Eastern Sierra Climate and Communities Resilience Project

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Background

The project area is located on approximately 55,000 acres of Inyo National Forest Land, surrounding the Town of Mammoth Lakes (TOML). These acres are primarily on the Mammoth Ranger District and partly on the Mono Lakes Ranger District. The project is bounded to the south by the John Muir Wilderness and to the west by the Ansel Adams Wilderness. The northern and eastern project boundaries are delineated by well-maintained roads such as Deadman Creek Road, Owens River Road, Claypit Cutoff, and other National Forest System Roads. The southeastern project boundary abuts Los Angeles Department of Water and Power land. Specific descriptions for the ecotypes encompassed by the project area precede their proposed actions.

Purpose and Need for Action

Due to the effects of fire exclusion and past management on Inyo National Forest lands, forests have become over dense, possess continuous and elevated fuel loading, non-fire and drought resistant tree composition, and homogenized spatial structure. For most of the project area, these conditions are not in line with the stated Desired Conditions of the Land Management Plan for the Inyo National Forest (LMP) or within the historical range of variation. Higher than historically present tree densities increase competition for limited water resources leading to more severe drought stress and degraded forest health. Tree composition has become dominated by fire intolerant species reducing the short-term resistance and long-term resilience of the forests to fire. Surface and ladder fuels are also at a much higher density than historically was present creating the conditions for high severity crown fires. Specifically, forests surrounding the TOML currently have high forest densities and structures that make them susceptible to an uncharacteristically large, high-severity wildfire, drought stresses, and widespread bark beetle mortality, all of which pose a major risk to lives, property, natural resources, and the economic viability of the TOML and the Eastern Sierra Nevada.

Wildfire risk analysis in the LMP identified a high concentration of Community Wildfire Protection Zone (CWPZ) and General Wildfire Protection Zone (GWPZ) acres, 23,720 and 22,121 acres respectively, comprising 82% of the total project area. The CWPZ encompasses locations where communities, community assets, and private land could be at a very high risk of damage from wildfire where high fuel loadings exist and are in close proximity to the Forest boundary. Wildfires that start in this zone contribute more to potential loss of community values and assets than any other strategic fire management zone. The GWPZ identifies where conditions currently put some natural resource and/or community values at high risk of damage from wildfire. Wildfires in this zone will likely have negative effects on natural and community resources due to the degraded condition of forest ecosystems associated with the absence of several natural fire cycles. The abundance of acres classified as CWPZ and GWPZ demonstrates the urgent need to create forest conditions for low to moderate fire severity around the TOML and within the project area through vegetation management.

The best available science published clearly demonstrates the need for a reduction in forest fuel loading and restoration of forest structure, composition, and diversity (Larson and Churchill,

2012; Malleck et al, 2013; North (Ed.) 2012; North et al., 2022; Stephens et al. 2012). Fires have become uncharacteristically large and severe and are projected to continue to do so without intervention. It also makes clear the beneficial effects forest treatments have on firefighting operations such as reducing flame lengths, fire spread rates, and erratic or explosive fire behavior (Agee and Skinner, 2005; Safford et al, 2009).

There is an urgent need to treat these forests on an increased pace and scale to manage the current environment of large, high severity fires. A major objective of the LMP is to restore at least 20,000 acres of terrestrial ecosystems within the next 10 to 15 years of plan approval (TERR-FW-OBJ 01), particularly surrounding communities (MA-CWPZ-GOAL). This project marks a significant advance in bringing us closer to these objectives and Desired Conditions of the LMP. There is also a desire to utilize prescribed fire for forest management and restore fire as an essential ecosystem process (TERR-MONT-DC 02). The majority of the forest in the project area is severely departed from its historical fire regime and is experiencing decreased fire frequency because of aggressive fire suppression in combination with past forest management. This has led to denser, more uniform vegetation and an accumulation of high levels of hazardous fuels, and as such are not suitable for safe and effective prescribed fire entry. This densification and accumulation of fuels, especially in forests that historically burned frequently such as those found in the project area, promotes more severe and undesirable fire effects. Fuel reduction and forest structure management actions from this project are required to create safe conditions for reestablishing natural fire regimes and restoring fire-dependent forest ecosystems and biodiversity surrounding the TOML.

Forest thinning and fuel reduction will enable the protection of private and public assets; the safe and effective implementation of prescribed fire; the use of wildland fire for multiple resource benefits and not require immediate suppression; as well as improve forest health, restore habitats, and increase resiliency to insects, disease, and wildfire. This will shift current vegetation conditions towards their Desired Conditions identified in the Inyo National Forest Land Management Plan.

