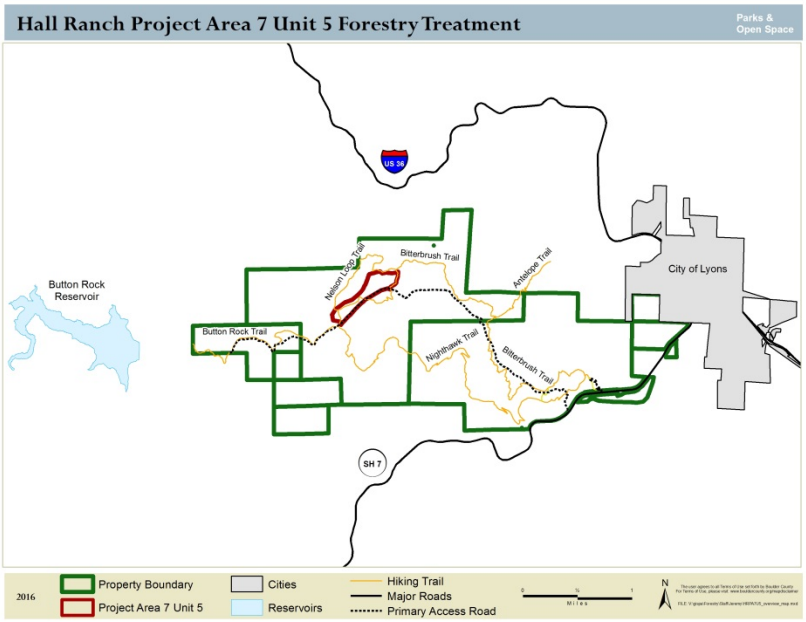
Hall Ranch Open Space
Project Area 7 Unit 5
Forest Restoration Treatment



1. Project Area Background

North Foothills Open Space (NFOS) was conceptualized during the development of the initial Boulder County Comprehensive Plan in the 1970s. Much of the area was designated as a "Scenic Area" on the Open Space Map. The designations stemmed from the beauty, undeveloped nature, cultural value and natural resources of these lands. Boulder County Parks & Open Space Department (BCPOS) made their first purchase of land in the NFOS in 1990 with the acquisition of Trevarton Ranch. In 1993, Boulder County began acquiring portions of Hall Ranch and Heil Valley Ranch, two of the most significant properties in the county. As of 2010, Heil Valley Ranch totals 6,326 acres and Hall Ranch covers 3,898 acres.

In 1996, the department approved a management plan for the North Foothills Open Space (NFOSMP), which includes both Hall and Heil Ranch. Goals, objectives and treatment priority areas for vegetative management and more specifically forest and grassland management are listed in Section 6.0 and Figure 5 of the NFOSMP. For Hall Ranch, one large treatment area was identified and is referred to as treatment area nine. The Colorado State Forest Service (CSFS) highlighted this same area in a 1998 report to BCPOS as a location in need of forest management. This property was also identified as a high priority in the CSFS Statewide Resource Assessment, the Front Range Fuels Treatment Partnership (FRFTP) Recommendations and the St. Vrain Watershed Assessment.

In the Hall Ranch area, Lyons Fire Protection District completed a Community Wildfire Protection Plan in 2011 that included hazardous fuels reduction as a high priority in the district. The

project area is between neighborhoods with high and moderate fire danger ratings. The neighborhoods surrounding Hall Ranch are: North St. Vrain – 1 mile to the north with a high fire danger, Apple Valley – 2 miles to the east with a moderate fire danger, South St. Vrain – 2 miles to the south with a moderate fire danger, and Lyons Park Estates – 2.5 miles to the southeast with a high fire danger (Lyons CWPP). It is less than one mile from the Button Rock Preserve, Longmont's primary source for drinking water. The Button Rock Preserve Forest Stewardship Plan recommends extensive forest management action to protect water resources (Button Rock Forest Stewardship Plan). The forest management actions recommended through the Button Rock Forest Stewardship Plan compliment the actions recommended in this prescription in that they are both conceptualized as forest restoration treatments, but both accomplish this through an overall reduction in fuels.

