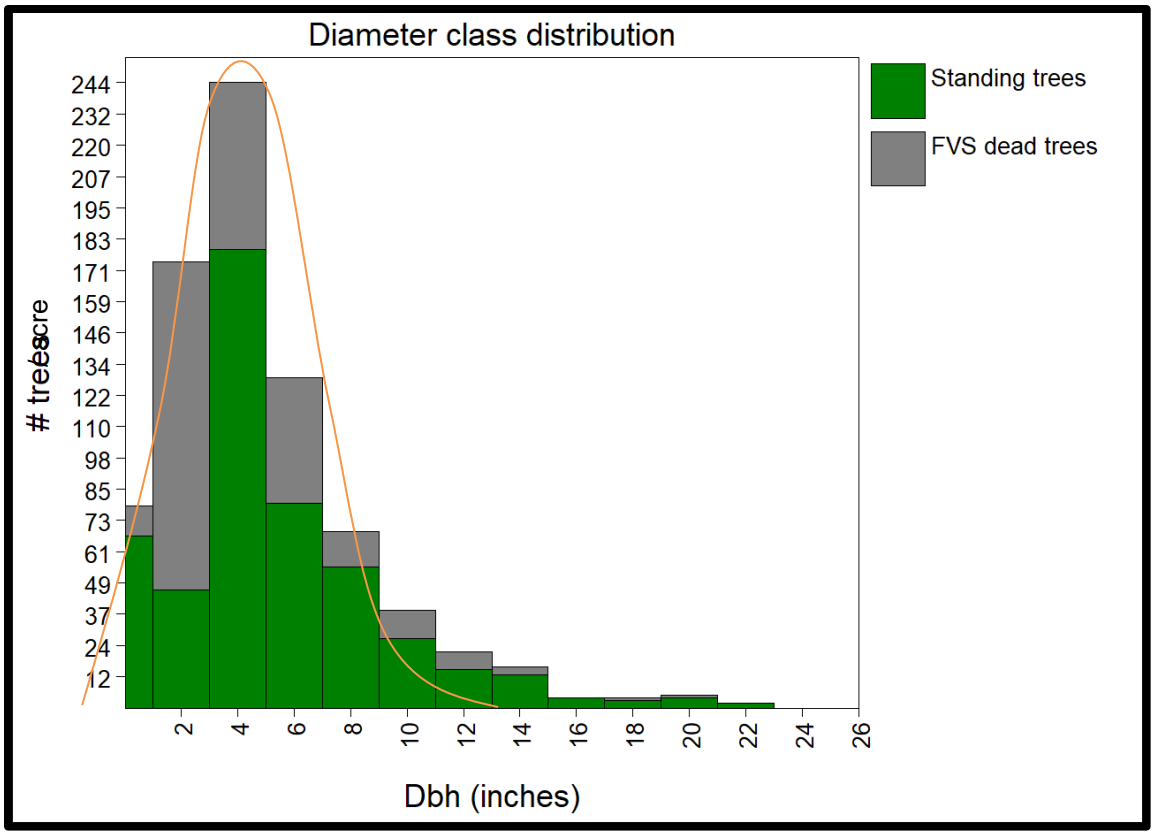

Figure 14: The Spruce-Fir vegetation type shows an even-aged structure.

VT2 has approximately 6,030.2 board feet per acre, and 1,702.6 merchantable cubic feet per acre. These are moderate merchantable values. The highest percentage of volume is from both Douglas-fir and Engelmann spruce trees in the 8”-14” diameter classes. Stand and Stock tables are located in **Section 9.0**.

The estimated average site index for ponderosa pine in VT2 is 37 based on a 100-year scale. A site index of 37 suggests that at 100 years of age a dominant, open grown Engelmann spruce within the vegetation type would be expected to be 37 feet tall. **Figure 15** below is a simulated image of how an average acre might look within the vegetation type, although large variations may actually be present on the Park. **Figure 16** shows the high forest density present in this vegetation type.

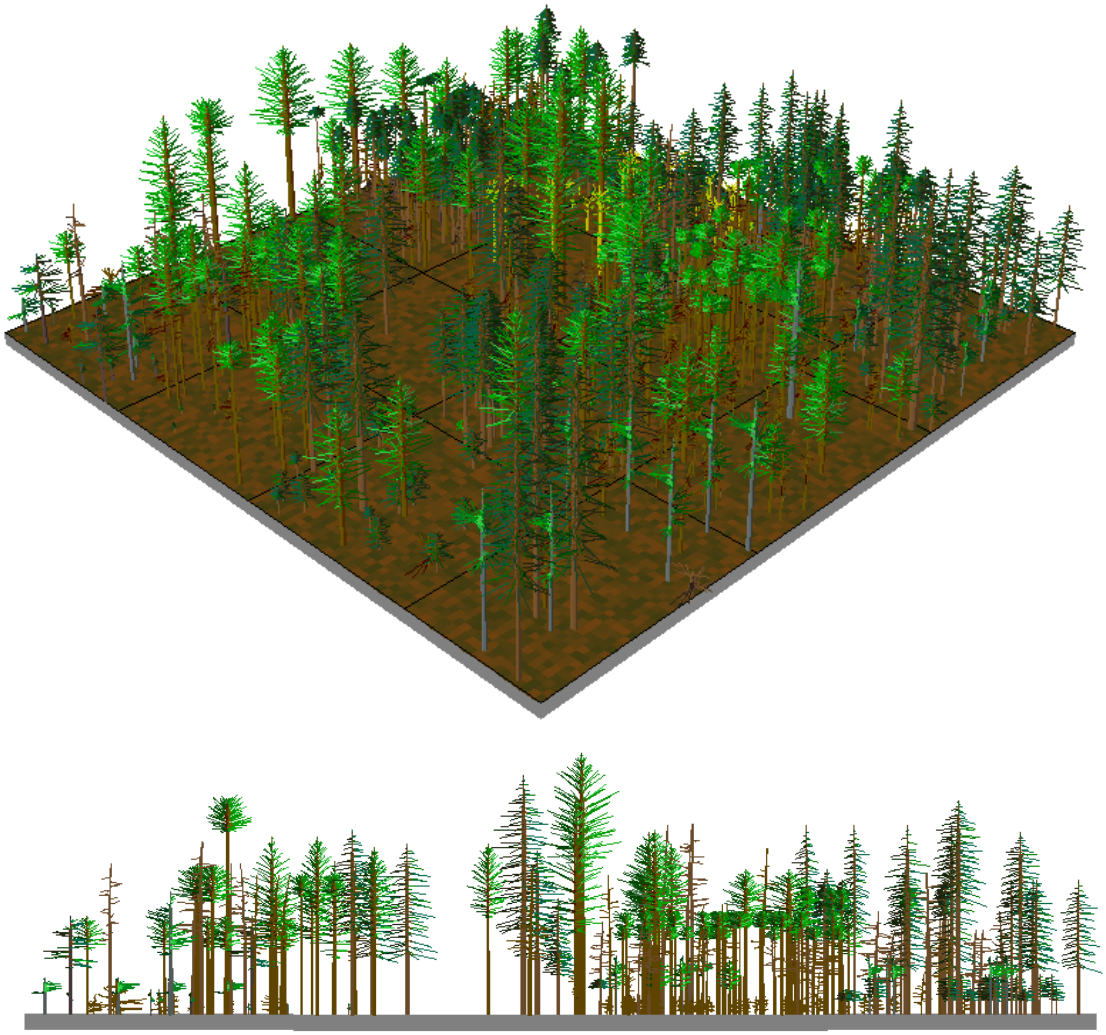

Figure 15: A visual output of an average acre in VT2 on Indian Mountain Park produced by Forest Vegetation Simulator. This simulation shows a high forest density.

Figure 16: VT2 on Indian Mountain Park. Forest density is high. Douglas-fir and Engelmann spruce are the dominant overstory species present in VT2.

The understory of VT2 was composed of a mix of Engelmann spruce and Douglas-fir seedlings, shrubs, forbs and high amounts of downed woody debris. Typical understory shrub species include wax currant, chokecherry (*Prunus virginiana*), and common juniper; and forbs such as wild strawberry (*Fragaria virginiana*), kinnikinnick (*Arctostaphylos uva-ursi*), raspberry (*Rubus idaeus*), and creeping thistle (*Cirsium arvense)*. Grasses were seen but were not prolific due to the amount of shade being provided by the dense overstory in this vegetation type.

Vegetation Type 3 (VT3): Spruce-Fir Forest (Recently Treated)

There are 9.6 acres found in the recently Treated Areas in Indian Mountain Park's northwest corner (**Figure 17**). VT3 was treated in the summer of 2024. Access to VT3 is through the newly created forest access road located on the north edge of the disc golf course. Slopes in the inventoried acres of VT3 average approximately 27%. Refer to the **Vegetation Type Map** for locations of VT3 (**Section 6.0**).

VT3 averages 32.8 trees per acre that are 5 inches DBH or greater in size. The average DBH of this vegetation type is estimated at 12.1 inches. Regeneration plots estimate that there are approximately 109.1 trees per acre that are 5 inches DBH or less. Including the regeneration data brings VT3 up to 141.9 trees per acre total and brings down the average tree diameter to 5.9 inches. Residual tree heights averaged 45.9 feet within VT3.

The basal area per acre of VT3 is 28.3 ft^2. Live tree basal area was tallied at 26.5 ft^2 per acre while standing dead trees account for only 1.8 ft^2 per acre of basal area. Mortality only makes up 0.7% of the composition and 6.4% of the basal area. As compared to the untreated areas of Spruce-Fir forest (VT2), this recently treated area is 80% less dense overall.

Figure 17: VT3 on Indian Mountain Park.

When looking at trees >5" DBH, VT3 composition is dominated by Engelmann spruce (61.9%). Douglas-fir (35.4%) is next, and a small amount of limber pine (2.7%) is also present. Including trees <5" DBH shows a slightly different tree species distribution: Engelmann spruce (52.7%), and small-diameter aspen (38.4%) are the dominant tree species. Douglas-fir (8.7%), and limber pine (0.7%) make up the remainder. **Figure 18** shows the species distribution for VT3.

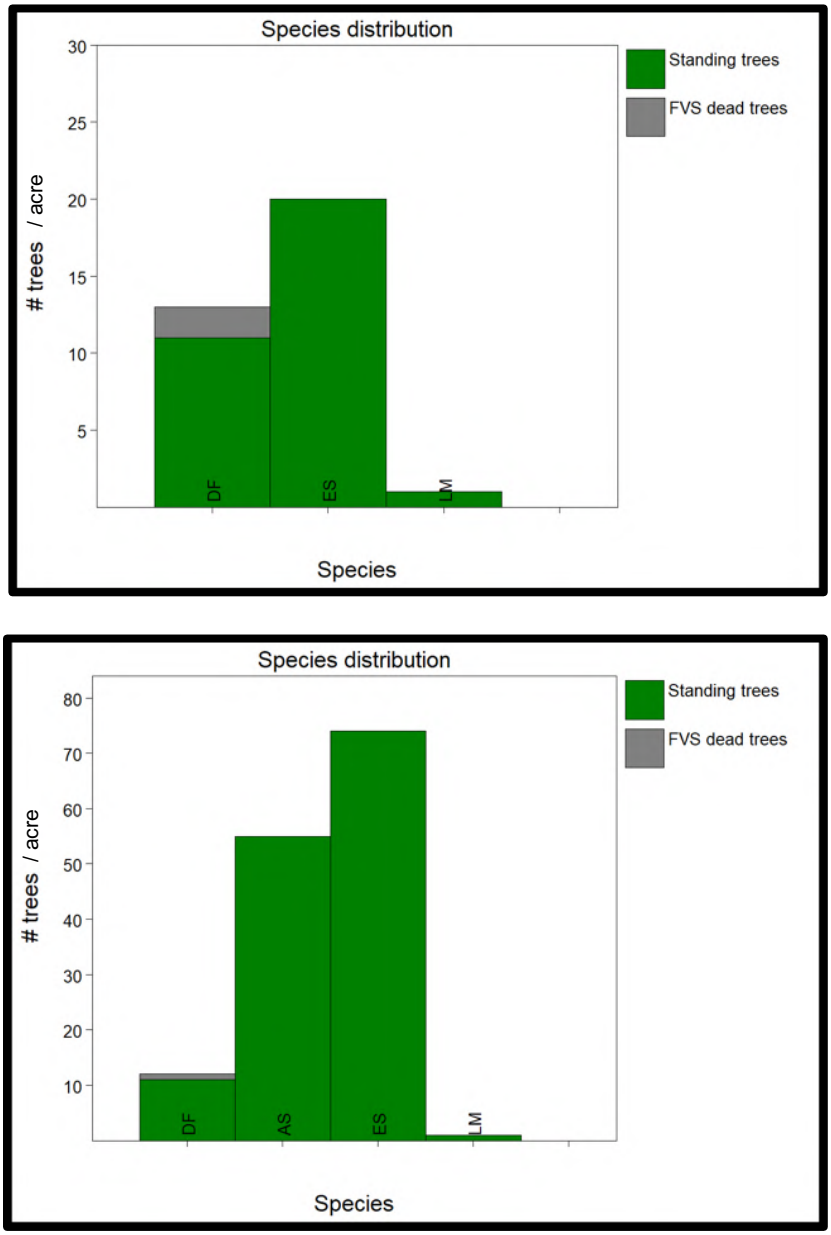

Figure 18: Species distribution for VT3. A) When trees >5" DBH are examined, Engelmann spruce and Douglas-fir dominate the overall composition. B) When regeneration sized trees (<5") are included, Engelmann spruce and small-diameter aspen dominate.

The diameter class distribution (**Figure 19**) of VT3 isn't definitive, but has been dramatically altered due to the recent forest management operations. The high count of trees present in the <2" size class is represented by aspen sprouts, and Engelmann spruce seedings.