Proposed Action

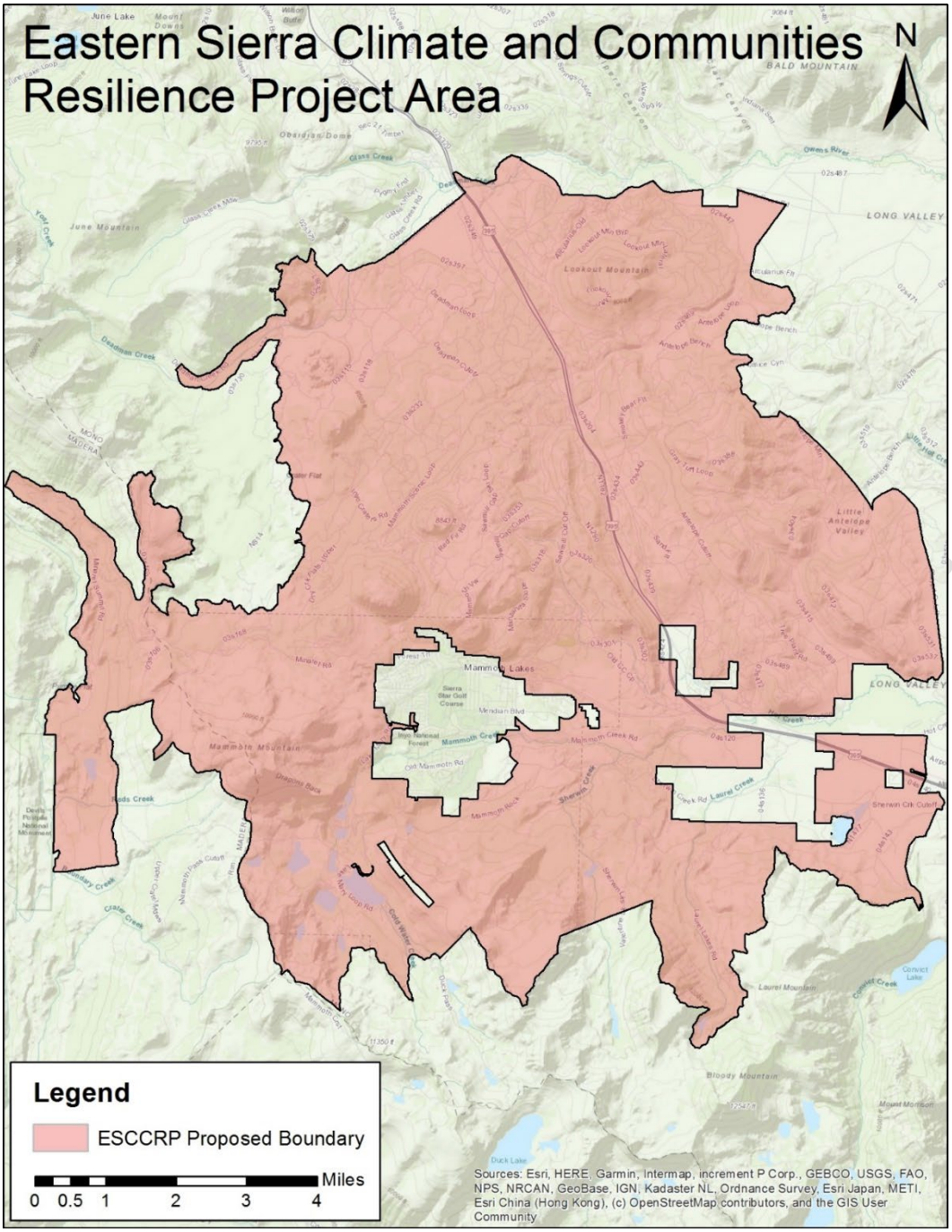
To meet the project's purpose and need, the Inyo National Forest proposes to restore forest structure and composition by reducing tree densities and fuel loading, increasing stand structural heterogeneity, and enhancing forest resilience and diversity across approximately 56,000 acres:

- Cultural Resource Stewardship Opportunities such as pinyon-juniper forest health treatments and cultural site fire resistance enhancements.
- Community Wildfire Protection Zone Buffer establishment around community assets and intensive fuel reduction activities.
- Jeffrey pine, Dry Mixed Conifer, Red fir, and Lodgepole pine fuel reduction and forest restoration, including live and dead tree cutting and removal of large hazardous fuels from the forest floor.

- Aspen and meadow restoration including tree cutting and removal of large hazardous fuels from riparian channels, aspen stands, and meadows.
- Remove encroaching conifers from sagebrush shrublands to improve sage-grouse habitat.
- Whitebark pine restoration and/or enhancement treatments including removing snags, fuel reduction, and live conifer thinning.
- Hand labor and/or mechanized equipment will be utilized where effective and appropriate to implement these proposed actions.
- Existing and activity generated biomass will be piled to be burned in some cases or in others chipped.
- The removal of material may also occur through sales, instead of piling, such as, but not limited to timber, biomass, or fuelwood sales.
- Some treatment units may have activity generated materials left on the forest floor or in log decks for public fuelwood gathering. These areas would implement special considerations to ensure public safety and accessibility such as flush cutting stumps and removing snags.

The project area covers a diverse range of special management concerns and current conditions in addition to those listed. Maps presented below are only modeled estimates and require surveys and ground truthing to determine the actual conditions. Implementation of this project will follow the Decision Matrix after a determination of current conditions have been made. See Proposed Actions for more details including general forest proposed actions and specific proposed actions by emphasis area are outlined in further detail.