Project Area 7 Unit 5 (PA7U5) is located along the north-central boundary of Hall Ranch, on the north side of treatment area nine as outlined in the NFOSMP. The unit is 54 acres, with 14 forested acres. A detailed inventory was completed in the forested section of the unit in 2016. The following document includes a baseline inventory and a recommended forest restoration prescription for PA7U5. A forest restoration treatment will restore the composition and structure of vegetation to that of the historic precedent in order to increase the resilience of the forest to wildfire and other disturbances (Reynolds, 2013). This project builds on forest restoration projects implemented at Hall since 2008 by completing an untreated unit that lies in the middle of three completed projects. The treatments are part of the BCPOS Forestry-Fire five-year work plan, and are part of an integrated cycle of management including forest treatment and prescribed fire. The project has two phases: mechanical treatment and prescribed fire. The mechanical treatment reduces forest density and sets the groundwork to use prescribed fire in a way that's less likely to support crown fire. Prescribed fire reintroduces the ecological process that the ecosystem evolved under, and reduces the potential fire severity and need for further mechanical treatment. This plan details the mechanical portion of the restoration treatment. A Burn Plan will be written and approved prior to the implementation of prescribed fire.

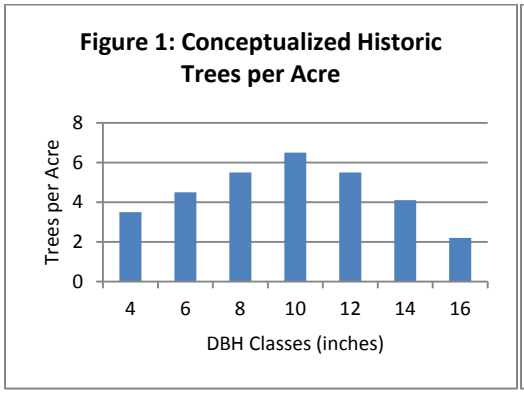
2. Historic Stand Condition

Refer to Boulder County Parks and Open Space Forest Management Policy, Appendix A, Lower Montane Life Zone pages 22-32. This document can be found at G:\Forestry-Fire\Management-Work Plans\Forest Management Policy.

In general, ponderosa pine dominated ecosystems in the Colorado Front Range historically experienced frequent, low intensity forest fires. These frequent fires served an important role in the ecosystem by periodically clearing the understory of built up fuels and juvenile trees, which helped to maintain a relatively open forest structure. These fires accomplished this by preventing most juvenile trees from reaching maturity, thereby maintaining a diameter class distribution similar to those shown in Figures 1 and 2, which are a conceptual representation of what the historic stands would look like under the historic fire regime.

In 2013, the historical forest structure was reconstructed at Hall Ranch. Researchers from the Rocky Mountain Tree Ring Institute, USFS Rocky Mountain Research Station, and Colorado State

University found that historically fires occurred at Hall Ranch every 14 years, which is similar to fire frequencies seen along like elevations along the Front Range. As shown in Table 1, Brown also found that historic basal areas ranged from 0-80 ft²/ac and historic trees per acre ranged from 0-65. These numbers suggest that the historic forest was relatively variable, with some areas having no trees at all, some areas having a relatively open forest structure, while others have a more dense forest structure.



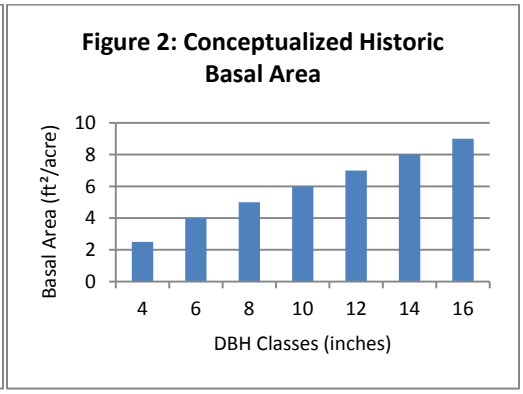


Table 1: Historic Stand Condition for Hall Ranch (Brown, 2013)				
	Minimum	Mean	Maximum	Standard Deviation
Basal Area (ft²/acre)	0	34.03	80.13	31.72
Trees per Acre	0	33.24	64.75	27.17

3. Current Stand Condition

As shown in Table 2 the stand had an average elevation of 6,490 feet, which classifies this area within the lower montane zone of the Colorado Front Range. On average the stand has a southeast aspect, but encompasses every aspect to some degree. The slope of the stand ranges from 0% to 37% with an average slope of 12%.