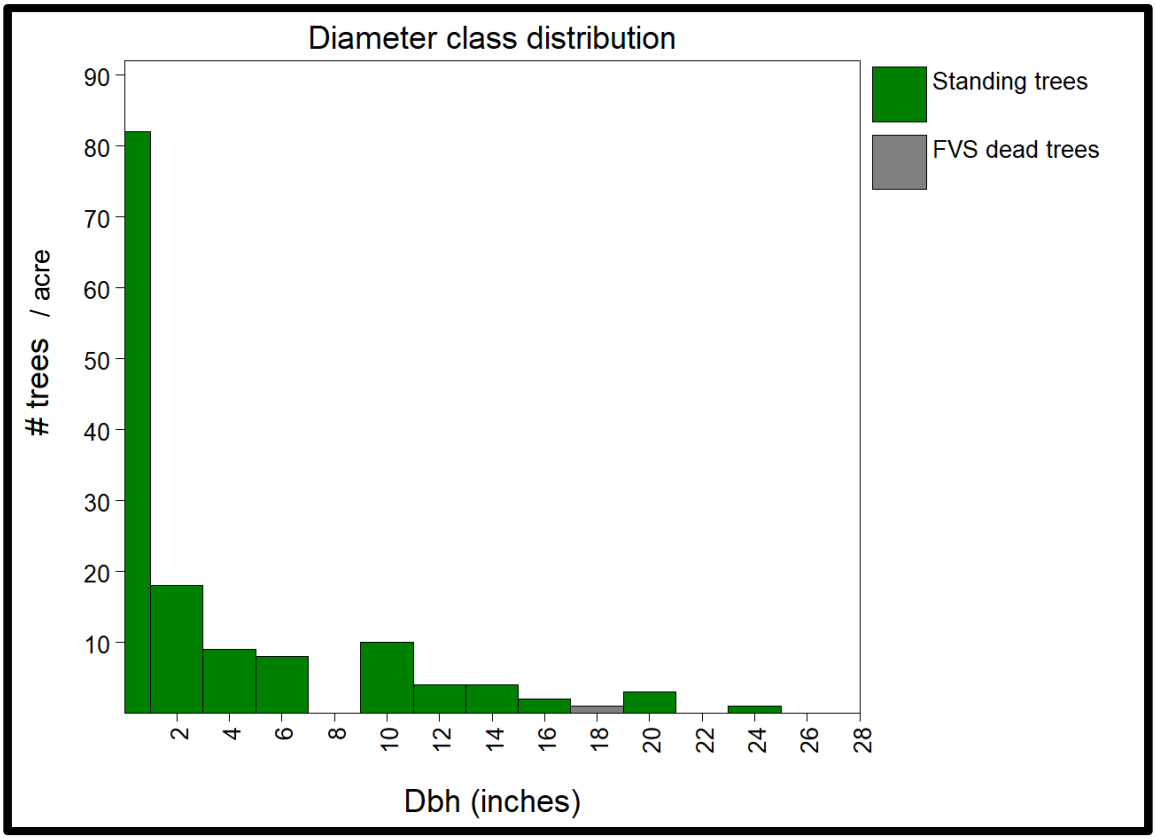

Figure 19: A) The Previously Treated areas have a larger amount of stems present in the <1" diameter class which is comprised of aspen sprouts, and Engelmann spruce seedlings.

Figure 20 below is a simulated image of how an average acre might look within the treated areas, although variations may actually be present on the Park.

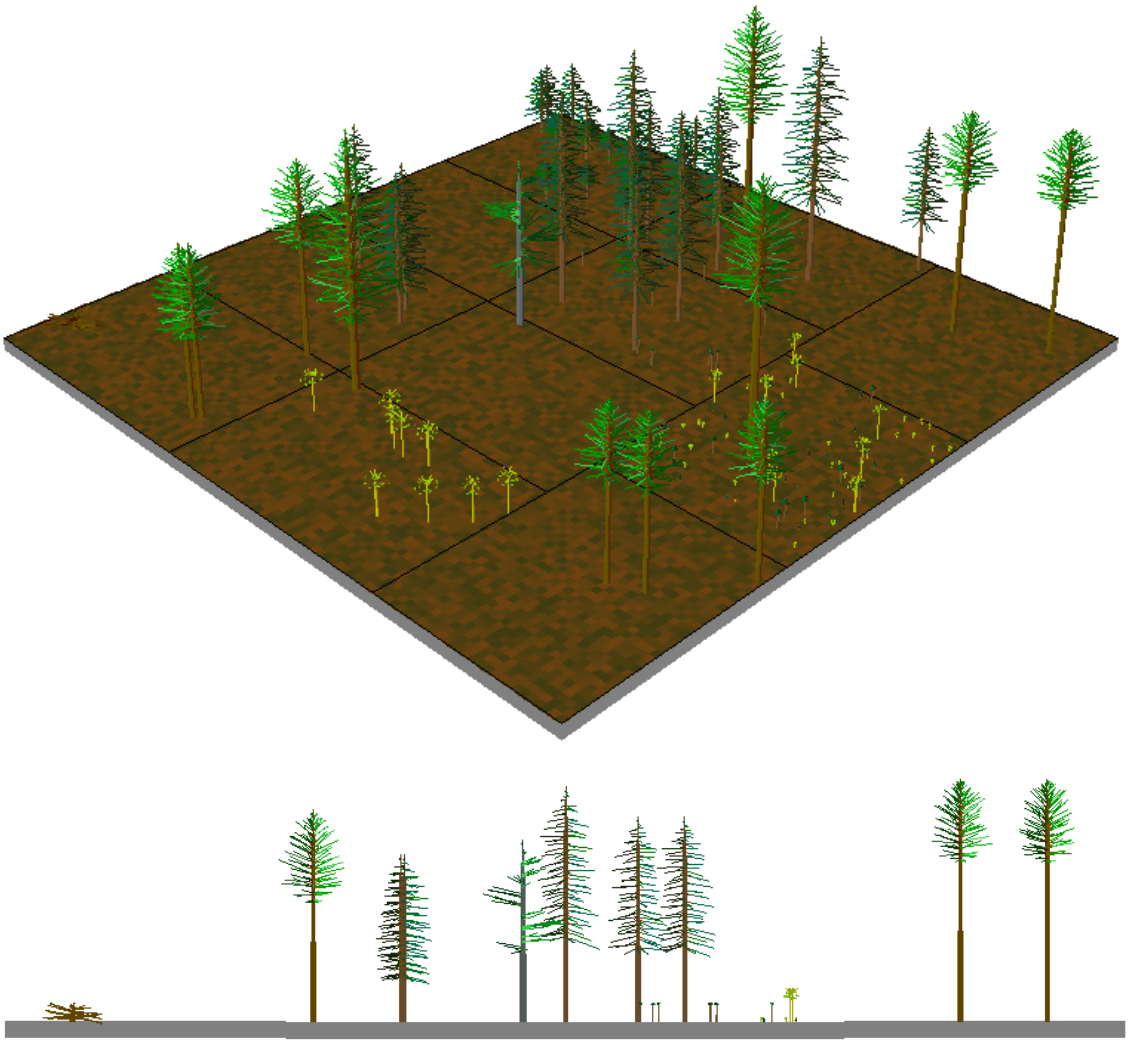

Figure 20: A visual output of an average acre in VT3 on Indian Mountain Park produced by Forest Vegetation Simulator.

The understory of VT3 was composed of masticated slash, limited common juniper, and sparse grasses. Aspen sprouts and more grasses should proliferate in these recently treated areas in the next few years in areas where slash isn't too deep on the forest floor.

Vegetation Type 4 (VT4): Aspen & Grasslands

VT4 is found on approximately 31.2 acres of the Park encompassing the disc golf course, Park structures, picnic area, and playground (**Figure 21**). Aspen is the dominant tree species in VT4, but Douglas-fir and Engelmann spruce are also present. Higher water availability and deeper soils in VT4 support such grass species including Idaho fescue, western wheatgrass, Kentucky bluegrass, blue grama (*Boutelous gracilis*), mountain muhly (*Muhlenbergia montana*), Arizona fescue (*Festuca arizonica*) needleandthread (*Stipa comata*) and various *Bromus* species.

VT4 is a recreation area and no formal forest management operations are being recommended outside of defensible space around structures, and hazard tree removal where needed to protect public safety. Access and operability are good for most of this vegetation type. The main resource concern outside of defensible space, and hazard trees in this vegetation type is noxious weeds. Care needs to be taken whenever equipment needs to pass through this VT in order to stop the spread or introduction of noxious weeds. Refer to the **Vegetation Type Map** for the location of VT4 (**Section 6.0**).

Figure 21: VT4 covers approximately 31.2 acres at Indian Mountain Park.

3.2 Insects and Diseases

The most prolific vector affecting trees within Indian Mountain Park is Western Spruce Budworm (*Choristoneura freeman*). Some minor occurrences of mountain pine beetle (*Dendroctonus ponderosae*) were noted on the southwest end of the Park during the annual USFS/CSFS aerial survey in 2017 (see **Insect and Disease Map** in **Section 6.0**), but were not seen during the 2024 inventory. Numerous other tree insects and diseases (I&D) are common in Spruce-Fir, Mixed Conifer, and aspen forests and are discussed below.

Western Spruce Budworm (WSBW)

Western spruce budworm (WSBW) is an insect known to defoliate Douglas-fir and Engelmann spruce trees, and is affecting both significantly within the Park. WSBW was observed across the Spruce-Fir forest type in the Park during the 2024 forest inventory; 80% of forest inventory plots in the Spruce-Fir forest type contained trees currently affected by WSBW.

WSBW can be identified by dieback in a tree's terminal branches, heavy concentrations of small moths (late-June through early-August) and caterpillars (mid-May through mid-July) on the trees (**Figure 22**).

A

B

C

D 

Figure 22: A) Western spruce budworm commonly feeds on the new growth of fir/spruce trees. B) WSBW moth and C) caterpillar (*Photos A, B & C not from Park – Photos B-C courtesy of CSFS*). D) Dieback in the forest canopy due to WSBW.

WSBW feeds on the new growth of trees and can be particularly harmful to young understory trees. Multi-storied forests, where regeneration of these tree species is abundant in the understory, are especially favorable for western spruce budworm outbreaks due to the ability of larvae to rappel out of large trees—a behavior known as "ballooning"—to land on younger trees below and continue feeding. The Spruce-Fir forests present on Indian Mountain Park are multi-storied and contain a significant amount of Douglas-fir and spruce in the understory.

Larger trees may be killed if persistent (3-5 years consecutively) defoliation occurs and that is what has occurred on Indian Mountain Park. In theory, WSBW outbreaks tend to run in 10 year intervals (K. Worley, personal communication, Dec 2024). Additionally, larger infested trees become weakened and more susceptible to other tree insects and diseases like Douglas-fir beetle, Douglas-fir pole beetle, Douglas-fir engraver beetle, and spruce beetle.

Control of WSBW can be expensive and complex since aerial spraying of the biological insecticide Bt (*Bacillus thuringiensis*) is a common option for treating WSBW affected trees, and has to be timed correctly to be useful. Bt is commonly sold under the trade name "Foray." It should also be noted that Bt is not host specific and will kill other *Lepidoptera* species when used as a treatment. Bt has to be sprayed at the correct time of the year over 3-4 consecutive years to be effective. Also, spraying on windy days is not advised due to drift onto neighboring properties. As mentioned in the updated CWPP for the Indian Mountain Subdivision in regards to timing:

With insecticide treatments, timing is everything. The products require direct contact with the caterpillars, so the time to spray is just after the bud caps come off the tree tips and the new tips and needles begin to expand. Depending on elevation and aspect, this generally occurs in Colorado during the first half of May, and the opportune time to spray lasts about two weeks. If you miss this window, you are wasting your time and money and mostly killing non-target insects.

Other effective preventative measures include thinning to increase remaining tree vigor, as well as removing younger potential host trees growing under (ladder fuels) or directly adjacent to the canopy of older trees, as well as promoting a mixed species forest (CSFS 2016). In regards to thinning treatments, and as mentioned in the updated CWPP:

A less-hospitable environment for WSBW is an open forest structue, where tree crowns do not touch and the height of the tree canopy is fairly uniform. The less Douglas-fir understory available between the ground and the top of the tallest trees, the more likely the budworm larvae will drop all the way to the ground and have a more arduous journey back up into the trees.

This preference for dense, unbroken forest presents an opportunity to control populations of western spruce budworm by thinning forests and removing some of the trees. A good rule of thumb for ideal tree spacing is to multiply tree diameter in inches by 1.5 to determine the desired number of feet between tree trunks. (Thus a 12-inch diameter tree should be at least 18 feet away from the trunk of the nearest tree.)

In summary, thinning treatments to reduce ladder fuels and increase residual tree spacing will provide an inhospitable environment for WSBW to continue feeding. Targeted biological insecticide treatments should be also be considered as part of a broader WSBW strategy; however, differing opinions exist on the efficacy of spraying a biological insecticide like Bt broadscale to treat WSBW and further consultation with forest entomologists should be sought to make a decision on use of Bt or similar to give Indian Mountain Park's spruce-fir forests the best chance at recovery from the ongoing WSBW outbreak.

Douglas-fir Beetle (DFB) & Douglas-fir Pole Beetle (DFPB)

The Douglas-fir beetle (DFB) (*Dendroctonus pseudotsugae*) typically attacks larger Douglas-fir trees (**Figure 23**). Yearly monitoring will allow for prompt action should DFB attacked trees be found on the Park in the future. Trees typically attacked are >14" DBH and older than 120 years. Douglas-fir trees also targeted include those growing in dense forests and weakened by drought, root disease or defoliation from insects like the previously mentioned WSBW. Only one tree with a likely DFB infestation was observed during the 2024 forest inventory.

Trees near recently infested trees or recently downed trees are also more susceptible. It is common for Douglas-fir beetles to attack trees injured by fire or defoliated by other insect infestations. The Douglas-fir beetle does not generally cause widespread mortality like the mountain pine beetle. Depending on weather and elevation, attacks occur from late April through August, with peak flights occurring from early June to early July. Treatment for DFB is similar to that of mountain pine beetle (**See DIGITAL Insect and Disease Appendix Section 10.0**).