Maps



Land swaps

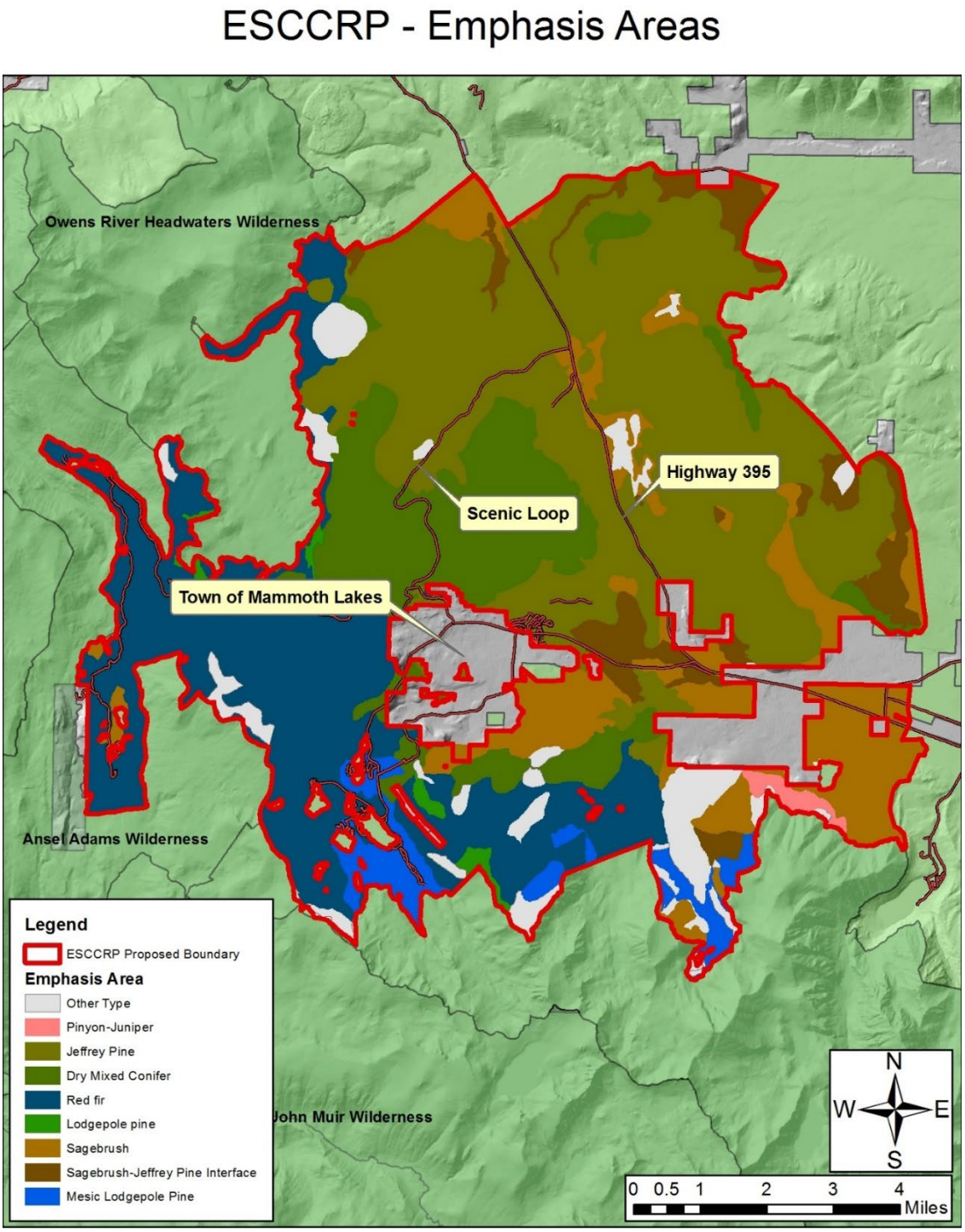


Figure 1 Modeled estimates of major ecosystem types are delineated into Emphasis Areas for the project. The table below lists acreage by forest types displayed on the map.

TEUI Vegetation Type	Acres
Jeffrey Pine	20,609

Red fir	12,785
Dry Mixed Conifer	7,932
Sagebrush	6,473
Sagebrush-Jeffrey Pine Interface	2,670
Wet Lodgepole	1,839
Lodgepole pine	508
Pinyon-Juniper	286
Other Type	3,226