Table 2: Topographical Information			
	Minimum	Mean	Maximum
Elevation (feet above sea level)	6,419	6,490	6,542
Aspect (degrees)	0	152 (SE)	360
Slope (percent)	0	12	37

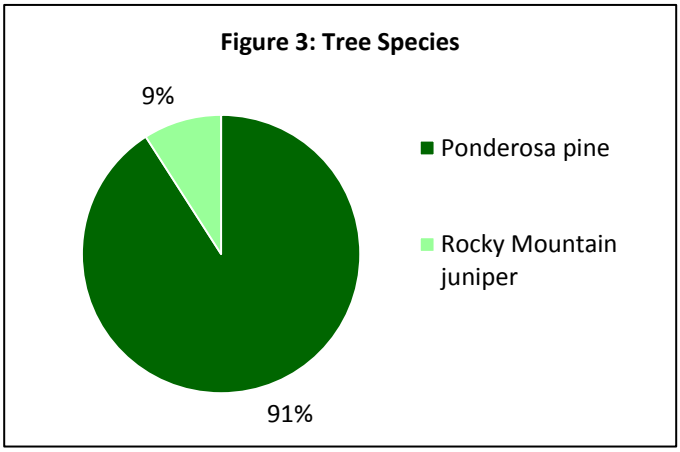
This stand was inventoried during the summer of 2016 using seven randomly placed variable radius plots in which the following were recorded: elevation, aspect, slope, basal area, and canopy cover. At each plot a prism with a 10 basal area factor was used to determine each “in” tree, for which the following was recorded: diameter at breast height, overall height, kind (living, dying, or dead), crown ratio, and vigor. All of these figures are identified in Table 3. As shown in Figure 3 this stand is dominated by ponderosa pine with less than 10% Rocky Mountain juniper. While there was not any Douglas-fir within plots, they are present in the stand.

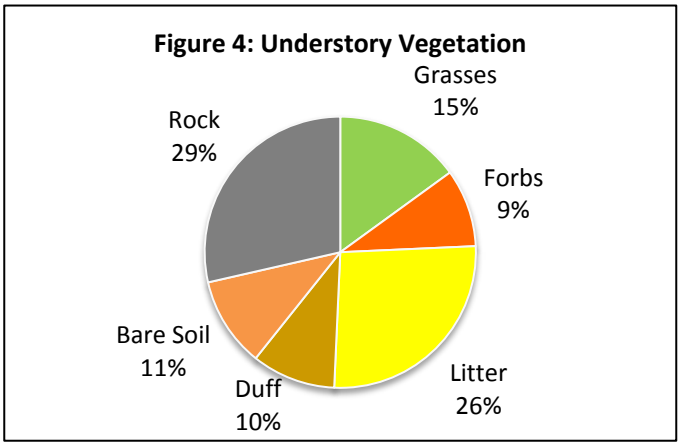
At each plot a percent ocular estimation of ground cover was recorded from 1/300th of an acre subplot. This data is represented in Figure 4 and although ground cover is not specifically being

manipulated in this prescription, historically this area would have higher percentages of grass and forb than litter and duff.