Figure 23: A Douglas-fir that has its needles turn red all at once is a sign of possible Douglas-fir beetle attack. B) Sap streaming down the trunk of a Douglas-fir tree also indicates woodpeckers or sapsuckers have been trying to find and eat beetles present in the tree (*Photos not from Park*).

Douglas-fir beetle also may be associated with attacks by Douglas-fir pole beetle and Douglas-fir engraver beetle. However, the Douglas fir pole beetle and engraver beetle often attacks smaller-diameter (less than 6 inches DBH) Douglas-fir trees or the tops of trees (CSFS 2017). No evidence of Douglas-fir pole beetle or engraver beetle was seen during the 2024 forest inventory.

Spruce Beetle (SB)

The spruce beetle is one of the most detrimental insects that affects Spruce-Fir forests in Colorado (**Figure 24**). Typically, the spruce beetle is around in endemic levels attacking isolated pockets of downed or extremely weakened trees. Large outbreaks have been known to occur when blowdowns or windthrow covers a large area. No spruce beetle infested trees were seen during the 2024 forest inventory.

Spruce beetles will attack fallen trees and begin a buildup of population. Once the food source is gone, this large progeny will attack live trees and is very hard to control. The beetles have an average of a 2-year life cycle depending on elevation and temperature. In cooler areas, the life cycle may take up to three years, while in warmer areas only one year is needed. Beetles emerge in May to July and attack trees from Late May through early August. Eggs are laid and they hatch by the end of August. Larvae feed in the tree and pupate after one year. After the first year, most beetles emerge and will over-winter near the base of the tree. This location keeps them warm and safe since it is typically below snow levels and protected by freezing temperatures and from bird predation. Extreme cold of -15 degrees can kill adults, while -30 degrees can kill larvae. These temperatures need to be consistent for a few days in succession for this to occur.

Typically, there are no pitch tubes found making identification difficult. Red boring dust and frass clogged entrances are often seen. Mixed species forests with a basal area less than 150 ft^2 per acre have a better chance of avoiding outbreaks. Forests can be managed by maintaining open mixed structures. No spruce beetle activity was seen on the property during the 2024 forest inventory, but it may be present or arise in the future.

Figure 24: Spruce beetle outbreak in southern Colorado (*Photo credit CSFS and not from Park*).

Mountain Pine Beetle (MPB)

A small occurrence of MPB was detected during the 2017 aerial insect/disease survey in the Park's southwest corner. Monitoring for future outbreaks should be a priority given the number of ponderosa pine present on the Park. Yearly monitoring in late spring/early summer for MPB infected trees is recommended in order to identify and curb further infestations. Depending on weather and elevation, attacks occur from mid-June through September, with peak flights occurring in mid-August for ponderosa pine.

Successfully attacked trees typically turn red all at once in May/June and may also show pitch tubes (**Figure 25**). Successfully attacked trees should be felled and immediately debarked, chipped, or removed from the Park if possible to decrease outbreaks. Other treatment methods can be found in **Section 10.0**.

A **B**

Figure 25: (A) Pine trees with red/brown needles from top to bottom are an indication of a probable MPB infestation. (B) The presence of pitch tubes common to mountain pine beetle infestations provides confirmation of an attack (*Photos not from Park*).

Ips Beetle (IPS) – [aka Pine Engraver Beetle]

The presence of recently cut trees, blown down trees, trees with recent ice damage, and other tree disturbances have all been determined to attract flying adult pine engraver beetles (*Ips pini*) to an area (USFS 2011). Logging slash created between December and June can be a major attractant to *Ips* beetles therefore cutting/slash creation should be timed in order to avoid beetle flying times (see **Section 10.0**).

Additionally, contractors at the Park should avoid stacking recently cut wood against the trunks of healthy coniferous trees to avoid *Ips* infestations that move from cut wood up into adjacent healthy trees (**Figure 26**). Such green woody material should be chipped or treated so that the inner bark area is destroyed. *Ips* larvae will not survive standard chipping or debarking treatments (CSFS 2002), but chips piled high around residual trees can attract new beetles to the area. Larger chunks of slash created from mastication operations also could pose as an *Ips* attractant if the inner bark area is not destroyed.

Figure 26: Avoid stacking fresh cut firewood against the bark of healthy pine trees. *Ips* beetle infestations can readily move from recently cut firewood up into a healthy adjacent tree (*Photo not from Park*).

Aspen Diseases & Insects of Concern

Aspen forests in Colorado also have an assortment of insects and diseases that disturb them (**Figure 27**). Affecting aspen leaves are two fungal infections (ink spot disease and Marssonina blight) and three insects (aphids, aspen leaf miners and sawflies). Affecting the branches are three common insects: western tent caterpillar, oystershell scale and poplar twiggall fly. Disorders of the trunk include the fungal diseases *Cytospora* canker, black canker, sooty bark canker, and *Phellinus* trunk rot. Insects affecting aspen trunks include the epidermal bark-mining fly, bronze poplar borer and poplar borer. Since it is fairly normal for aspen forests in Colorado to exhibit insect infestation and fungal diseases, no action needs to be taken on a wide scale basis. Black canker and *Cytospora* were seen during the 2024 forest inventory, but were not widespread.

A B

Figure 27: (A) Aspen trees are susceptible to fungal diseases like black canker. (B) The presence of orange or brown liquid streaming down aspen bark is common to Cytospora canker fungus (Photo B not from Park).

3.3 Wildfire Hazards and Structures

The horizontal and vertical density, arrangement, and continuity of fuels are responsible for the wildfire risk seen throughout the Park. Horizontal fuels refer to the density and continuous nature of fuels across the horizontal plane and can exist both on the ground and within the canopy. Continuous horizontal fuels on the ground facilitate the spread of surface fires, while continuous horizontal fuels in the canopy facilitate the spread of dangerous crown fires.

Vertical fuels are made up of three different types of fuels, each found at a specific height above the ground. Ground fuels are found beneath the surface and include partially decomposed organic matter (duff), roots, and buried logs. Surface fuels are found immediately above the surface and include grasses, small shrubs, and forest litter. Aerial fuels are elevated above the ground and include large shrubs and all live and dead vegetation in the forest canopy. The arrangement of vertical fuels refers to how much fuel is in each of these three types of vertical fuels and the continuity between them. Ladder fuels are referred to as any fuel that helps carry fire vertically from ground surface into the forest canopy, such as large shrubs or intermediate sized trees.

Reduction in the density and/or re-arrangement of horizontal and vertical fuels would help decrease the risk of catastrophic wildfire at Indian Mountain Park. An effective method of mitigation is to disrupt the continuity of vertical fuels by removing ladder fuels, which helps decrease the risk of surface fires developing into dangerous and unpredictable crown fires. Breaking up crown continuity through thinning or creating openings will help create a mosaic forest structure. These mosaic structures allow fires to revert to ground fires and also cause uneven flame fronts, which can promote fires to burn out on themselves, or at the very least alter their severity.

At the time of the writing of this Forest Management Plan, the **Jefferson-Como Fire Protection District** responds directly to fires on the Park. **It should be noted that fire protection district boundaries can and do change and the Park should confirm their local fire protection district on a regular basis to verify who responds to fires on the property and to confirm the nearest fire station location*.

Jefferson-Como Fire Protection District

20200 County Road 15, Como, CO 80432
Nearest Station: (#7) 511 Apache Trail, Jefferson, CO 80456
Administration: 719-836-2082 (Non-emergency) --- Emergencies: 911
http://www.jcfpd.org

Structures

Defensible space around all existing Park structures should be monitored and maintained annually. Defensible space is an area around a structure where fuels and vegetation are treated, cleared or reduced to slow the spread of wildfire towards the structure (**Figure 28**). Creating defensible space also reduces the chance of a structure fire spreading to the surrounding forest or other structures (CSFS 2021). Defensible space creation/ maintenance should follow the guidelines as outlined in the Colorado State Forest Service's '*The Home Ignition Zone'* guide in **Section 11.0**.

Figure 28: Defensible space around the Park's existing structures should be monitored and maintained annually.

Colorado Forest Atlas

The Colorado Forest Atlas - Risk Reduction Planner is a location where a Wildfire Risk Assessment Report can be created for a specific area. A wildfire risk summary report was created for Indian Mountain Park and can be found on the accompanying digital drive included with this plan. Two essential portions of this report are the **Predicted Rate of Spread (Table 2 & Figure 29)** and the **Fire Intensity Scale (Table 3 & Figure 30)** and they are described below.

The Risk Reduction Planner's (RRP) own words and descriptions from the COATLAS Website and Report:

This tool allows users of the Risk Reduction Planner application of the Colorado Forest Atlas web portal to define a specific project area and generate information for this area. A detailed risk summary report can be generated using a set of predefined map products developed by the Colorado Wildfire Risk Assessment (WRA) project which have been summarized explicitly for the user defined project area.

The Colorado WRA provides a consistent, comparable set of scientific results to be used as a foundation for wildfire mitigation and prevention planning in Colorado. Results of the assessment can be used to help prioritize areas in the state where mitigation treatments,

community interaction and education, or tactical analyses might be necessary to reduce risk from wildfires.

Rate of Spread is the typical or representative rate of spread of a potential fire based on a weighted average of four percentile weather categories. Rate of spread is the speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour (ch/hr) or feet per minute (ft/min). For purposes of the Colorado WRA, this measurement represents the maximum rate of spread of the fire front. Rate of Spread is used in the calculation of Wildfire Threat in the Colorado WRA.

Rate of spread is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in Colorado. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform. There are 11 weather influence zones in Colorado.

This output represents the weighted average for all four weather percentiles.

Table 2: Rate of Spread for the Park in chains per hour (1 chain = 66 feet). The Park had over 91% of its total acres register as "High, and Very High Rate of Spread" rating.

Rate of Spread	Acres	Percent
Very Low (0 - 2 ch/hr)	1	0.5 %
Low (2 - 4 ch/hr)	4	1.4 %
Moderate (4 - 12 ch/hr)	17	6.5 %
High (12 - 40 ch/hr)	113	42.5 %
Very High (40 - 60 ch/hr)	77	28.9 %
Extreme (60+ ch/hr)	53	20.2 %
Total	**265**	**100.0 %**

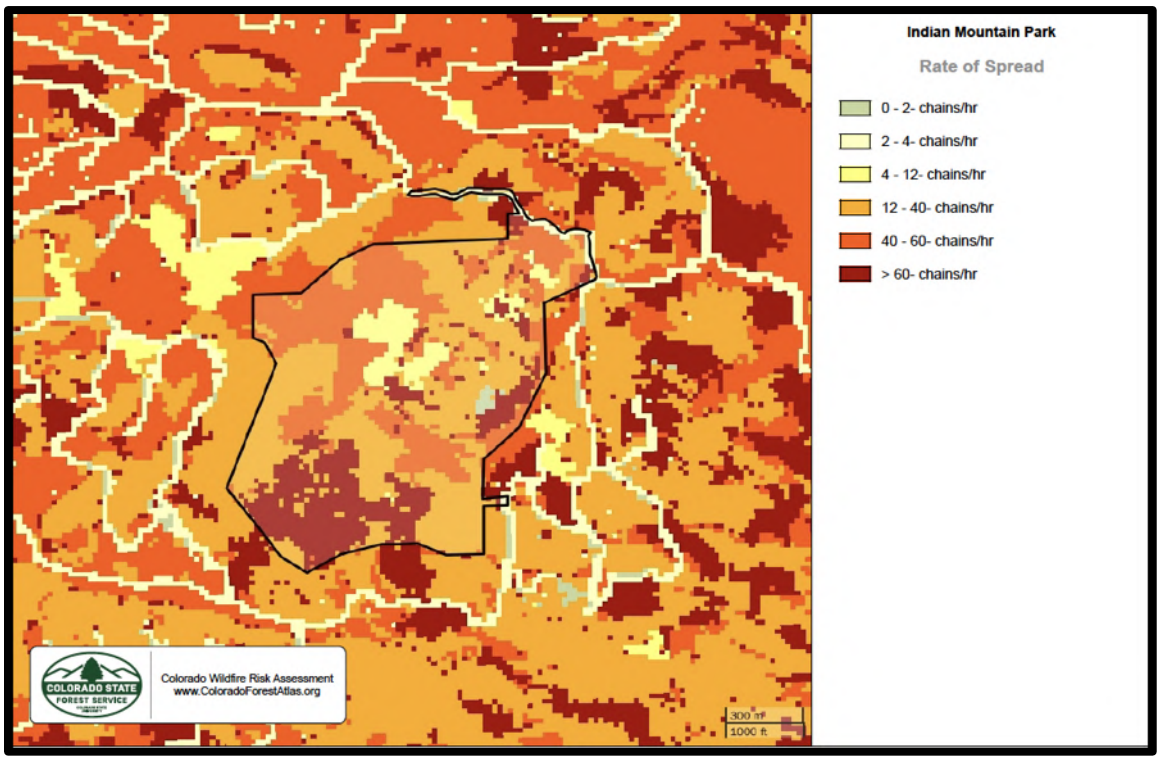

Figure 29: A Characteristic Rate of Wildfire Spread Map generated for Indian Mountain Park using the RPP. This map shows fire behavior potential in the form of "High", "Very High", and "Extreme" fire spread predicted during a wildfire event.

Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist. Similar to the Richter scale for earthquakes, FIS provides a standard scale to measure potential wildfire intensity. FIS consist of five (5) classes where the order of magnitude between classes is ten-fold. The minimum class, Class 1, represents very low wildfire intensities and the maximum class, Class 5, represents very high wildfire intensities.

Class 1, Lowest Intensity: Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.

Class 2, Low: Small flames, usually less than two feet long; small amount of very short-range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.

Class 3, Moderate: Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increased potential for harm or damage to life and property expected.

Class 4, High: Large Flames up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property expected.

Class 5, Highest Intensity: Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack is marginally effective at the head of the fire. Great potential for harm or damage to life and property expected.

Fire intensity scale is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in Colorado. The FIS represents the weighted average for all four weather percentiles.

Table 2: Fire Intensity Scale for Indian Mountain Park. The Park had over 77% (205 acres) classify as High wildfire Intensity.