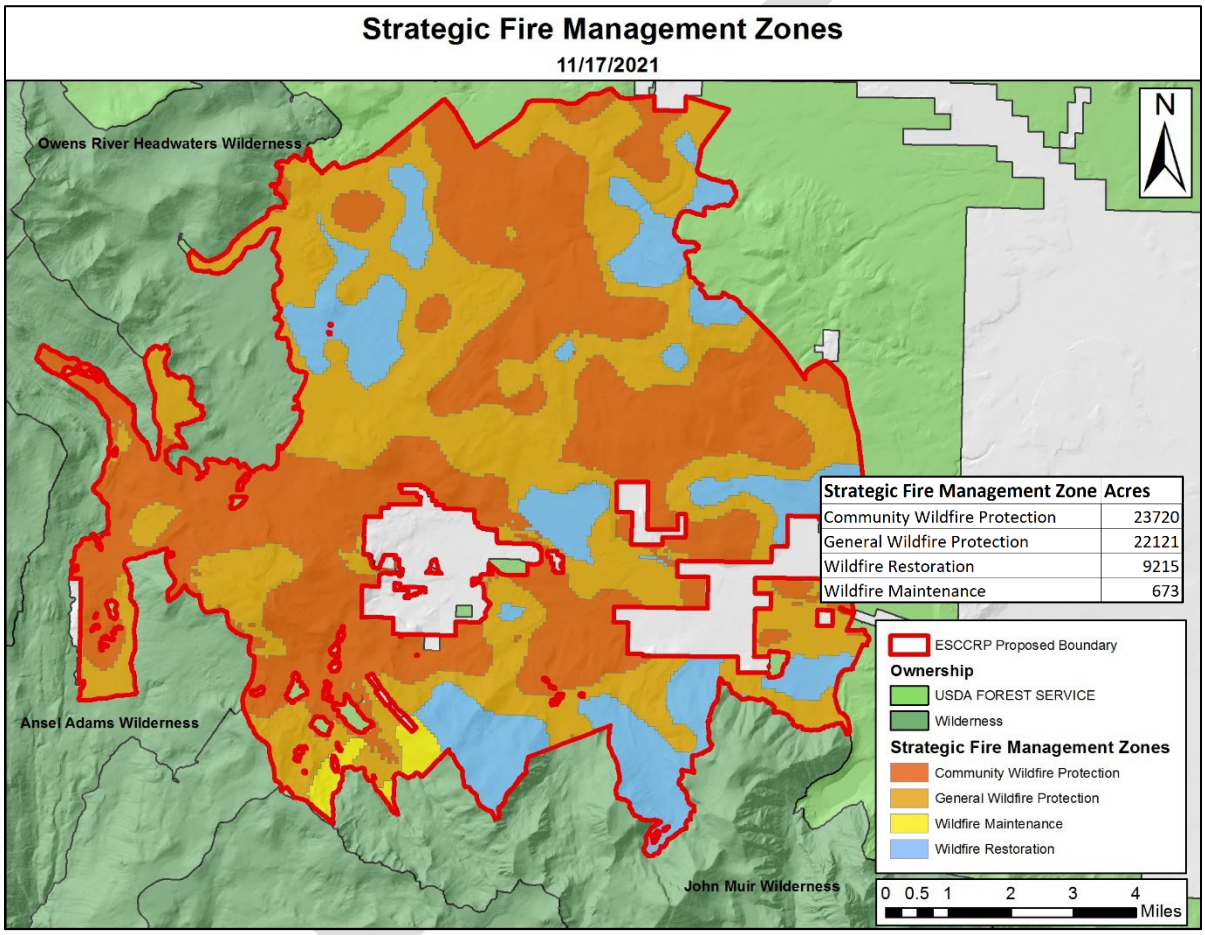


Figure 2 Strategic fire Management Zones are delineated within the project area. Over 80% of the project area is within the Community Wildfire Protection or General Wildfire Protection zones which are the two most at-risk zones.

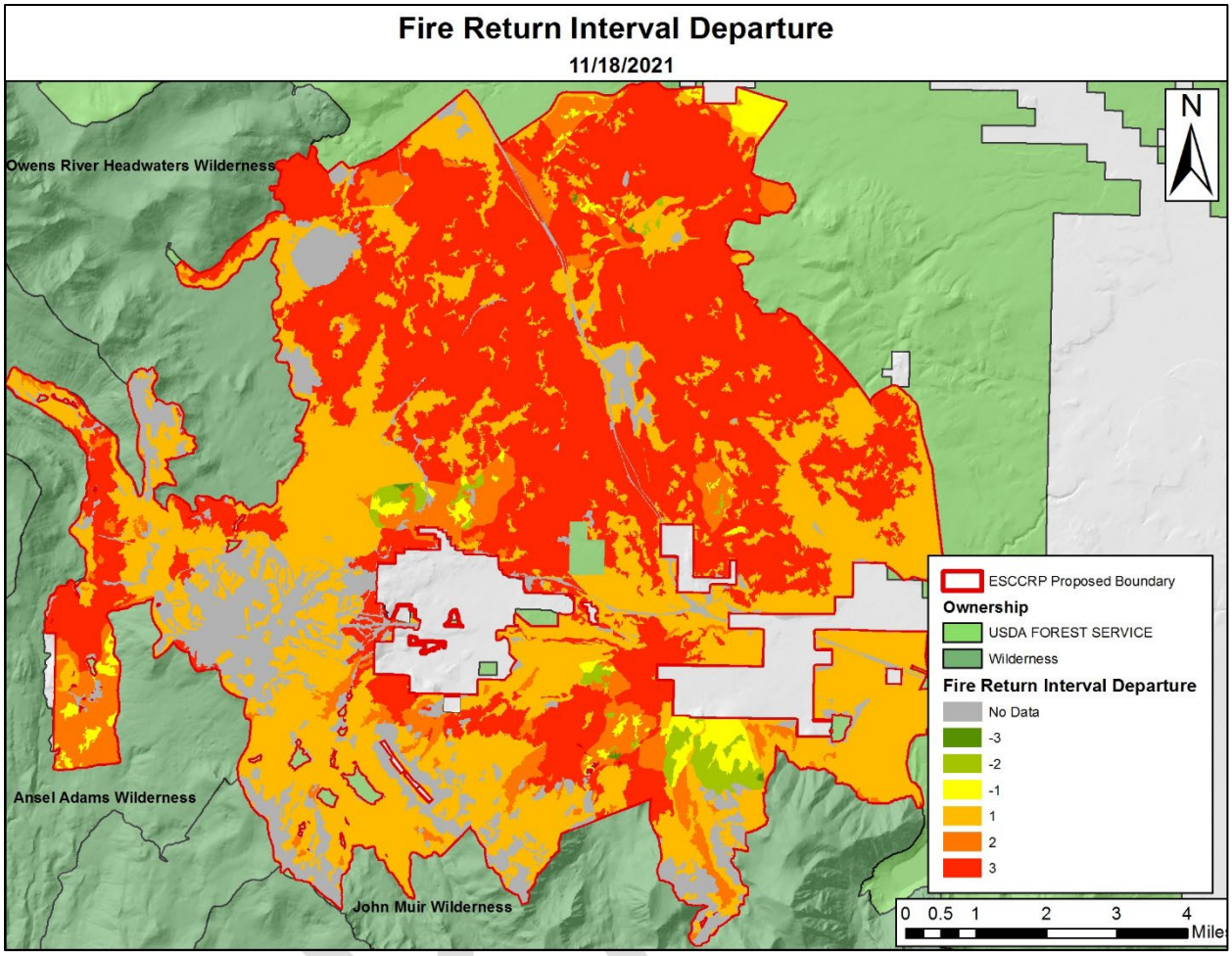


Figure 3 The fire return interval departure for the project area. A more positive number and correspondingly darker red color represents land that has gone longer without fire compared to what was historically present. An increasingly negative number and correspondingly darker green represents more fire than was historically present.

Definitions

BA – basal area, a measurement of the cross-sectional area (ft^2) of a tree's stem at DBH, usually expressed per acre by averaging the basal area of a representative sample of trees in a given area and extrapolating to an acre.

Composition – The diversity and abundance of tree species in a given area.

Desired Conditions – From LMP, terrestrial dc……

Structure – The horizontal and vertical arrangement of forest components (live trees, snags, downed logs.

CWD – coarse woody debris, a general classification of non-green biomass of larger diameters.