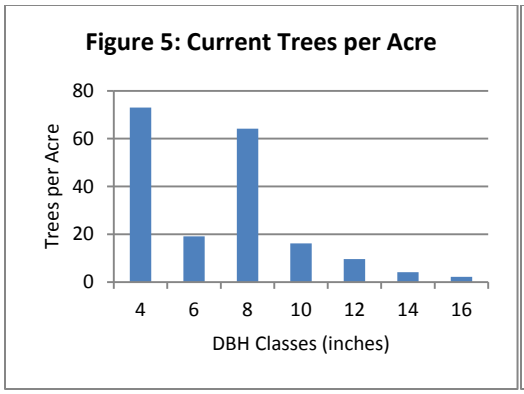
Table 3: Stand Summary*			
	Mean	Standard Deviation	n
Basal Area (ft²/acre)	60	19.2	7
Trees per Acre	188.4	N/A	42
Canopy Cover (percent closed)	54	12	7
DBH (inches)	8.7	3.3	44
Height (feet)	25.4	8.9	44
Kind (1=living, 2=dying, 3=dead)	1.11	0.44	44
Crown Ratio (% of total height with live crown)	6.7	1.5	42
Vigor (1=dominant to 4=suppressed)	2.3	0.87	42

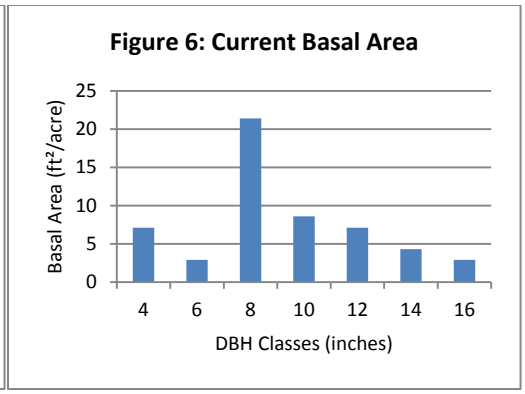
*Everything was calculated through plot level observations, except for trees per acre which was an output of the Forest Vegetation Simulator (version 2.06, Central Rockies Variant).





The last recorded date of a spreading fire (one that impacted multiple stands) at Hall Ranch was 1859 (Brown, 2013) and while the data isn't precise enough to say that this is the last fire that occurred within PA7U5, the data does show that fire stopped being as prevalent on the landscape around then. Due to this lack of fire more juvenile trees were able to reach maturity, resulting in a stand today that is fundamentally different than what the landscape historically supported. As shown in Table 3, the stand currently has over 180 trees per acre, well outside of the historic range of variability (HRV) for this area, which is anywhere from 0 to 64 trees per acre. In addition to the overall trees per acre being outside of the HRV, the diameter class distributions for both trees per acre and basal area shown in Figures 5 and 6 are very different than the diameter class distributions shown in Figures 1 and 2. Currently this stand has far more trees per acre in the lower size classes than it did historically. A similar relationship can be observed in basal area, specifically the high amount of basal area within the 8" diameter class, and the relatively low amount of basal area in the 14" and 16" diameter classes.





4. Desired Stand Condition

A) Management Plan Recommendations

All management plan recommendations are from the North Foothills Open Space Management Plan

The management direction is towards protecting critical resources, encouraging native species over exotic, and maintaining natural processes. Where feasible, a passive approach of letting nature take its course will be utilized. However, active tools such as forest thinning, herbicides, seeding, grazing, rest from grazing, exclusion from grazing, biological weed controls and prescribed fire will also be utilized.

1) General Management Plan Objectives for Vegetative Management (Section 6.0)

- *Protect and properly manage Conservation Areas, Significant Plant Communities, and rare plants.*
- *Manage vegetative communities by maintaining and encouraging desirable native species, restoring degraded areas, and eliminating or controlling undesirable exotic species.*
- *Manage for ecosystem integrity by encouraging and planning for naturally occurring processes, or the simulation of those processes, so they will remain vital components of the ecosystem.*

2) Forest and Grassland Management (Section 6.2)

- *Increase native plants, increase diversity, cover and vigor, control soil erosion, and retain more moisture on site.*
- *Reduce the density of some forest stands to bring these stands back to a more natural density and to decrease the probability of major wildfire, and largescale insect and disease infestations.*
- *Restore natural meadow systems by reducing invasion of conifers.*
- *Retain and perpetuate old-growth forests and woodlands. Retain large diameter trees (generally those over 20" dbh), snags (standing dead) and course woody debris in the understory. Retain a minimum of three snags per acre of 10" dbh for wildlife.*