FIS Class	Acres	Percent
1 (Lowest Intensity)	0	0.0%
2 (Low)	1	0.5%
3 (Moderate)	59	22.0%
4 (High)	205	77.5%
Total	**265**	**100.0%**

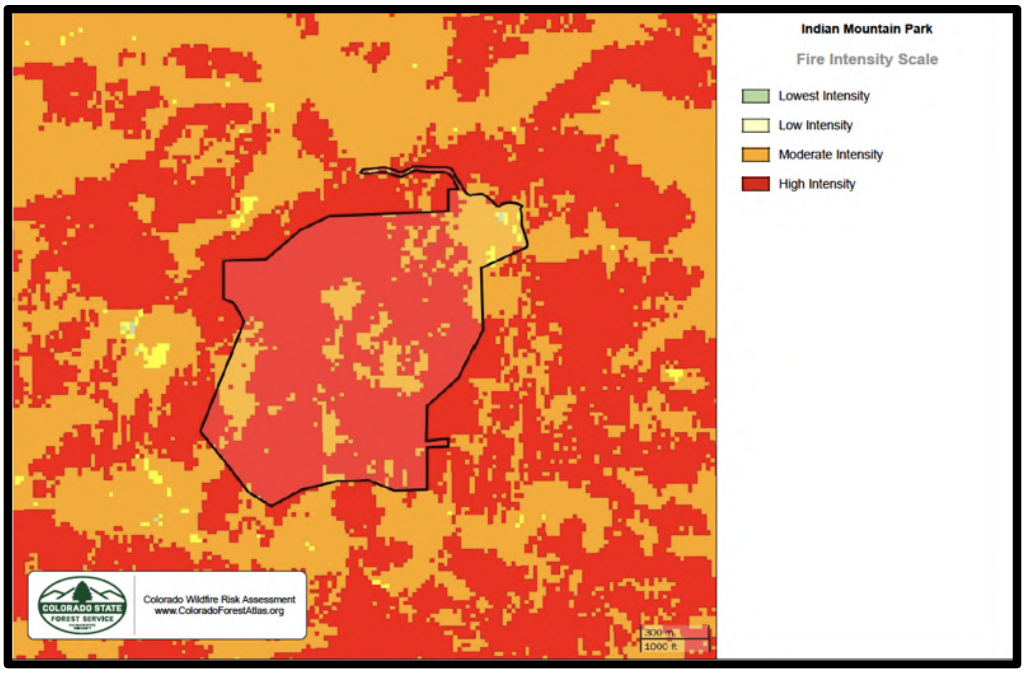

Figure 30: A Fire Intensity Scale Map generated for the Indian Mountain Park using the RRP. This map shows fire behavior potential in the form of High fire Intensity over 77% predicted during a fire event.

The Rate of Spread and the Fire Intensity Scale reinforce the fact that the Park needs to see active forest management activities to help decrease the possible intensity of future wildfires. Given that over 77% of the property is classified as "High" fire intensity, significant consideration of the wildfire potential and effects needs to be made. Numerous recent wildfires starts have occurred around the Park in the last decade (**see Figure 31 below**), which adds to the importance of wildfire hazard reduction. The Park dodged harm from these previous wildfires, but may not be so lucky with future wildfires.

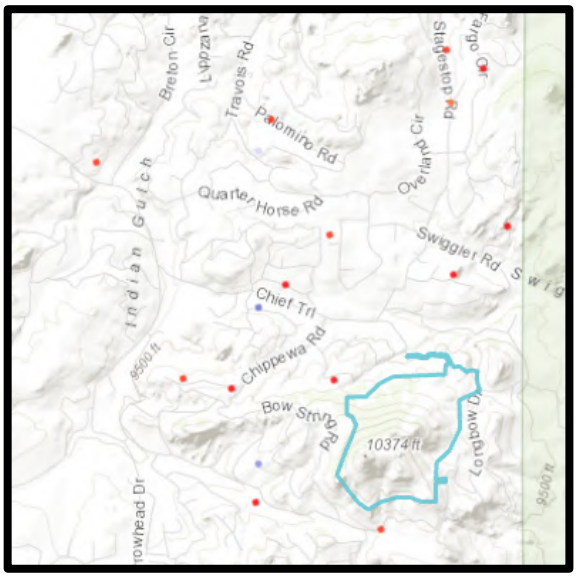

Figure 31: Each dot represents the location of a fire start (Data care of COATLAS - RRP).

Given the current fuel loading and forest density across untreated areas on the Park, a future wildfire remains a continued threat and the consequences could be detrimental to the forested landscape on the property. Additionally, the possibility of a fire start from a neighboring property – as a result of outdoor grilling, campfires or in the event of a house fire – presents a significant possibility of a fire moving from these areas onto Indian Mountain Park.

The effects of a potential fire on the Park could be significant. In the event of a fire during a period of drought, high winds and low humidity (common in summer and autumn), a fast-moving surface and/or crown fire could be experienced especially if the fire were to start below the Park). Such an event would possibly result in adverse effects to the Park's forest resources, wildlife habitat, aesthetics, and the value of the property.

Conducting forest management activities (thinning) that reduce basal area (density) and increase residual tree spacing will be the best use of the Park's time and effort in reducing the wildfire hazard on this property. Thinning on the Park should also lessen the fire danger to some degree (and the impacts from WSBW) through the reduction of ladder fuels. A continuation of these activities over the next decade will extend these benefits across the Park (see **Section 4.0 for Management Prescriptions**).

3.4 Other Treatment Concerns

Noxious Weeds

One of the concerns with completing mechanical forestry treatments is spreading noxious weeds. When mechanical forestry treatments are undertaken, every precaution must also be taken to avoid bringing noxious weeds onto the Park from other locations. One example of mitigating the risk of bringing noxious weeds onto the Park would be to require contractors to clean their equipment before arriving on the Park, and having that equipment inspected by Park staff or a contract manager (this is standard in forest management contracts that occur on Colorado State Parks).

Canada thistle, musk thistle, scotch thistle, poison hemlock, yellow toadflax, common burdock, common mullein, diffuse knapweed, spotted knapweed, leafy spurge, field bindweed, pennycress, white and yellow sweet clover, St. John's wort, kochia, crested wheatgrass, bouncing-bet, and cheatgrass are common noxious weeds seen in Park County and should be continually monitored and treated if necessary (CPW 2015) (**Figure 32**). Many of these noxious weeds are found in meadows, along roads and in other locations where soil has been disturbed.

Figure 32: Thistle seen during the 2024 forest inventory.

Wildlife

Wildlife species expected to be resident or transient on the property during all or parts of the year include elk, white-tail deer, pronghorn antelope, porcupine, raccoons, cottontail rabbits, badgers, rock squirrels, chipmunks, various small rodents, pocket gophers, mice, butterflies, songbirds, prairie falcon, Cooper's Hawk, Swainson's hawk, red-tailed hawk, great horned owl, coyote, red fox, gray fox, bobcat, mountain lion, moose, and black bear (**Figure 33**). During the forest inventory in 2024, many signs of wildlife were seen including two subadult black bears.

Figure 33: Wildlife signage at Indian Mountain Park.

The forest inventory data was analyzed for elk hiding cover using the previously mentioned USFS FVS software. Elk hiding cover is determined by the ability of a stand of trees to hide an elk at a distance of 200 feet and is measured in percent of elk covered. This information can also be loosely translated to represent hiding cover for other ungulates. Elk hiding cover for the different inventoried forest vegetation types was rated by FVS as follows: Mixed Conifer (Untreated) – 92.6%, Spruce-Fir (Untreated) – 86.1%, and Spruce-Fir (Recently Treated Areas) – 29.4%, (see **Section 9.0** for **Elk Hiding Cover Data**).

The extremely low rating in the recently treated areas is no surprise given how much forest density was reduced there. The higher rating present in the untreated areas is due to the significant amount of vertical fuels and higher tree densities. Ratings are calculated by looking at both the tree stem density of the overstory and density of ladder

fuels/branches in the understory. A rating level of 95 or higher is considered great cover, while anything higher than 90 is good.

It is worth noting there is a downside to having “good” elk hiding cover. Typically, high elk hiding cover percentages are mainly due to high tree densities/ladder fuels, which have a greater risk of burning as catastrophic wildfires due to those high tree densities. If done properly, wildfire mitigation projects can lower overall tree density, while maintaining pockets of high-density trees for wildlife cover. These types of projects can create a forest that is able to withstand and recover from a wildfire without compromising the wildlife that call the Park home.

Maintenance of wildlife snags provides habitat for raptors and other tree bound animals (**Figure 34**). Live trees with broken tops, dead tops, or mechanical damage are likely candidates to become wildlife trees. Criteria for selecting wildlife snags are as follows:

- Trees already with signs of woodpecker or raptors (nests, holes, cavities, etc.).
- Trees with dead or broken tops, which are likely to develop heart rot.
- All wildlife snags should be at least 8 inches DBH and have their bark intact.
- Snags can range anywhere from 5 - 10 per acre, but the size is more important in deciding if a tree should stay or go.
- One large snag per acre greater than 20 inch DBH for use by large woodpeckers and owls.
- Four medium sized snags between 10 and 20 inch DBH for use by smaller raptors, kestrels and also squirrels.
- Two smaller snags per acre between 6 and 10 inch DBH for smaller birds such as chickadees and nuthatches.

Figure 34: (A) Trees with existing wildlife holes should be retained where not an immediate hazard to the public, (B) while large trees with their bark intact make good candidates for retention as wildlife trees. (*Photos not from Park*)

Wildlife slash piles six to eight feet in diameter and four to six feet high can also be left throughout the Park in order to promote small mammal populations. These piles can provide a good source of food for these small mammals, which in turn provides a good source of food for birds of prey. Two to three piles per acre are acceptable if desired. Care must be taken in their placement to minimize wildfire risk to nearby trees should they ignite.

The prescribed work in **Section 4.0** below would have beneficial consequences for wildlife, improving their overall habitat by continuing to increase understory forage of grasses. This is of particular significance since browsing and grazing areas are the limiting factor for ungulates in these areas. The prescriptions also include instructions to leave dead standing trees for wildlife purposes. Implementation of projects should avoid work in the spring in order to protect breeding birds, calving ungulates, and to avoid wet conditions that could lead to soil resource damage.

Threatened and Endangered Species

Extensive species surveys have not been conducted, but no threatened and endangered (T&E) species are known to utilize this property. **Table 4** (below) is a status list for Park County species, and if any of these species are identified on the Park, the Colorado Division of Parks & Wildlife (CPW) should be contacted.

Additionally, according to the Colorado Natural Heritage Program's (CNHP) GIS data set, the Eagle Rock quadrangle (of which the Park lies within) has some elements important to rare or significant animal and plant communities (CNHP 2024) (**Table 4**). Birds such as the mountain plover (*Charadrius montanus*); and plants such as grassy-slope sedge (*Carex oreocharis*), pale blue-eyed grass (*Sisyrinchium pallidum*), Rocky Mountain ragwort (*Packera debilis*), and Colorado tansy-aster (*Xanthisma coloradoense*) are known to be in the Eagle Rock quadrangle and should be treated according to their preservation goals if ever found on the Park. None of these 'elements' were seen on the property during the 2024 forest inventory. CPW may be contacted for further inquiries into habitat preservation for desired species or if a T&E species is observed.

Table 4: Park County Status List.

Status	Common Name	Scientific Name	Occurrence	Abundance
Federally Endangered	Southwestern Willow Flycatcher	Empidonax traillii extimus	Known to occur	Uncommon
Federally Endangered	Whooping Crane	Grus americana	Known to occur	Unknown
Federally Threatened	Lynx	Lynx canadensis	Known to occur	Very Rare
State Endangered	Boreal Toad	Bufo boreas	Known to occur	Rare
State Endangered	Least Tern	Sterna antillarum	Known to occur	Unknown
State Endangered	Lynx	Lynx canadensis	Known to occur	Very Rare
State Endangered	Southwestern Willow Flycatcher	Empidonax traillii extimus	Known to occur	Uncommon
State Endangered	Whooping Crane	Grus americana	Known to occur	Unknown
State Endangered	Wolverine	Gulo gulo	Known to occur	Extirpated
State Threatened	Bald Eagle	Haliaeetus leucocephalus	Known to occur	Unknown
State Threatened	Western Burrowing Owl	Athene cunicularia	Known to occur	Rare
State Threatened	Northern River Otter	Lutra canadensis	Known to occur	Extirpated
State Special Concern	Ferruginous Hawk	Buteo regalis	Known to occur	Unknown
State Special Concern	Greater Sandhill Crane	Grus canadensis tabida	Known to occur	Unknown
State Special Concern	Long-billed Curlew	Numenius americanus	Known to occur	Unknown
State Special Concern	Mountain Plover	Charadrius montanus	Known to occur	Unknown
State Special Concern	Northern Leopard Frog	Rana pipiens	Known to occur	Uncommon
State Special Concern	Northern Pocket Gopher	Thomomys talpoides	Known to occur	Common
State Special Concern	Peregrine Falcon	Falco peregrinus	Known to occur	Unknown
State Special Concern	Townsend's Big-eared Bat	Plecotus townsendii	Known to occur	Uncommon
State Special Concern	Western Snowy Plover	Charadrius alexandrinus nivosus	Known to occur	Unknown

Known Archeological Sites

There are no known (recorded) archeological sites on the Park property. The Colorado Historical Society's Office of Archaeology and Historic Preservation (OAHP) should be contacted at http://www.coloradohistory-oahp.org/ if anything is found of historical significance.

Climate Change/Carbon Sequestration

Natural climate solutions are conservation, restoration and improved land management actions that increase carbon storage or avoid greenhouse gas emissions in landscapes and wetlands across the globe. The higher elevation Spruce-Fir forests and Mixed Conifer forests within the Park are most likely to be impacted first and significantly by climate change. *Opportunities for managing to increase climate resilience are highest in the Park's Spruce-Fir forests as these areas have less opportunity to migrate up in elevation. Riparian areas must also be protected as part of any climate resilience focused management on the Park, as these systems are relatively small and can be heavily impacted by human disturbance.*

In the case of riparian areas on the Park, implementing Streamside Management Zones (SMZs) so as not to disturb water quality will be required in all areas with proposed forest management activity. Work completed by hand crews within a SMZ (50 feet either side of a riparian area) would ensure minimal disturbance, but leaving the forest denser near streams/drainages/riparian areas is recommended. More information on SMZs can be found in the *Best Management Practices to Protect Water Quality* document available in **Section 12.0**.