DBH – diameter at breast height, a measurement of tree diameter taken at 4.5 feet above the ground.

ICO – Individuals, clumps, and openings, a description of forest structure that emphasizes these three desired structural components in their horizontal spatial arrangement within a post-treatment forest (Appendix B).

INF – Inyo National Forest.

HIP – Pull out key definitions from the phasing approach

LMP – Land Management Plan.

NRV – Natural range of variation, a description of an ecosystem's characteristics usually based on observations of pre-Euro-American settlement conditions.

Stocking – A measure of a forest's density, measured as basal area per acre, trees per acre, or other relative or absolute measures of stand density. Forested stands exceeding stocking standards for a management objective are deemed "overstocked" and those under are "understocked".

Protection Zone –

Protection Zone Buffer –

PMA – Potential management approaches, as defined for the relevant section in the Land Management Plan.

TOML – Town of Mammoth Lakes.

General Project Forest Proposed Actions

The following treatment methods and operational constraints would be used throughout the project area, except where explicitly precluded by emphasis area management actions:

Treatments and Constraints per diameter class:

- Live trees less than or equal to 30 inches in diameter will be thinned as part of this project but the majority of trees to be thinned will be less than 20 inches DBH (TERR-FW-STD 01).
- Live trees over 30 inches but less than 40 inches in DBH may only be removed under the specific circumstances in TERR-FW-STD 01:
    - When public or firefighter safety is threatened and cannot be otherwise mitigated (relevant to all tree diameters including those exceeding 40 inches).
    - When removing trees is needed for aspen or meadow restoration treatments or for cultural or Tribal importance.
    - When required for equipment operability: individual trees less than 35 inches in diameter may be removed when they cannot be reasonably and feasibly avoided.
    - In overstocked stands to favor retention or promote growth of even larger or older shade-intolerant trees to more effectively meet tree species composition and forest structure restoration goals.
    - If removing trees over 30", reasoning will be documented.
- Live trees over 40 inches in diameter will not be removed as part of this project.
- All trees exhibiting old-growth characteristics (typically largest diameters, thick, platey, or segmented bark, large diameter branches, and a flattened top or irregularly shaped crown), including those with wildlife structures will be protected and enhanced by removing all trees under and within 15 feet of the drip line of the large and old tree(s), which may act as a fuel ladder and represent increased competition for resources (TERR-OLD-GDL 01).

Snags

- Generally standing dead trees or 'snags' over 12 inches will be retained unless it is required to meet snag density standards, fuel loading standards, or they pose a hazard to infrastructure, workers, or the public (SPEC-SMPF-GDL 01, TERR-OLD-GDL 02, TERR-FW-GDL 01 & 02)
    - Dead trees under 12 inches will generally be removed to reduce or maintain desired fuel loading.
    - If a tree is deemed a hazard tree there will be no diameter cap.
    - Snags that contain nests, dens, or other wildlife-built habitat structures will not be removed (See Expected Design Feature: Wildlife).

Coarse Woody Debris or Other Dead and Downed Wood

- Downed logs under 15 inches may be removed. Downed logs over 15 inches will be retained except:

- When removal is required to meet desired conditions or other plan components in the Land Management Plan such as TERR-OLD-DC 07, TERR-FW-GDL 02, or TERR-MONT-DC Table 3.
- When removal is required for equipment operability or if they are located such that they pose an excessive fire hazard.

Operations

- Mechanical equipment would be allowed across the entire project area except where it is excluded for resource protection, such as but not limited to wet meadows, riparian areas, sensitive natural and cultural resources, invasive plant infestations, etc.
    - Ground-based logging equipment, such as but not limited to, skidders, feller bunchers, processors, and forwarders may be used where not precluded.
    - Helicopters or other non-ground-based logging equipment will be used primarily where other ground-based logging equipment are precluded.
    - The project manager would consult the relevant specialists and implement the relevant design features if logging equipment is desired in the project area.
    - Ground-based logging equipment may be used on slopes greater than 30% only in consultation with the soils specialist (Expected Design Feature: Soils).
- Landings, temporary roads, and bridges may be created to expedite fuels reduction work and will be decommissioned and rehabilitated as soon as operations conclude. Where these are desired, the project manager would consult with the soils, watershed, or equivalent specialist (Expected Design Feature: Soils).
- Merchantable and non-merchantable activity generated materials, generated by these fuel reduction and forest restoration activities, will be removed from the forest to meet fuel loading desired conditions as follows:
    - Allow for commercial timber and/or other wood product sales within the project area where feasible, and where operations will not irreversibly cause a detrimental impact to the natural resource (TIMB-FW-DC 02).
        - Removal of timber may occur using ground-based, skyline, or aerial timber systems.
        - Prioritize commercial sales to achieve thinning and fuel reduction when within the Suitable Timber Base as designated in the LMP (TIMB-FW-DC 01, TIMB-FW-OBJ 01).
        - Emphasize the use of mechanical equipment such as feller-bunchers where possible as these are more effective at meeting forest spatial heterogeneity objectives.
    - Non-merchantable activity fuels will be removed by piling and burning or chipping and/ or removal from the site when pile and burning is not feasible.

    - If fuel loading is sufficiently low for prescribed burning to achieve desirable fire effects as determined by the fire ecologist or other relevant specialist, then fuels may be left in place.
- Opportunities for public fuelwood collection will be allowed as appropriate.