- *Maintain a mosaic of stand density, size and age for vegetation types, particularly coniferous forests and wood-lands, and foothill shrublands.*
- *Protect and restore riparian habitat. Reduce grazing to a level that allows for the regeneration and establishment of willows, shrubs and cottonwoods in riparian zones.*
- *Manage undesirable vegetation, including noxious weeds, using and integrated pest management approach. Unwanted vegetation may be managed using manual removal, prescribed fire, mechanical, biological, or herbicidal methods. All methods of control will be evaluated to reduce potential adverse effects to human health and the environment.*

The primary tools for active management include: thinning and pruning of forests and woodlands; use of controlled burns; grazing; and weed management.

3) Wildlife Management (Section 7.0)

- *Protect the ecosystem functions of the properties relative to their values within the North St. Vrain and South St. Vrain/Foothills Environmental Conservation Areas, and particularly Coffintop and Central gulches.*
- *Protect and properly manage conservation areas and critical resources.*
- *Protect wildlife habitat by maintaining natural food, cover, nesting sites, resting areas and habitat effectiveness.*

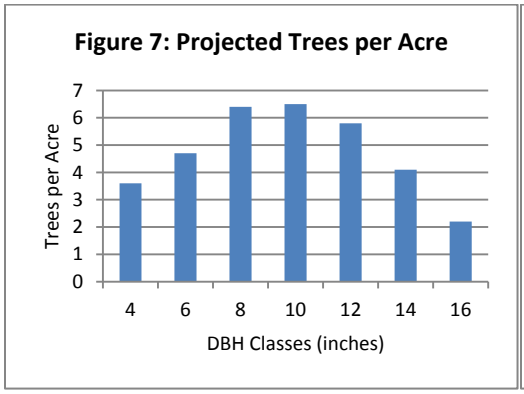
The management direction focuses on three different scales: 1) the context of the property in the landscape of northwestern Boulder County; 2) the ability of the property to function as effective wildlife habitat; and 3) the protection of known significant resources.

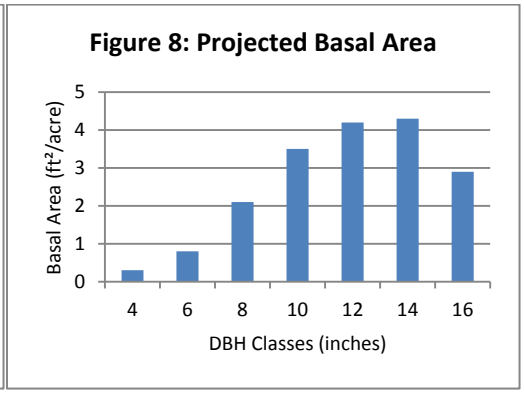
4) Primary Tools

- *Thinning and pruning of forests and woodlands: This management tool is utilized in order to decrease stand density in ponderosa pine forests and maintain open meadows, shrublands and woodlands. It also allows fire to a more effective and less dangerous agent by reducing stand density, maintaining less hazardous fuel types, and eliminating ladder fuels. Thinning will focus on removing understory trees, as well as many seedlings and saplings which would have been killed by historically occurring low-intensity ground fires. Most active forest management will focus on maintaining meadows, shrublands and woodlands. Thinning can be used to reduce fuel loads, bring ponderosa pine stands back to more natural densities, and feather the sharp edges created by thinning operations of the past.*
- *Use of Prescribed Burns: Fire is an important part of grassland, woodland, shrubland and forest ecosystems of Boulder County. Recent research suggests that fires in the foothills burned at an interval of 10-20 years prior to suppression efforts. Many plants and plant communities are influenced by fire or are dependent upon it for germination and growth. Fire burns in a mosaic that creates a diversity of species and densities within a vegetative community. Fire helps return nutrients to the soil. Fire should be used in conjunction with grazing, mowing, thinning and pruning to maintain periodic disturbances in vegetative communities.*

B) POS Forestry-Fire Recommendations

This prescription is focused on forest restoration in that it is seeking to mimic its historic composition through the manipulation of diameter class distributions for both trees per acre and basal area. This project will be targeting specific diameter classes of ponderosa pine for removal in such a way that the post treatment stand structure will resemble the historic stand structure as closely as possible in terms of overall basal area and trees per acre as well as specific diameter class basal area and trees per acre as shown in Figure 7 and 8.