In Spruce-Fir forests on the Park, the thinning and ladder fuels reduction work being recommended (see **Section 4.0** below) will help this forest type gain resiliency against the WSBW outbreak that is currently harming the Douglas-fir and Engelmann spruce trees within it. These operations will leave the majority of larger healthy trees in place. The largest healthy trees in a forest store the most carbon, and by leaving these trees in place, Indian Mountain Park will conserve this valuable resource while simultaneously providing a natural seed source for the next generation of spruce-fir forest.

Unique Aesthetic and Recreational Qualities

Indian Mountain Park has many unique aesthetic and recreational qualities within and around the Park boundary (**Figure 35**). The planned forest management activities may cause an initial disturbance to forest aesthetics, but these disturbances would be short-term alterations that would help promote long-term health improvements to forest structure and ultimately forest aesthetics. Appropriate project restrictions and methods should be instituted to ensure aesthetics are protected to the largest degree possible while still accomplishing the goals of each forest management activity.

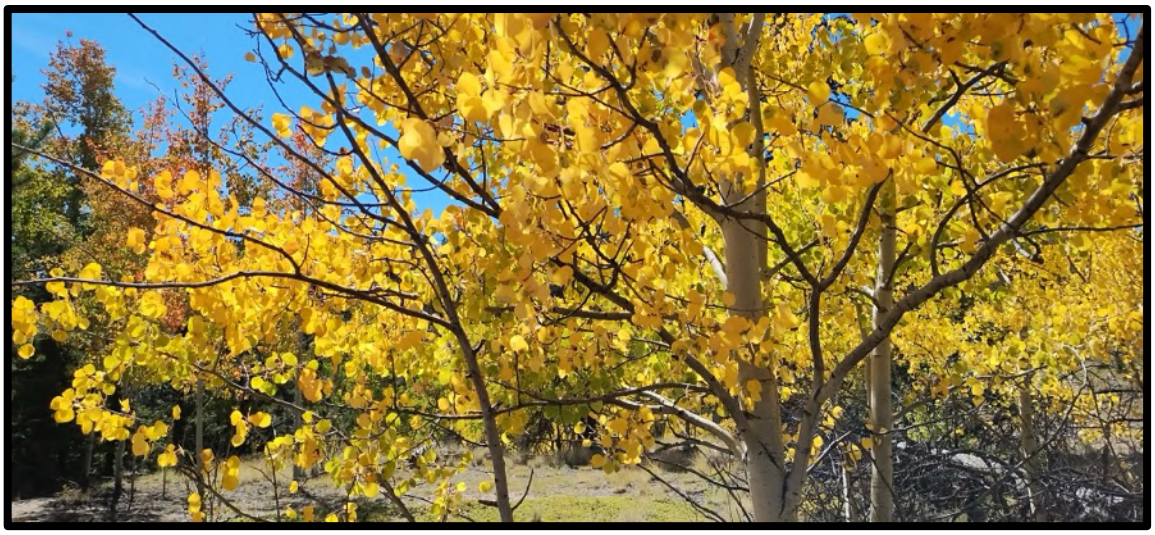

Figure 35: Photos of the many aesthetic views of and from Indian Mountain Park.

SECTION 4.0 PRESCRIPTIONS AND IMPLEMENTATION

Silvicultural prescriptions are defined as a planned series of treatments designed to change current forest structure to one that meets management goals (**Helms 1998**). The prescriptions set forth for the Park below were developed from the forest management goals stated at the beginning of this plan. Appendix materials regarding management actions can be found in **Section 12.0**.

With the use of Silvicultural prescriptions, (i.e. appropriate mechanical alterations or modifications to the land), Indian Mountain Park should be able to counteract some of the less desirable forest issues present on the Park. The following is a list of different types of treatments that may be appropriate for implementation.

- **"Thin From Below"** - The removal of trees from the lower crown classes (smaller DBH) to favor those in the upper crown classes (larger DBH).
- **"Thin From Above"** - The removal of trees from the dominant and co-dominant crown classes (larger DBH) to favor the best trees from these crown classes.
- **"Free Thinning"** - The removal of trees to control tree spacing and favor desired trees, by using a combination of thinning criteria without regard to crown class. Often utilized to gain product during thinning and cutting operations while also promoting age diversity on landscape.
- **"Sanitation Cutting"** - The removal of trees to improve health by stopping or reducing the actual or anticipated spread of insects and disease. Removal of dead trees can be considered sanitation if the goal is to open up new growing space or protect understory growth.
- **"Salvage Cutting"** – The removal of dead standing or diseased trees in order to salvage any value associated with this material.
- **"Pruning"** - The removal, close to the branch collar or flush with the stem, of live or dead side branches (ladder fuels) to decrease fire hazard and/or to improve growth and form.
- **"Patch Cuts / Overstory Removal" -** The complete removal of overstory vegetation to facilitate the growth of advanced regeneration or to allow a stand to naturally regenerate. Patch cuts differ from clear cuts since they are smaller and more focused on ecosystem management rather than forest products.

4.1 Vegetation Type Prescriptions

This Forest Management Plan has identified work areas where new forest management activities may be feasibly implemented (**Figure 36**). The newly proposed work areas have not been 100% ground-truthed, but the general locations for possible future work were chosen based on their accessibility (proximity to roads/trails), operability (slopes less than 40%), links to adjacent management units and benefits from forest management.

Section 6.0 contains **Management Unit Maps** and **Proposed Work Area Maps** that outline where these proposed future work areas are located. It is important to reference the **Proposed Work Area Maps** from **Section 6.0** while reviewing this section. Each "Forested" Vegetation Type will receive a prescription below and corresponding management units will be noted. This will help land managers to better understand the nature of these vegetation types, and what a desired managed forest could look like. After these vegetation type prescriptions, a description of the new work areas will be discussed in more detail.

Figure 36: Density within the Spruce-Fir vegetation type is highly elevated which allows WSBW to easily spread between adjacent trees, and would allow a wildfire to easily become a crown fire that spreads from crown to crown given the lack of spacing between trees.

Vegetation Type 1 (VT1): Mixed Conifer (Untreated)

The Mixed Conifer vegetation type at Indian Mountain Park is approximately 87 acres in size and is on predominantly drier south-facing slopes. VT1 is comprised of the **South Conifer MU** and **East Conifer MU** (see **Management Unit Map** in **Section 6.0**). Current forest structure of VT1 is naturally open with an existing basal area of 62.5 ft^2/acre. As a result, tree spacing is currently quite good; however, ladder fuels that exist in the form of smaller trees underneath the dripline of larger conifers and within 10 feet of larger conifers, in addition to lower branches near the ground pose a wildfire risk to those larger trees.

This vertical arrangement of fuels, often referred to as "ladder fuels", allow surface wildfires to easily enter into the canopy of larger trees. Once within the canopy, those larger ponderosa pines don't stand a chance at survival. **Thinning from Below** to remove these ladder fuels is typically one of the best ways to mitigate against the existing fire hazard.

Lop and scatter (South Conifer MU), and chipping (East Conifer MU) could be used to manage slash created from removal of these ladder fuels in VT1. Residual coniferous trees within a work area should be pruned up to remove the lower branches to at least arm's reach above the head (or 1/3 the tree height for trees less than 30 feet tall) (**Figure 37**). A combination of pruning saws and/or brush saws could be used to accomplish this work. Ladder fuel removal and pruning work could be completed as a hand work project either by Park staff or volunteer groups.

Figure 37: Pruning up the lower branches of residual conifers in VT1 will make it harder for a wildfire to ladder up from the ground into the crowns of these trees.

Vegetation Type 2 (VT2): Spruce-Fir (Untreated)

The Spruce-Fir vegetation type at Indian Mountain Park is comprised of approximately 146 acres that are primarily found on the north-facing slopes below Indian Peak. VT2 is comprised of the **Northeast MU, Mountain Top MU, West MU**, and **Southeast MU** (see **Management Unit Map** in **Section 6.0**). VT2 will be the primary focus for forest management at the Park over the next decade.

Overview: This vegetation type is overly dense with an average basal area of 143.3 ft^2 per acre. A century of fire suppression has led to an undesirable congestion of tree canopies that would benefit from increased residual tree spacing and lower overall forest density. VT2 has a dense vertical and horizontal arrangement of fuel that is dominated by Douglas-fir and Engelmann spruce in all canopy layers (**Figure 38**). Additionally, the ongoing WSBW outbreak is severely defoliating and killing large numbers of spruce and fir. Our forestry prescription will address both issues.

Figure 38: VT2 in Indian Mountain Park.

Thinning Operations: **Thinning from below** to remove ladder fuels, and **free thinning** to increase spacing between residual trees is typically one of the best ways to mitigate against the fire hazards present. Removal of small-diameter Douglas-fir and spruce trees under the dripline of larger trees, and within 10 feet of larger residual trees should be the focus of the **Thinning from Below** treatment. Not only does removal of these types of small diameter trees serve to reduce wildfire hazards, it also helps break the cycle of WSBW infesting smaller trees underneath and adjacent to larger infested trees.

Free Thinning to promote tree crown separation will further reduce wildfire hazards and WSBW impacts (**Figure 42**). A minimum 10-foot spacing between the edges of tree

crowns/groups of tree crowns is recommended on level ground. As slope increases, crown spacing should also increase. This will help reduce fire intensities and torching potential during a wildfire event. Small, isolated groups of trees can be retained for visual diversity. Chipping slash from thinning treatments is ideal, while lop and scatter could be used to manage slash in steep areas.

Sanitation thinning to remove at least 90% of the standing dead trees in addition to removal of dying trees will also be needed given the WSBW outbreak's impact on the Park. Only wildlife appropriate trees (as described in **Section 3.4**) should be retained from the dead standing trees in future work units. Lop and scatter could be used to manage slash in less accessible/steeper areas, but efforts should be made to remove cut material from work areas when possible as mentioned above. Most of VT2 is operable, but certain areas exceeding 40% slopes are considered minimally operable and work will need to be completed by hand crews if possible (see **Management Unit Map** and **Slope Map** in **Section 6.0** for minimally operable areas).

Retention Trees: Tree species other than Douglas-fir and Engelmann spruce should be left uncut (**Aspen, limber pine, and bristlecone pine**) to promote species diversity as long as they are not diseased (unhealthy [beetle-infested] or diseased trees are the exception) or within the dripline of residual trees.

Pruning Retention Trees: Any retained coniferous trees in a work area should be pruned up to remove the lower branches to at least safe arm's reach above the head. Trees less than 30 feet tall should not be pruned more than 1/3rd of their height (ex: a 21-foot-tall tree should only be pruned up 7 feet off the ground). Be careful to follow pruning protocol as outlined in **Digital Management Actions Appendix Section 12.0**. Pruning can be completed with a chainsaw, pole saw or hand-pruning saw. Pole saws make reaching overhead easier and are very helpful when trying to remove branches that are high off the ground. Ladder fuel removal and pruning work could be completed as a hand work project either by Park staff or volunteer groups.

Summary: Regardless of whether spraying of Bt is pursued to help deal with the current WSBW outbreak in VT2, the **Thinning from Below/Free Thinning/Sanitation Thinning** prescription should be part of an effective long-term strategy to reduce tree losses from this insect and to reduce wildfire hazards. An additional benefit of reducing density in VT2 is improving overall forest health by freeing up limited water and nutrients for remaining trees that will have less competition post treatment.

Vegetation Type 3 (VT3): Spruce-Fir (Recently Treated Areas)

The previously treated areas at Indian Mountain Park are primarily comprised of an approximately 10-acre work area dispersed amongst three blocks (East, Central, West) that was treated in the summer of 2024 (**Figure 39**). As previously mentioned, this work unit (**North Fuelbreak MU**) is located in the northwest corner of the Park.

This overall density of this treatment unit was reduced down to a basal area of 28.3 ft^2 per acre compared to a basal area of 143.3 ft^2 per acre in the untreated Spruce-Fir vegetation type. That represents an 80% reduction in forest density. The pre-harvest forest in this area had been severely affected by western spruce budworm with many standing dead trees/dying trees. It is likely that aspen will be the first trees species to repopulate the three work area blocks. A future maintenance treatment may be needed once conifers begin to take hold and shade out the aspen, but that is likely many years into the future.

Monitoring and treatment of noxious weeds in these three work area blocks should be completed yearly. Noxious weeds are opportunists and known to take hold in recently disturbed areas that have ample sunlight. Please refer to **Section 3.4** for more information on noxious weeds.

Figure 39: West block in the North Fuelbreak Management Unit.

Vegetation Type 4 (VT4): Aspen & Grasslands (45 Acres)

VT4 comprises the disc golf course, and the area around the Park's structures and should be monitored and treated annually for defensible space, hazard trees, and noxious weeds (**Figure 40**). VT4 is comprised of the **Base MU** (see **Management Unit Map** in **Section 6.0**).

Figure 40: VT4 in Indian Mountain Park.

4.2 Maintenance of Past Work Treatments

As mentioned in the **Section 2.4** review of previous work treatments, there are some locations where maintenance of past work is critical to ensure the success of these past treatments. The **Defensible Space work** and **Hazard Tree treatments** mentioned below should be revisited annually. It should also be noted that this maintenance work was assigned **Priority Level 1** as it is the most critical in maintaining the hazardous fuels reductions around the Park's infrastructure/roads/trails along with visitor safety.