Other Constraints

- When within community buffer areas, as established within the Community Wildfire Protection Zone or where the risk is deemed unacceptable to life and property, trees, snags, and logs may be removed more intensively, and terrestrial ecosystem desired conditions may not be met to protect communities and ensure firefighter safety (MA-CWPZ-GOAL 01 and 02).
- Trees targeted for removal will be characteristic of Acceptable or Non-Desirable trees (Appendix D).
    - Trees displaying signs of drought stress will be removed where possible.
    - Trees displaying signs of pests such as pitch tubes, flagging branches, or fading tops will be targeted for removal.
- Trees > 20" with existing cavities, dead tops, lightning scars, or structures beneficial to wildlife, and any trees with raptor nests, are considered desirable and should be retained.

Maintenance of Treatments and Reentry

- Reentry may occur if:
    - It is deemed necessary to reduce potential for undesirable fire behavior.
    - Units have not been broadcast burned within the reentry timeframe of treatment and:
        - fuels conditions are outside NRV or
        - are such that a broadcast burn would not achieve ecologically desirable fire effects.
    - No broadcast burn will occur in that unit and maintenance of initial treatment is required.
    - To address ongoing levels of tree mortality outside NRV and/or desired conditions.
- Retreatments of previously treated units will be in line with actions as proposed in this document to achieve the same desired conditions.
- Within meadows, reentry or maintenance of treatments occur when density of conifer encroachment or fuel loading has become unacceptable, or fire effects would be undesirable.
- Approximate reentry timeframes are given below in Table XX; for those Emphasis Areas not listed, reentry will be based on site evaluations by specialists if determined site characteristics are no longer in line with desired conditions.

Emphasis Area	Approximate Reentry Timeframe	References
Community Wildfire Protection Zone	3 – 10 years	Evans et al. 2011; Safford et al. 2012; Vaillant et al, 2015;
Jeffrey Pine	5 – 40 years	Hugh and Jens, 2017
Dry Mixed Conifer	5 – 50 years	Hugh and Jens, 2017
Red Fir	9 – 55 years	Meyer and North, 2019
Lodgepole Pine	9 – 55 years	Meyer and North, 2019
Riparian / Aspen	5 – 55 years; depends on surrounding forest type	Van de Water and North, 2010
Meadow	5 – 50 years	Gross and Coppoletta, 2013
Sagebrush and Sagebrush-Jeffrey Pine Interface	15 - 85	Van de Water and Safford, 2011

Emphasis Areas

Community Wildfire Protection Zone Buffer

The community wildfire protection zone encompasses locations where communities, community assets, and private land could be at a very high risk of damage from wildfire where high fuel loadings exist. There is a general recognition in this zone of surface and ladder fuels being too high, homogenous forest structure, not enough big trees, and all trees experiencing elevated levels of drought stress and mortality. Within this zone, community buffers will be established and used to strategically mitigate vegetation directly adjacent to structures and allow for safer conditions for firefighters.

Treatments within the buffer will intensively remove surface, ladder, and canopy fuels. Surface fuels are highest priority to be targeted as these are necessary to carry fire. They will be removed through piling and burning either by hand or mechanically and/or chipping and removal of fuels, where it will effectively reduce fuels. Ladder fuels will be next for priority to reduce the likelihood of surface fires carrying into the canopy and creating a dangerous, high severity fire. These trees will be cut by hand or mechanically or masticated. Lastly, over-dense canopy fuels combined with high surface fuel loading create conditions for dangerous crown fires that can kill large swaths of trees and make firefighting operations difficult and dangerous. Trees will be thinned, and heterogeneous forest structure will be restored to reduce canopy continuity. Snags or trees that pose a hazard to firefighting operations will also be removed where deemed necessary to protect firefighters and the public. All three fuel categories may be treated with a single entry.

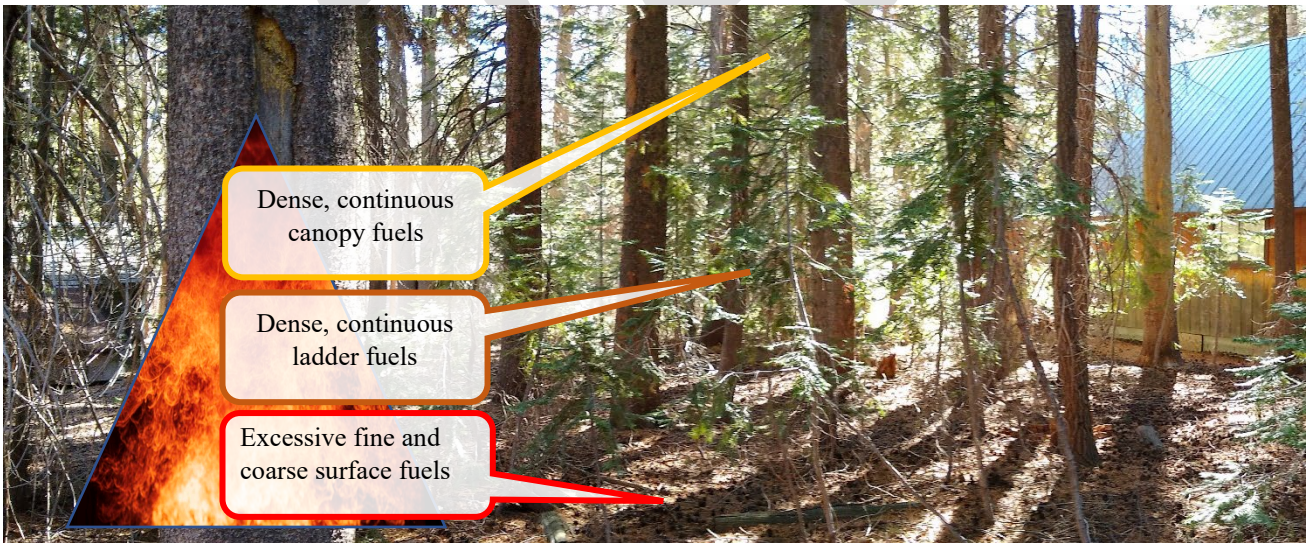


Figure 4 High fuel accumulations surrounding a house within the Community Wildfire Protection Zone Buffer. The priority for fuel treatments is surface, ladder, and then canopy fuels. Photo by: Marc Meyer.