The recommendations meet the forest health and ecosystem objectives of BCPOS and the CSFS. This treatment is designed as a forest restoration treatment, but the recommendations also address the need to reduce fuels for fire. This will meet goals of fuels management of BCPOS, CSFS, Lyons Fire Protection District, and Boulder County Sheriff's and Land Use Departments. This project will also treat vegetation within a high priority area as outlined in the NFOS management plan.

1) **Overall Goals for Hall PA7U5**
   - Emulate pre-settlement forest structure by creating a clumpy, uneven-aged forest structure interspersed with openings that more closely resembles historic conditions.
   - Retain Douglas-fir and Rocky Mountain juniper except where they are ladder fuels for ponderosa pine over 10" dbh.
   - Retain and perpetuate old-growth forests and woodlands.
   - Retain large-diameter trees (generally those over 18" dbh), snags (standing dead) and fallen trees/coarse woody debris in the understory.
   - Reintroduce low intensity surface fire 1-5 years from completion date of mechanical thinning and approximately every 14 years thereafter to mimic the historic fire return interval.
2) **Stand and Finer Level Objectives**
   - Reduce density of ponderosa pine from 188 trees per acre to 33 trees per acre.
   - Reduce basal area of ponderosa pine from 54 square feet per acre to 18 square feet per acre.

- Up to 10% of ponderosa pine 13”- 18” dbh can be removed if it helps to reach overall objectives.

Table 4: Cutting Parameters (Trees per Acre)			
Size Class (dbh)	**Trees to Leave**	**Trees to Remove**	**Percent to Remove**
3”- <5”	3.6	69.4	95%
5” - <7”	4.7	14.4	75%
7” - <9”	6.4	57.8	90%
9” - <11”	6.5	9.7	60%
11” - <13”	5.8	3.8	40%

- At the stand level the cutting will be implemented in a way that will expand existing openings in the interior and exterior of the stand creating openings up to 7 acres.
- At the tree group level, groups of two to thirty-three trees that span one to three diameter classes (not more than four diameter classes) will be left so we can maintain a diversity of diameter classes between groups.
- At the tree level only the most vigorous, fire resistant trees that are capable of surviving wildfire will be maintained.
    - The average vigor of the stand is currently at 2.3, with the goal to reduce it to 1.5.

5. Operational Guidelines

A) Marking

- The unit will be marked as a “leave tree stand.”
- Leave trees will be marked with blue paint at breast height facing the unit interior.
- Retain all pre-settlement (legacy) ponderosa pine, to be marked by green flagging wrapped at breast height.
- Retain all trees over 18 inches dbh, to be identified by the marking crew using dbh tapes.
- Retain Douglas-fir and Rocky Mountain Juniper except where they are ladder fuels for pre-settlement (legacy) ponderosa pine or any ponderosa pine over 10” dbh.
- Create groups/clumps of trees that include 2-33 trees and are centered on existing pre-settlement trees and/or rock outcrops.
- Retain dbh diversity within clumps, favoring vigorous, fire resistant regeneration where it is present outside the drip line of leave trees.
- Retain habitat trees with wildlife nests.
- Maintain all snags greater than 10” dbh.
- Leave in place all old downed logs.

B) Stand Layout

- Unit will be flagged with pink and black “Timber Harvest Boundary” or green “Silviculture Boundary” flagging on the outside edge of the unit
- The northern and eastern boundaries are the Nelson Loop Trail. The southern boundary is an existing access road, and the western boundary is a remnant two-track roadbed.