Base MU - Defensible Space Work - Priority 1

As mentioned in **Section 3.3**, in order for defensible space to remain effective, ongoing annual maintenance is paramount and should be scheduled accordingly. An extensive list of annual Defensible Space maintenance activities can be found in the '*The Home Ignition Zone'* guide (CSFS 2021), but a few items specific to the Indian Mountain Park structures are worth mentioning here, such as: keeping grasses and weeds to a height of six inches or less in Zones 1 & 2 (first 30 feet) around structures, raking conifer needles and other flammable debris away from structure foundations, and clearing roofs and gutters of conifer needles and debris on a regular basis. Creating and improving defensible space will give the Park's structures a fighting chance of surviving a wildfire (**Figure 41**).

Figure 41: Keeping grasses around the Comfort Station and propane tank to 6 inches or less is highly recommended to maintain the defensible space that already exists. Adding a layer of gravel around the base of the propane tank that extends out a few feet on all sides would create a non-flammable perimeter that would help keep fuels like burning grasses from making direct contact with the tank during a wildfire event.

Base MU - Hazard Tree Removal – Priority 1

Hazard tree removal typically focuses on removing dead or damaged trees that are within 1.5 times tree height from any area to be protected (**Figure 42**). As mentioned in **Section 2.4**, there are five primary categories where hazard trees are of concern: 1) trail corridors, 2) along roads/parking areas, 3) around structures, 4) around stationary high use areas like picnic areas, and 5) within recreation areas. This type of work is already ongoing at Indian Mountain Park and should be considered part of the annual maintenance program.

Figure 42: A) Hazard tree removal within the disc golf course, and along the Park's trail/road system should continue to be a priority.

4.3 Proposed New Treatments

The following six management units listed below containing a total of 187 operable acres were identified as possible new project locations on Indian Mountain Park (see **Management Unit Maps** in **Section 6.0**). As mentioned previously in **Section 3.4**, high tree densities found in the untreated Spruce-Fir areas typically have a greater risk of burning as a catastrophic wildfire if ignited. When done properly, wildfire mitigation projects like the ones listed below can lower overall tree density, while maintaining pockets of high-density trees for wildlife cover and habitat diversity. These types of projects can create a forest that is able to withstand and recover from a wildfire without compromising the wildlife that call the Park home.

All four untreated units in the Spruce-Fir vegetation type were identified as Priority 1 and Priority 2 project locations on Indian Mountain Park (see **Proposed Work Area by Priority Map** in **Section 6.0**). These fuel reduction units would link into the hazardous fuels reduction work already accomplished in the North Fuelbreak MU (**Figure 43**). Additionally, management units where fuels reduction work will take place will also help mitigate against some of the detrimental effects of the current WSBW outbreak. The two remaining management units in the Mixed Conifer vegetation type were identified as Priority 3 areas given forest density in these units is already low.

Figure 43: The North Fuelbreak MU saw extensive treatment in the Summer of 2024.

It is important to reference both **Proposed Work Area Maps** from **Section 6.0** while reviewing this section. As mentioned above, each management unit was assigned **Priority Level 1-3** based on access, difficulty of work, slope, and need.

PRIORITY 1 MANAGEMENT UNITS (MUs)

Northeast MU – 38 Acres

Vegetation Type: Spruce-Fir

Primary Treatment Goal: Wildfire Fuels Hazard Reduction – Public Safety - Forest Health

The Northeast MU is found on the Park's north-facing slopes between the Base MU and Mountain Top MU. This MU is approximately 38 total acres. This MU sees a significant amount of recreation use so aesthetics and public safety need to be prioritized with any future forest management work. Access to this MU is via existing road and trail system in addition to the ski lift cut (**Figure 44**).

The **Thinning from Below/Free Thinning/Sanitation Thinning** prescription (VT2) referenced in **Section 4.1** above is recommended for this MU as part of an effective long-term strategy to reduce wildfire hazards and tree losses from WSBW. The overarching goal should be to remove ladder fuels and break up residual tree/tree group crowns so that they have at least ten feet of separation between crowns of residual trees/tree groups (greater distance between trees/clumps will be needed as slopes increase). Additionally, residual trees within the work area should be pruned up off the ground, but no more than 1/3 the tree's total height (pruning up aspen is not needed).

Tree species other than Douglas-fir and Engelmann spruce should be left uncut (aspen, limber pine, and bristlecone pine) to promote species diversity. Work could be readily completed by both mechanized equipment and hand crews. Again, the detailed Spruce-Fir vegetation type prescription above in **Section 4.1** should be referenced before treatment commences.

Riparian Areas: Please note that side drainages likely exist within the work unit. If a riparian area is encountered, implementing Streamside Management Zones (SMZs) so as not to disturb water quality will be required. Work completed by hand crews within a SMZ (50 feet either side of a riparian area) would ensure minimal disturbance, but leaving the forest denser near streams/drainages/riparian areas is recommended. More information on SMZs can be found in the *Best Management Practices to Protect Water Quality* document available in **Section 12.0**.

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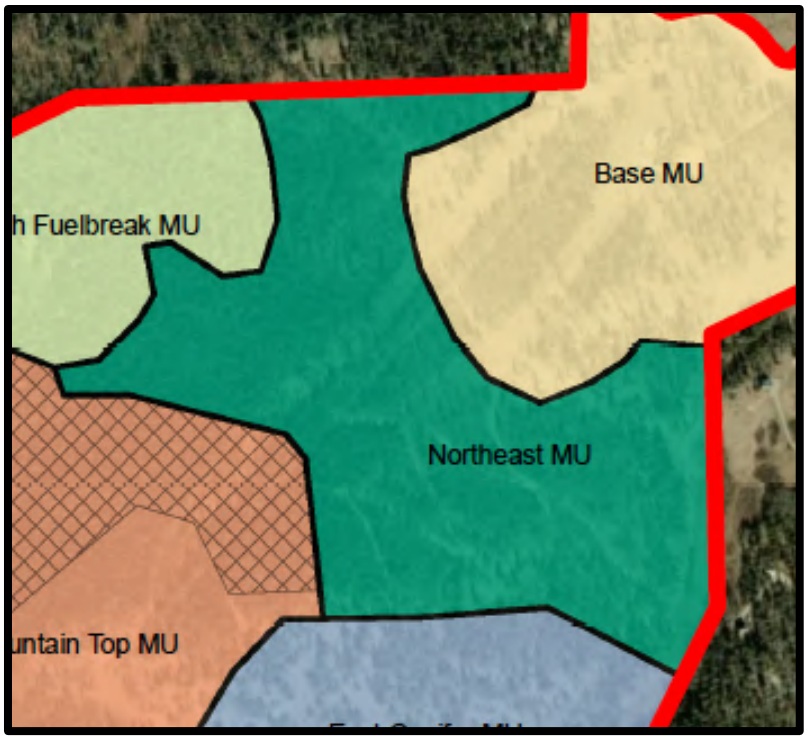

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Figure 44: A) Northeast MU in Indian Mountain Park. B) This MU is dominated by Douglas-fir and spruce trees with aspen intermixed.

Mountain Top MU – 34 Acres

Vegetation Type: Spruce-Fir

Primary Treatment Goal: Wildfire Fuels Hazard Reduction – Public Safety - Forest Health

The Mountain Top MU is found on the Park's high points around Indian Peak and the north-facing slopes heading down towards the Northeast MU. This MU is approximately 34 total acres although 13.7 acres in the north end of this MU have been deemed minimally operable due to steep/rocky slopes. This MU also sees a significant amount of recreation use so aesthetics and public safety need to be prioritized with any future forest management work. Access to this MU is via existing road and trail system in addition to the ski lift cut.

The **Thinning from Below/Free Thinning/Sanitation Thinning** prescription (VT2) referenced in **Section 4.1** above is recommended for this MU as part of an effective long-term strategy to reduce wildfire hazards and tree losses from WSBW. The overarching goal should be to remove ladder fuels and break up residual tree/tree group crowns so that they have at least ten feet of separation between crowns of residual trees/tree groups (greater distance between trees/tree clumps will be needed as slopes increase). Additionally, residual trees within the work area should be pruned up off the ground, but no more than 1/3 the tree's total height (pruning up Aspen is not needed).

Tree species other than Douglas-fir and Engelmann spruce should be left uncut (aspen, limber pine, and bristlecone pine) to promote species diversity. Work could be readily completed by both mechanized equipment and hand crews. Care needs to be taken around the old ski lift infrastructure and log cabin present in this MU (**Figure 45**). Again, the detailed Spruce-Fir vegetation type prescription above in **Section 4.1** should be referenced before treatment commences.

Riparian Areas: Please note that side drainages likely exist within the work unit. If a riparian area is encountered, implementing Streamside Management Zones (SMZs) so as not to disturb water quality will be required. Work completed by hand crews within a SMZ (50 feet either side of a riparian area) would ensure minimal disturbance, but leaving the forest denser near streams/drainages/riparian areas is recommended. More information on SMZs can be found in the *Best Management Practices to Protect Water Quality* document available in **Section 12.0**.

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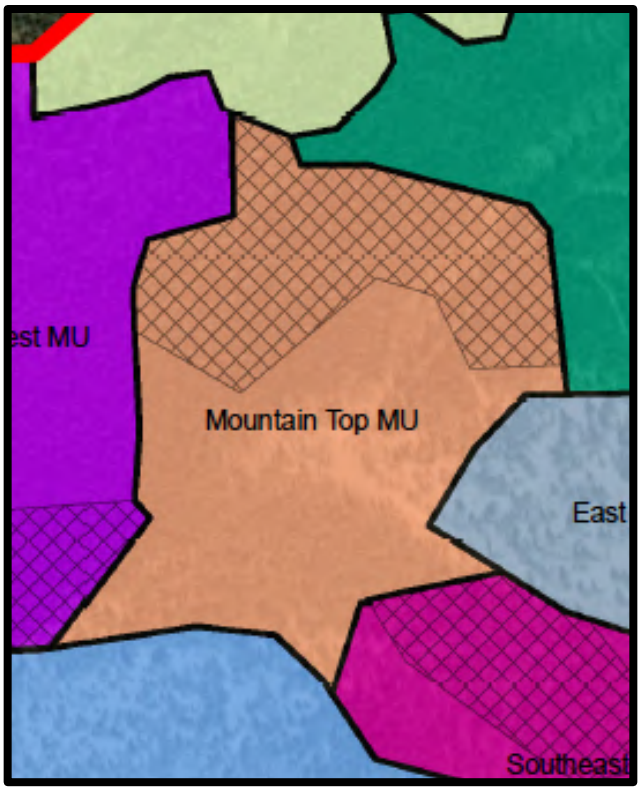

B

Figure 45: A) Mountain Top MU in Indian Mountain Park.
B) Old log cabin present within the Mountain Top MU.

PRIORITY 2 MANAGEMENT UNITS (MUs)

West MU – 32 Acres

Vegetation Type: Spruce-Fir

Primary Treatment Goal: Wildfire Fuels Hazard Reduction – Forest Health

The West MU is found on the Park's western edge sandwiched in between the North Fuelbreak MU and the South Conifer MU (**Figure 46**). This MU is approximately 32 total acres although 7.7 acres in the south end of this MU have been deemed minimally operable due to steep/rocky slopes. There are no formal roads/trails that traverse the West MU so current access is via cross-country foot travel from the North Fuelbreak MU or Mountain Top MU. A future firebreak road through the MU would provide access to mechanized equipment and to firefighters during a wildfire event. A possible location for this future firebreak road is shown on the **Roads & Trails Map** in **Section 6.0**.

The **Thinning from Below/Free Thinning/Sanitation Thinning** prescription (VT2) referenced in **Section 4.1** above is recommended for this MU as part of an effective long-term strategy to reduce wildfire hazards and tree losses from WSBW. The overarching goal should be to remove ladder fuels and break up residual tree/tree group crowns so that they have at least ten feet of separation between crowns of residual trees/tree groups (greater distance between trees/clumps will be needed as slopes increase). Additionally, residual trees within the work area should be pruned up off the ground, but no more than 1/3 the tree's total height (pruning up Aspen is not needed).

Tree species other than Douglas-fir and Engelmann spruce should be left uncut (aspen, limber pine, and bristlecone pine) to promote species diversity. Work could be readily completed by both mechanized equipment and hand crews once access is created. Again, the detailed Spruce-Fir vegetation type prescription above in **Section 4.1** should be referenced before treatment commences.

Riparian Areas: Please note that side drainages likely exist within the work unit. If a riparian area is encountered, implementing Streamside Management Zones (SMZs) so as not to disturb water quality will be required. Work completed by hand crews within a SMZ (50 feet either side of a riparian area) would ensure minimal disturbance, but leaving the forest denser near streams/drainages/riparian areas is recommended. More information

on SMZs can be found in the *Best Management Practices to Protect Water Quality* document available in **Section 12.0**.

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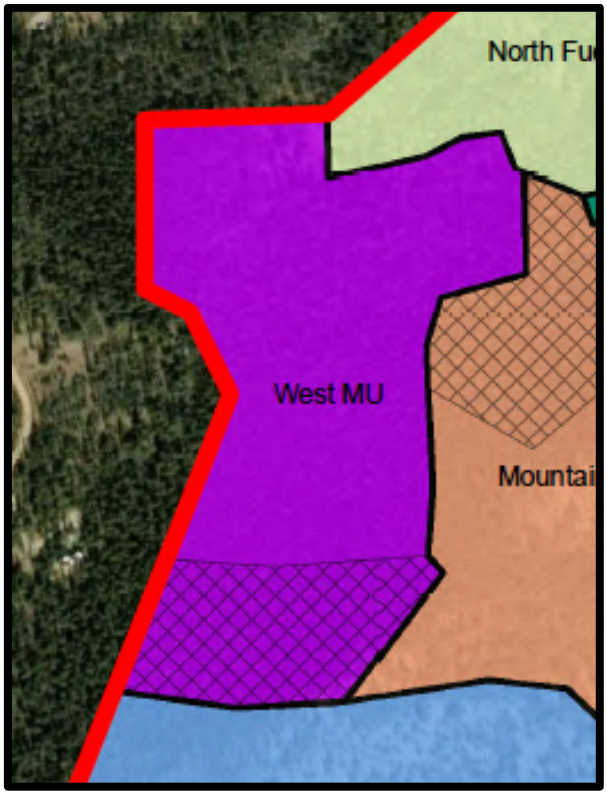

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Figure 46: A) West MU in Indian Mountain Park. B) This MU is dominated by Douglas-fir and spruce.