Fuel management

- Establish a community buffer with a minimum width of 230 feet from community structures within the zone (LMP 2019; Safford et al. 2012) and should extend to a feature on the landscape that supports firefighting operations.
    - Buffer width will be established on a site-by-site basis after survey and modeling efforts.
        - Larger buffers may be established where more time is needed for firefighting resources to arrive, on steeper terrain, or where the fuel type or forest is conducive to high intensity fire severity.
        - Smaller buffers may be established close to firefighting resources, on flat terrain, or where the fuel type is conducive to low severity fire effects and low intensity fire.
    - Remove all snags within 2.5 tree lengths of structures and reduce large logs to 1 per acre within 2.5 tree lengths of structures within the buffer (MA-CWPZ-GDL 01).
    - Surface fuel loading should be reduced to less than or equal to 5 tons/acre within the buffer, depending on moisture availability of the site and likelihood of detrimental fire effects.
    - Reduce ladder fuels and living trees which connect surface fuels to the canopy.
    - Remove trees which are dead or dying from insect outbreaks or are infected by pathogens, create an unacceptable risk to life and property, or will in the future within the buffer (MA-CWPZ-DC 01).
    - Create a heterogeneous spatial pattern of openings, individuals, and clumps, but emphasize a larger proportion of openings followed by individual trees over small clumps within the buffer.
        - Post-treatment forest structure may be more open and less dense than forest outside the community buffer area (MA-CWPZ-DC 01).
    - Prune residual trees to increase average canopy base height, to at least 15 ft within the buffer; prune higher when determined necessary by specialist input (MA-CWPZ-DC 01).
    - Higher fuel loadings may be allowed on a site-specific basis, after consultation with specialists or District Ranger approval.

- Protect remaining old-growth trees (typically large diameter, thick, platey or segmented bark, large diameter branches, and a flattened top or irregularly shaped crown), including those with wildlife structures, by removing all trees less than 30 inches in diameter under and within 15 feet of the drip line of the large and old tree(s), which may act as a fuel ladder and represent increased competition for resources (TERR-OLD-GDL 01).
    - Trees larger than 30 inches but smaller than 40 inches may be removed under the exceptions in TERR-FW-STD 01
- Outside the community buffer, follow actions described for the Ecosystem Type Specifics.

Special Habitats

Special habitats are generally small-scale geologic or vegetation types that support unique assemblages of plants and animals, including at-risk species. Within the project area, pumice flats/dry forb (e.g. Smokey Bear Flat) and alkali meadows are the primary special habitat types. The objectives of proposed actions are to maintain or enhance composition, diversity, and structure in these areas (TERR-SH-DC-01).

In addition to protection/avoidance measures identified in the botany design criteria section, implement enhancement measures where appropriate (TERR-SH-STD 01), such as:

- Retain higher tree and/or shrub densities in a buffer around special habitats to discourage incursion by OHVs, especially where system routes pass close to the edge of special habitats.
- Use large treatment-generated logs to delineate routes that pass through special habitats or block access at the edge of special habitats. If needed, large boulders or other barrier methods could be installed in problematic locations.
- To promote restoration of native plant species in disturbed areas, ameliorate the disturbance and spread local seed or install container plants grown from local seed.

Cultural Resource Stewardship Opportunities and Traditional Tribal Uses

As part of this project, several Cultural Resource Stewardship Opportunities (CRSOs) have been identified. These opportunities are where mutual benefits arise for Tribes and Forest Service managed land. The objective with these actions is to limit the widespread usage of flag-and-avoid style protection features, work cooperatively with Tribes to properly restore or protect cultural resources, and increase the overall fire resistance and resilience as outlined in the purpose and need. These opportunities should be implemented when encountered or identified in operational units during implementation of these proposed actions in consultation with INF heritage professional. They may also constitute their own implementation project if specifically identified and / or requested to be treated.

Protect or increasing piagi harvest where possible.

More intensive / extensive fuel breaks around heritage sites?

While the map shows 250 acres, we believe there are more acres in the project area than this. Pinyon pine gathering site improvement. Reduce fire risk, reduce root rot risk, increase tree vigor? Historical densities?

Aspen work? Protect arborglyphs?

Jeffrey Pine Ecosystem

These forests generally occur in the NE portion of the project area, where soils are shallower and less productive, sometimes interfacing with Sagebrush or Pinyon-Juniper ecotypes. They transition into the Dry Mixed Conifer, Red Fir, and Lodgepole Pine forest types around TOML, moving from the NE to SW. This ecosystem type comprises the majority of the project area and represents the most departed fire regime.

Jeffrey pine forests in the project area currently contain an overabundance of trees; in particular, 12-to-30-inch diameter trees. These trees create fuel conditions for undesirable, high-severity fire effects in the project area and around TOML. However, the larger end of this diameter range presents an opportunity to recruit the next cohort of large trees which will add to and replace the currently small population of pines greater than 30 inches across the Jeffrey pine ecosystem type. Thinning trees on the lower end of the diameter range also releases medium and large diameter trees; residual tree's vigor increases when surrounding trees are cut down and resource availability increases (water and nutrients). Some stands within the project area currently contain large diameter trees which will be retained and targeted for release and increased fire resistance through cutting small trees. Jeffrey pine beetle (*Dendroctonus jeffreyi*) has started to cause mortality in pockets in the project area and tree density reduction would reduce the risk of bark beetle-related mortality. Preliminary field observations measured basal areas twice as high as was historically documented in many of these mortality pockets.