- Forwarding trails are indicated on the map and marked with yellow/black “Skid Trail” flagging and pin flags.
- Landings are indicated on the map, and will be marked with pink pin flags.

C) Access

- Access by ATV or other equipment on designated routes to be determined by the operating staff, who will determine one designated stream crossing. Suggested forwarding/skid trails are designated on the map and will be marked on site by pink pin flags.
- Equipment is prohibited from wetlands, streams, and springs. These areas are indicated on the map and marked with yellow “Equipment Exclusion” flagging.

D) Slash

- Slash piling will be utilized as the management method to remove coarse woody debris generated during this project.
- Up to 4 tons/acre coarse woody debris will be generated in the unit. (See RMRS-GTR-190 for illustrations of CWD volume.)
- Slash piles will be placed at least 20’ from trails and roads.
- The ideal size of a slash pile after completion is 6’ in diameter and 6’ high.
- Slash piles will not be constructed on common juniper, stumps, downed woody material, or tree boles.
- Slash piles should be at least two times (2x) the height of the pile away from any overhanging vegetation.
- No material larger than 6” in diameter should be placed in a pile.
- No forest litter should be placed in a pile (if it doesn’t have a clean saw cut, it doesn’t belong in the pile).
- Piles should be built tight enough to not allow you to reach into the middle of the pile.
- Slash piles should not be built within 20‘of another pile.

E) Forest Products

- All logs greater than 5” diameter will be limbed and bucked into 8’ bolts.
- Material will be pre-bunched along forwarding trails or laterals.
- Chunkwood is all material greater than 5” diameter but less than 8’ in length. Material of similar length should be grouped together.
- Bolts are material that are greater than 5” diameter at the small end and are 8’ in length.
- All pre-bunches will be forwarded out of the unit and decked perpendicular along access road 1(see map).
- Sorted products listed above will be decked together.
- POS will contract or offer a public firewood sale of the wood that is decked along the access road.

F) Working Conditions

- If plastic limit of the soil is exceeded, then forwarding operations will not occur.
- If access roads are too muddy, then work will not occur until conditions improve to allow vehicle access without excessive road damage.

G) Additional Considerations

- All gates need to be closed and locked after passage.
- Provide a safe work environment when Youth Corps is present during felling operations.

6. Project Impacts

- Management activities may impact the trail system including trail crossing by equipment and/or forwarding operations and operations near trails.
- The road system may be impacted by vehicle traffic and roadside decking. Temporary access roads may be established to the treatment units. Temporary crossings may be established across wetlands/wet meadows.
- Equipment used may have noise impacts for limited periods for park users and wildlife.
- Wildlife may be temporarily displaced by management activities.
- Management may result in increased weed abundance post treatment.

7. Mitigation of Project Impacts

- Signs at the trailheads and in the units will notify users of activities and potential hazards and impacts.
- Trail and wetland crossings will be laid out under advisement from trail, resource protection and plant ecology staff.
- Impacts from forwarding operations will be assessed at the completion of the project.
    - Raking/ripping, seeding, and erosion control will be considered as rehabilitation techniques in heavily impacted areas and/or temporary roads.
- During stand layout, qualified staff will survey for nests and other high value wildlife use and mark those trees and groups for retention.
- Slash pile scars may be rehabilitated with seeding and wood chip/duff applications, as advised by qualified staff.
- Impacts from the decking and firewood removal will be assessed at the completion of the firewood sale.
- Raking/ripping, seeding, and erosion control will be considered as rehabilitation techniques in heavily impacted areas.

8. Monitoring of Post-Project Conditions

- The monitoring and treatment of weeds will be determined by invasive plant staff, with special attention on slash pile sites, forwarding trails, and the decking areas.
- Overstory inventories and photopoints noted with survey pins and GPS coordinates should be recollected within one year of the thinning treatment.
- It is recommended that overstory and limited understory vegetation inventories be completed within five years of thinning treatment, and in five-year increments thereafter. Photopoint plots should be recollected within one year of the thinning treatment.

9. Literature Cited

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10. Appendices