Southeast MU – 22 Acres

Vegetation Type: Spruce-Fir

Primary Treatment Goal: Wildfire Fuels Hazard Reduction – Forest Health

The Southeast MU is found on the Park's southeastern corner sandwiched in between the East Conifer MU and the South Conifer MU (**Figure 47**). This MU is approximately 22 total acres although 7.3 acres in the northwest end of this MU have been deemed minimally operable due to steep/rocky slopes. There are no formal roads/trails that traverse the Southeast MU so current access is via cross-country foot travel from the East Conifer MU or Mountain Top MU. There is also a small narrow piece of Park property on the east side of this MU that extends down to East Longbow Drive which could provide future access to this MU. A future forest road originating from Trail B in the East Conifer MU may be an easier option to gain forest road access to the Southeast MU. A possible location for this future firebreak road is shown on the **Roads & Trails Map** in **Section 6.0**.

The **Thinning from Below/Free Thinning/Sanitation Thinning** prescription (VT2) referenced in **Section 4.1** above is recommended for this MU as part of an effective long-term strategy to reduce wildfire hazards and tree losses from WSBW. The overarching goal should be to remove ladder fuels and break up residual tree/tree group crowns so that they have at least ten feet of separation between crowns of residual trees/tree groups (greater distance between trees/clumps will be needed as slopes increase). Additionally, residual trees within the work area should be pruned up off the ground, but no more than 1/3 the tree's total height (pruning up aspen is not needed).

Tree species other than Douglas-fir and Engelmann spruce should be left uncut (aspen, limber pine, and bristlecone pine) to promote species diversity. Work could be readily completed by both mechanized equipment and hand crews once access is created. Again, the detailed Spruce-Fir vegetation type prescription above in **Section 4.1** should be referenced before treatment commences.

Riparian Areas: Please note that side drainages likely exist within the work unit. If a riparian area is encountered, implementing Streamside Management Zones (SMZs) so as not to disturb water quality will be required. Work completed by hand crews within a SMZ (50 feet either side of a riparian area) would ensure minimal disturbance, but leaving the forest denser near streams/drainages/riparian areas is recommended. More information on SMZs can be found in the *Best Management Practices to Protect Water Quality* document available in **Section 12.0**.

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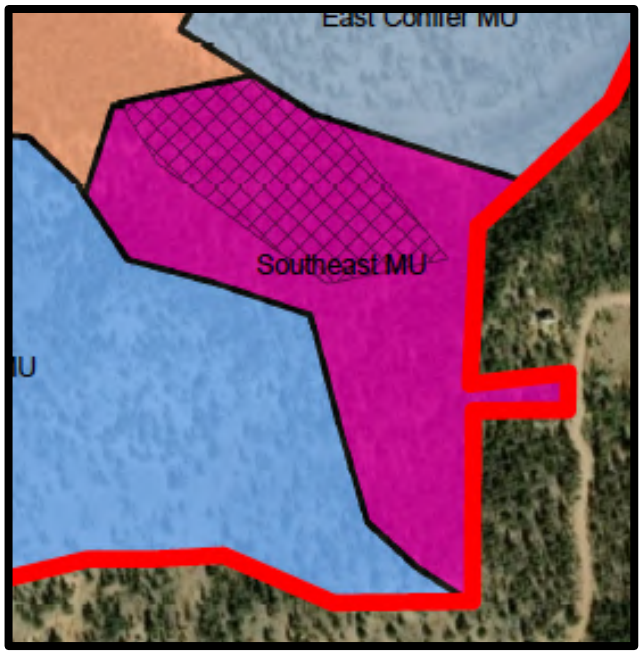

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Figure 47: A) Southeast MU in Indian Mountain Park. B) This MU is dominated by Douglas-fir and spruce trees with aspen intermixed.

PRIORITY 3 MANAGEMENT UNITS (MUs)

South Conifer MU – 66 Acres

Vegetation Type: Mixed Conifer (various pine species)

Primary Treatment Goal: Hazard Fuels Reduction (Ladder Fuels)

The South Conifer MU is found in southern section of the Park (**Figure 48**). This MU is approximately 66 total acres. There are no formal roads/trails that traverse the South Conifer MU so current access is via cross-country foot travel from the Mountain Top MU. A future firebreak road through the MU would provide access to mechanized equipment and to firefighters during a wildfire event. A possible location for this future firebreak road is shown on the **Roads & Trails Map** in **Section 6.0**.

The **Thinning from Below** prescription (VT1) referenced in **Section 4.1** above is recommended for this MU to reduce wildfire hazards. The primary treatment focus in this MU are ladder fuels that exist in the form of smaller understory trees underneath the dripline and within 10 feet of larger conifers. These ladder fuels pose a wildfire risk to those larger trees. **Free Thinning** (brush saws and/or pruning saws) to remove these ladder fuels is typically one of the best ways to mitigate against the existing fire hazard. Healthy aspen should be left uncut.

Lop and scatter could be used to manage slash created from removal of these ladder fuels. Residual coniferous trees within a work area should be pruned up to remove the lower branches to at least arm's reach above the head (or 1/3 the tree height for trees less than 30 feet tall). Ladder fuel removal and pruning work could be completed as a hand work project either by Park staff or volunteer groups. The detailed vegetation type prescription above in **Section 4.1** should be referenced before treatment commences.

Riparian Areas: Side drainages with water may exist within the work unit. If a riparian area is encountered, implementing Streamside Management Zones (SMZs) so as not to disturb water quality will be required. Work completed by hand crews within a SMZ (50 feet either side of a riparian area) would ensure minimal disturbance, but leaving the forest denser near streams/drainages/riparian areas is recommended. More information on SMZs can be found in the *Best Management Practices to Protect Water Quality* document available in **Section 12.0**.

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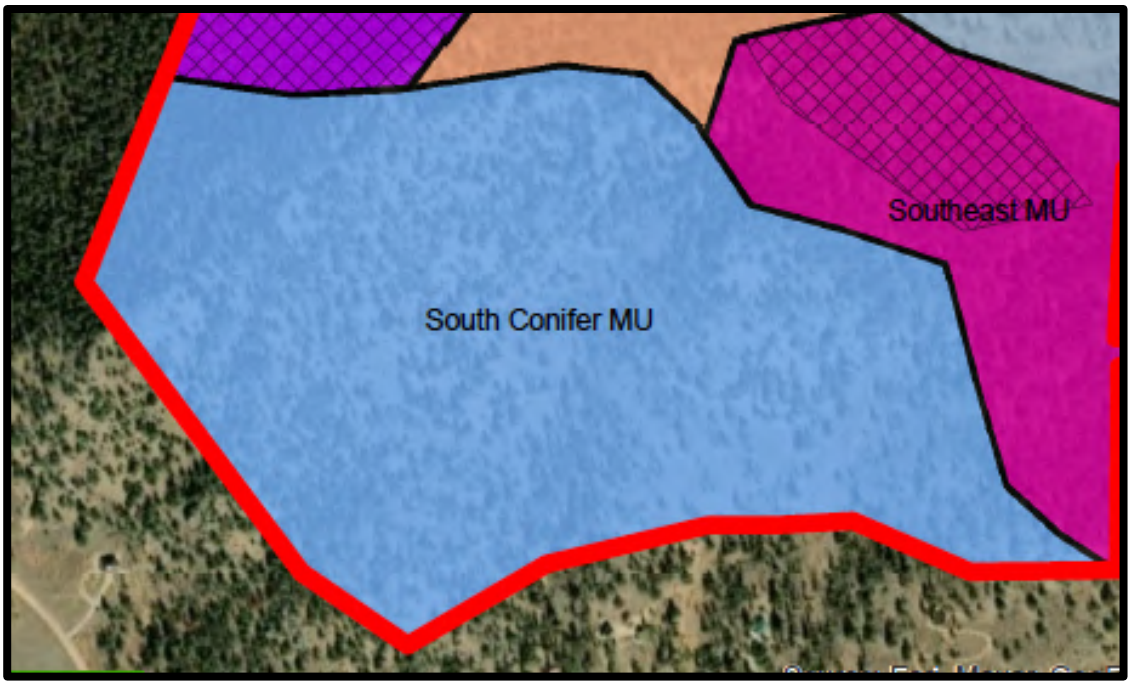

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Figure 48: A) South Conifer MU in Indian Mountain Park. B) Density within the South Conifer MU is lower but ladder fuels remain a wildfire hazard.

East Conifer MU – 20 Acres

Vegetation Type: Mixed Conifer (various pine species)

Primary Treatment Goal: Hazard Fuels Reduction (Ladder Fuels)

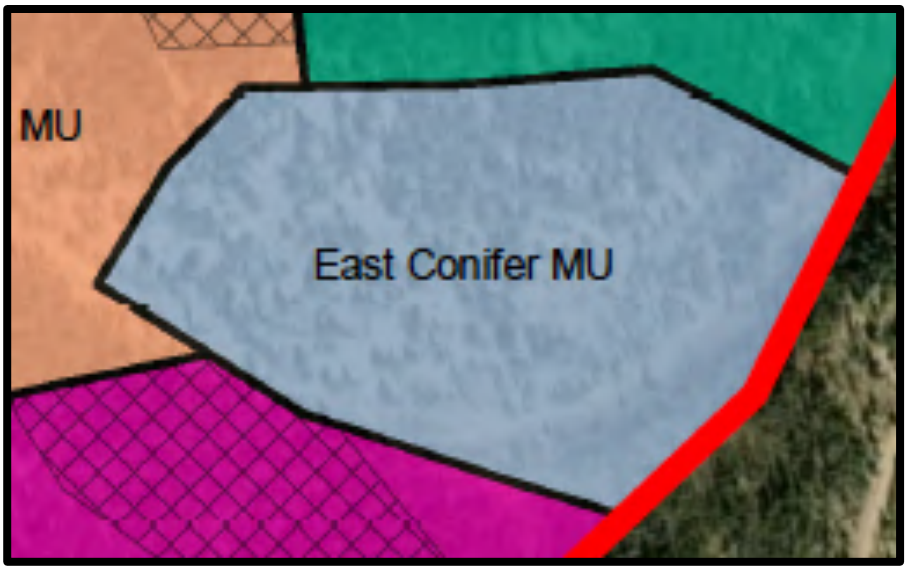
The East Conifer MU is found in eastern section of the Park surrounded by the Northeast MU, Mountain Top MU, and Southeast MU (**Figure 49**). This MU is approximately 20 total acres. This MU sees a significant amount of recreation use so aesthetics and public safety need to be prioritized with any future forest management work. Trail B and Trail C provide road/trail access to the MU.

The **Thinning from Below** prescription (VT1) referenced in **Section 4.1** above is recommended for this MU to reduce wildfire hazards. The primary treatment focus in this MU are ladder fuels that exist in the form of smaller understory trees underneath the dripline and within 10 feet of larger conifers. These ladder fuels pose a wildfire risk to those larger trees. **Free Thinning** (brush saws and/or pruning saws) to remove these ladder fuels is typically one of the best ways to mitigate against the existing fire hazard. Healthy aspen should be left uncut.

Given the road/trail access that exist within the East Conifer MU, a chipper could be used to manage slash created from removal of these ladder fuels. Residual coniferous trees within a work area should be pruned up to remove the lower branches to at least arm's reach above the head (or 1/3 the tree height for trees less than 30 feet tall). Ladder fuel removal and pruning work could be completed as a hand work project either by Park staff or volunteer groups. The detailed vegetation type prescription above in **Section 4.1** should be referenced before treatment commences.

Riparian Areas: Side drainages with water may exist within the work unit. If a riparian area is encountered, implementing Streamside Management Zones (SMZs) so as not to disturb water quality will be required. Work completed by hand crews within a SMZ (50 feet either side of a riparian area) would ensure minimal disturbance, but leaving the forest denser near streams/drainages/riparian areas is recommended. More information on SMZs can be found in the *Best Management Practices to Protect Water Quality* document available in **Section 12.0**.

A



B

Figure 49: A) East Conifer MU in Indian Mountain Park. B) Trail B traverses the East Conifer MU.

Slash Treatment

Slash is the residue, e.g., treetops and branches, left on the ground after logging/thinning or accumulating as a result of storm, fire, girdling, or delimbing. The remaining slash and branches in a work area unit can be treated in multiple ways. Naturally downed trees/large branches (>3" diameter) and intact felled trees should be dealt with according to the guidelines listed below; however, leaving a small amount of downed woody debris (≈300 linear feet/acre) is beneficial to wildlife.

The rest of the slash/logged material can be chipped, it can be removed and sold, it can be piled for near-future burning, or it can be lopped and scattered based on the specific recommendations below. Chipping, and lop/scattering is best for the soil, removal is best for aesthetics, and pile burning is best for fuels reduction and costs. A combination of these methods is probably the best option for the Park and should follow the recommendations below:

If chipping is used, the following parameters should be followed:

- Chips left on site should never exceed more than 4 inches in depth.
- Preferably, chips left on site should be raked out to a depth of less than 1 inch to give grasses and seedlings a chance to receive sunlight and establish themselves.

If pile burning (in Winter) is used:

- Obtain a burn permit first through the local fire protection district.
- Review the Pile Burning Guide located in **DIGITAL Management Actions Appendix Section 11.0.**
- Contact local Fire Protection District to notify them of planned pile burning.

If lopping and scattering is used, it should be used primarily on steeper areas, and used sparingly. The following parameters should be followed:

- Lop & Scatter is available for branches, limbs, and treetops that are 3 inches or less in diameter.
- The scattered material should not exceed 12 inches in depth.
- Rotten/visibly decaying logs (wood will crumble in hand) should be left on ground.
- Logs and material that do not fit the above criteria for Lop & Scatter should be removed from the site and salvaged for product use if possible.

Some wildlife piles can and should be left onsite in accordance with what was described in **Section 3.4**.

Cost

The cost to complete proposed work may vary greatly at Indian Mountain Park. Mastication work has seen cost per acre increase recently due to inflation with these rates being in excess of $2,500 per acre. Full tree removal and other harvesting methods will vary between a range of $2,000 to $5,000 per acre. As a comparison, helicopter logging would likely be in excess of $7,000 per acre and higher. These costs can be reduced when larger acreages are completed in one project and if product is removed from the Park and sold. Product removal (if applicable) from proposed new work areas is identified below in **Table 5**. More accurate cost estimates can be formulated when the work areas are assessed and set up as formal projects.

Future Project Maintenance

The forest management treatments detailed in this section will need future maintenance in order to remain effective. Maintenance of completed work is critical to ensure the success of these treatments. As a rule of thumb, each treated area should be revisited every 5 years to determine if and how things have changed and what can be done to maintain or facilitate the desired forest structure.

Additionally, hazard tree removal along the existing trails and roads will need ongoing and timely annual maintenance. As mentioned previously, hazard tree removal typically focuses on removing dead/damaged trees that are within 1.5 times tree height from any area to be protected. Again, the five areas where hazard trees will be a concern: 1) trail corridors, 2) along roads/parking areas, 3) around structures, 4) around stationary high use areas like picnic areas, and 5) within recreation areas. This type of work is already ongoing at Indian Mountain Park and should be considered a critical part of the annual maintenance program.

4.3 Prioritization Table

The following table (**Table 5**) ranks the different proposed work areas based on a combination of need, difficulty, and feasibility. Grant funding may allow the Park to re-prioritize some of the work areas. This Prioritization Table directly relates to the **Proposed Work Maps** found in **Section 6.**

Table 5: Prioritization of the proposed maintenance and new forest management units on Indian Mountain Park. The Maintenance Prioritization of past work projects are in blue ink followed by the Proposed New Treatment projects in black ink. Volunteer Work possibilities highlighted in Green – please note the proposed new work projects highlighted in Green could actually be done by both Park staff/contractors and/or volunteers.

	Table 5. Indian Mountain Park New Work Prioritization Table								
Priority Rank	**Location Name**	**Veg Type**	**Total Acreage**	**Work Type**	**Reason for Ranking**	**Product Possibility**	**Implementation**	**Access**	**Page #**
1	Base MU	Aspen /Grass	31 Acres	MAINTENANCE WORK Defensible Space, Hazard Trees	Maintenance, Wildfire Hazard Reduction, Public Safety	Firewood, Post and Poles, Sawlogs	Mechanized Equipment, Hand Crews	Driveway, Trailhead, Roads, Trails	65
1	Northeast MU	Spruce /Fir	38 Acres	NEW WORK Thinning from Below, Free Thinning, Sanitation Thinning	Wildfire Hazard Reduction, Density of Forested Area, Forest Health	Firewood, Post and Poles, Sawlogs, Chips	Mechanized Equipment, Hand Crews	Trail A, Trail C, Trail D, Ski Lift Cut	69
1	Mountain Top MU	Spruce /Fir	34 Acres	NEW WORK Thinning from Below, Free Thinning, Sanitation Thinning	Wildfire Hazard Reduction, Density of Forested Area, Forest Health	Firewood, Post and Poles, Sawlogs, Chips	Mechanized Equipment, Hand Crews	Trail B, Trail D, Ski Lift Cut	71
2	West MU	Spruce /Fir	32 Acres	NEW WORK Thinning from Below, Free Thinning, Sanitation Thinning	Wildfire Hazard Reduction, Density of Forested Area, Forest Health	Firewood, Post and Poles, Sawlogs, Chips	Mechanized Equipment, Hand Crews	Future Firebreak Road	73
2	Southeast MU	Spruce /Fir	22 Acres	NEW WORK Thinning from Below, Free Thinning, Sanitation Thinning	Wildfire Hazard Reduction, Density of Forested Area, Forest Health	Firewood, Post and Poles, Sawlogs, Chips	Mechanized Equipment, Hand Crews	Future Firebreak Road	75
3	South Conifer MU	Mixed Conifer	66 Acres	NEW WORK Ladder Fuels Reduction	Wildfire Hazard Reduction, Forest Health	N/A	Hand Crews	Foot, Future Firebreak Road	77
3	East Conifer MU	Mixed Conifer	20 Acres	NEW WORK Ladder Fuels Reduction	Wildfire Hazard Reduction, Forest Health	Chips	Hand Crews	Trail B, Trail C	79

SECTION 5.0 CONCLUSION

This Forest Management Plan analyzed Indian Mountain Park`s current forest conditions and developed a data-backed description of the main forest vegetation types that exist on the property. This plan also identified forestry resource concerns and evaluated the feasibility of completing new wildfire hazard reduction activities and forest health improvements. From this information, recommendations for possible forest management activities were developed. The findings are summarized below.

The vast majority of the forested land comprising Indian Mountain Park has never seen formal forest management, an extreme wildfire, or any other type of forest replacing event over the last century. As a result, significant portions of the Park's forested areas are overly dense. High forest densities have led to an unhealthy congestion of tree canopies and ladder fuels that have allowed western spruce budworm to proliferate. Future forest management on the Park will lessen the fire danger and existing wildfire hazards through the reduction of ladder fuels (vertical fuels) and increased spacing (horizontal fuels) between residual trees/tree clumps in addition to dampening the impact WSBW is having on the Park's spruce-fir forests.

Numerous locations were identified for completing new forest management work. These newly proposed work areas are focused in more operable and accessible areas to allow for a mix of mechanized equipment (where suitable) and hand crews. Locations for thinning operations, hazard tree removals, ladder fuels reduction, and a future firebreak road were identified. The newly identified management units represent over 187+ operable acres of possible hazardous fuels reduction projects.

The recommended projects will help improve forest health in the most accessible portions of the Park. Even though these areas are the most accessible, this does not mean access is easy or that the Park will be able to complete 100% of these projects; however, it is believed that these projects can be completed and are worthwhile endeavors to improve forest health and decrease wildfire hazards on Indian Mountain Park.

SECTION 6.0 MAPS

Location Map

Aerial Map

Roads & Trails Map

Inventory Map

Topographic Map

Slope Map

Aspect Map

Insect and Disease Map

Fire Intensity Scale Map

Predicted Rate of Wildfire Spread Map

Vegetation Type Map

Management Unit Map

Treated Areas Map

Proposed Work Area Map by Priority

Proposed Work Area Map by Treatment Type

SECTION 7.0 GLOSSARY

acre: one acre is approximately 209 feet by 209 feet or 43,560 square feet.

basal area: the cross-sectional area of a single tree, including the bark, measured at breast height (4.5 feet above ground level).

blowdown: trees felled or broken off by wind.

cohort: a group of trees that established themselves after a single disturbance.

defensible space: an area around a structure where fuels and vegetation are cleared or reduced to slow the spread of wildfire towards the structure.

diameter at breast height (DBH): the diameter of a tree at 4.5 feet above the ground typically measured on the uphill side of a tree.

dominant trees: trees with crowns extending above other tree crowns so they receive full light from above and partial light from the sides.

even-aged stand: a stand of trees composed of a single age class.

firebreak: a firebreak is strip of land, at least 20 to 30 feet wide, in which all vegetation is removed down to bare, mineral soil each year prior to fire season (not to be confused with a fuelbreak – see below).

free thinning: the removal of trees to control tree spacing and favor desired trees, by using a combination of thinning criteria without regard to crown class. Often utilized to gain product during thinning and cutting operations while also promoting age diversity on landscape.

fuelbreak: a fuelbreak (or shaded fuelbreak) is an easily accessible strip of land of varying width (depending on fuel and terrain), in which fuel density is reduced to improve fire control opportunities. The stand is typically thinned, and remaining trees are pruned to remove ladder fuels. Brush, heavy ground fuels, snags, and dead trees are disposed of and an open, park-like appearance is established.

fuel loading: the oven-dry weight of fuel per unit area.

ladder fuels: vegetative materials with vertical continuity that allows fire to burn from ground level into the branches and crowns of trees.

litter: the surface layer of a forest floor that has not decomposed, usually consisting of freshly fallen leaves, needles, twigs, stems, bark, and fruits.

moisture of extinction: a parameter of fire behavior fuel models; the dead fuel moisture content at which the Rothermel's (1972) surface fire spread model predicts spread rate will fall to zero.

noxious weed: a plant specified by law as being especially undesirable, troublesome, invasive and/or difficult to control.

overtopped or suppressed trees: trees with crowns entirely below the general level of the forest canopy that don't receive any direct light from above or from the sides.

patch: a small part of a stand or forest.

patch cuts / overstory removal: the complete removal of overstory vegetation to facilitate the growth of advanced regeneration or to allow a stand to naturally regenerate. Patch cuts differ from clear cuts since they are smaller and more focused on ecosystem management rather than forest products.

prism: a forestry tool used to visually capture trees at certain distances based on their diameter.

pruning: the removal, close to the branch collar or flush with the stem, of live or dead side branches (ladder fuels) to decrease fire hazard and/or to improve growth and form.

riparian area: related to, living, or located in conjunction with a wetland, on the bank of a river or stream, but also at the edge of a lake.

salvage cutting: the removal of dead standing or diseased trees in order to salvage any value associated with this material.

sanitation cutting: the removal of trees to improve health by stopping or reducing the actual or anticipated spread of insects and disease. Removal of dead trees can be considered sanitation if the goal is to open up new growing space or protect understory growth.

shaded fuelbreak: an accessible strip of land of varying width (dependent upon slope) in which fuel density is reduced thus improving wildfire control opportunities; the strip is thinned, and remaining trees are pruned to remove ladder fuels in addition to disposing of brush, heavy ground fuels, snags, and dead trees.

snag: a standing, generally un-merchantable dead tree from which the leaves and most of the branches have fallen.

stand: a contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit.

thinning: a treatment designed to reduce stand density of trees primarily to improve growth, enhance forest health, reduce fire risk or recover potential mortality.

thin from above: the removal of trees from the dominant and co-dominant crown classes (larger DBH) to favor the best trees from these crown classes.

thin from below: the removal of trees from the lower crown classes (smaller DBH) to favor those in the upper crown classes (larger DBH).

uneven-aged stand: a stand composed of multiple age classes.

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SECTION 9.0 INVENTORY & BACKGROUD MATERIALS APPENDIX

SECTION 10.0 TREE INSECT & DISEASE APPENDIX

Western Spruce Budworm-
http://static.colostate.edu/client-files/csfs/pdfs/05543.pdf
http://static.colostate.edu/client-files/csfs/pdfs/csfs-poster-sbw.pdf
https://apps.fs.usda.gov/r6_decaid/views/western_spruce_budworm.html

Spruce Beetle-
https://csfs.colostate.edu/forest-management/common-forest-insects-diseases/spruce-bark-beetle/
https://csfs.colostate.edu/wp-content/uploads/2014/02/Spruce-Beetle-QuickGuide-FM2014-1.pdf

Douglas-fir Beetle-
http://csfs.colostate.edu/media/sites/22/2018/01/Douglas-Fir-Beetle-QuickGuide2018.pdf
http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5299322.pdf
http://www.fs.fed.us/r3/resources/health/field-guide/bb/douglas.shtml

Mountain Pine Beetle-
http://csfs.colostate.edu/forest-management/common-forest-insects-diseases/mountain-pine-beetle/
http://static.colostate.edu/client-files/csfs/pdfs/MPB.pdf
http://static.colostate.edu/client-files/csfs/pdfs/pinebeetlemgmt.pdf
http://static.colostate.edu/client-files/csfs/documents/Solar_Treatment_for_Mountain_Pine_Beetle_April_2009.pdf

Ips Beetle-
http://static.colostate.edu/client-files/csfs/pdfs/Ips.pdf
http://static.colostate.edu/client-files/csfs/documents/IpsBeetleUpdate_final_000.pdf
http://static.colostate.edu/client-files/csfs/pdfs/ipsbeetle.pdf

Aspen Diseases-
http://csfs.colostate.edu/colorado-forests/forest-types/aspen/
http://static.colostate.edu/client-files/csfs/pdfs/aspen.pdf
http://csfs.colostate.edu/forest-management/common-forest-insects-diseases/common-insects-diseases-of-aspen/

SECTION 11.0 WILDFIRE & DEFENSIBLE SPACE APPENDIX

CSFS Wildfire Mitigation & Education Links-
http://csfs.colostate.edu/csfspublications/#wildfire

CSFS Home Ignition Zone/Defensible Space Guide-
https://csfs.colostate.edu/wp-content/uploads/2021/04/2021_CSFS_HIZGuide_Web.pdf

Creating Fuelbreaks-
http://static.colostate.edu/client-files/csfs/pdfs/fuelbreak_guidellines.pdf

Slash Pile Burning-
https://csfs.colostate.edu/media/sites/22/2014/02/SS-Slash-Burning-Guide2015.pdf
http://co.grand.co.us/DocumentCenter/View/5641
https://gilpin.extension.colostate.edu/wp-content/uploads/sites/29/2016/09/Slash-burning-guide-Gilpin-County.pdf

Fire Resistant Landscaping-
http://static.colostate.edu/client-files/csfs/pdfs/06303.pdf

FireWise Plant Materials-
http://static.colostate.edu/client-files/csfs/pdfs/06305.pdf

Forest Home Fire Safety-
http://static.colostate.edu/client-files/csfs/pdfs/06304.pdf

Grass Seed Mixes to Reduce Wildfire Hazard-
http://static.colostate.edu/client-files/csfs/pdfs/06306.pdf

SECTION 12.0 MANAGEMENT ACTIONS APPENDIX

Forestry Best Management Practices to Protect Water Quality in Colorado–
https://csfs.colostate.edu/wp-content/uploads/2024/01/BMP_WaterQuality_2023_Web_CMP.pdf

Mastication Guidelines-
http://static.colostate.edu/client-files/csfs/pdfs/masticationoperationalguidelines.pdf

Pruning Guidelines-
https://static.colostate.edu/client-files/csfs/pdfs/616_pruning_shade_trees.pdf

Landowner Guide to Thinning-
http://static.colostate.edu/client-files/csfs/pdfs/landowner_g4thin_scr.pdf