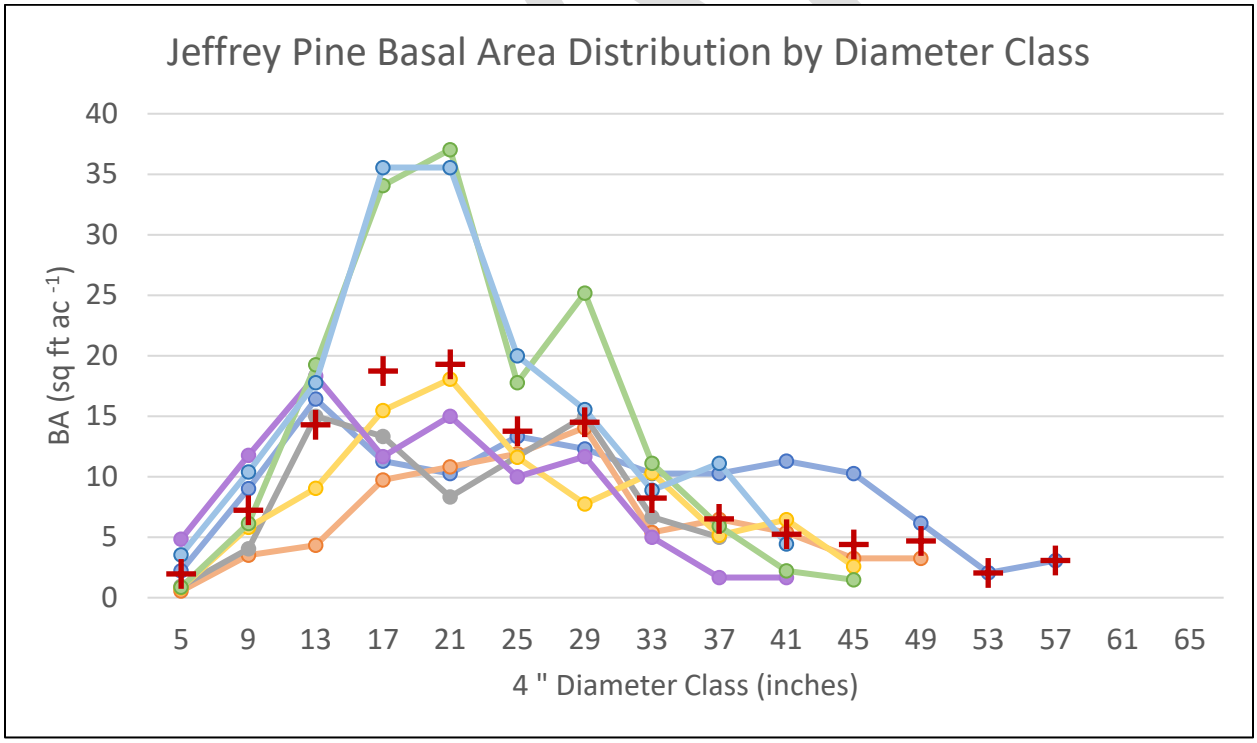


Figure 5. Distribution of basal area per acre by diameter class for forests identified as Jeffrey Pine ecosystem type. Each line represents common stand exam data for a stand identified as Jeffrey pine, plus signs are stand averages. Most basal area is contained in the diameter classes between 9" and 29". Common stand exam data collected in 2020.

The legacy of past management activities such as fire exclusion and past timber harvest have homogenized forest structure both vertically and horizontally. Continuous fuel profiles are commonly observed within the project area from the ground to the canopies of large and old trees as well as an increasing deficit of clumps and openings areas where canopy bulk densities are low. Species composition has incorporated a larger proportion of fire intolerant and drought intolerant trees, reducing future forest resiliency in the face of climate change and an increasing number of high severity fires.

The goals for treatments in Jeffrey Pine forest type is to promote forest structure and composition that improves the health and vigor of existing Jeffrey pine, improves fire resistance and resilience, and maintains or increases wildlife habitat.

Forest structure

- Size distribution should be shifted towards having the majority of trees in intermediate to large size classes (TERR-OLD-DC Table 4).
    - To increase tree vigor and recruit trees into larger diameter classes that are more fire resistant:
        - Basal area per acre will be reduced to less than 100 ft^2/acre on average but may range at the fine scale across the treatment units from 20 – 200 ft^2/acre (TERR-JEFF-DC 01, 03, 05).
            - Topographic features that support more biomass may exceed 100 ft^2/acre, up to 200 ft^2/acre.
            - Stands with 20 or more trees per acre with > 30” dbh may have up to 200 ft^2/acre.
        - Emphasize retaining all trees over 20” where basal area targets can still be met, and operational safety can be maintained.
    - All cutting of Jeffery Pine will focus on trees smaller than 20” in diameter
- Create irregularly shaped openings in forested stands 0.1 – 1.0 acres in size where residual tree cover is 10% or less (TERR-JEFF-DC 03, 07).
    - Openings will be created on 10 – 70 percent of the treatment area (TERR-JEFF-DC-07).
    - These opening can be aligned with existing rock outcrops or patches of grass, shrubs, and seedlings.
- Across no more than 10% of each stand, retain clumps of trees (3 – 12 trees), where stems are within 20’ of another tree in the clump (TERR-JEFF-DC 03, 06).
    - Clumps should be scattered throughout the treatment unit and, to the extent possible, aligned with microsite features that can support the clump.
    - Trees to be retained in clumps should be healthy and vigorous
    - Basal area where clumps are present should not exceed 200 ft^2/acre
- Forest between clumps and openings (forest matrix) should be thinned so the majority of crowns are not touching, or tree canopy cover does not exceed 40% (TERR-MONT-DC, Table 2; TERR-JEFF-DC 01, 03, 06).

    - Individual trees in the forest matrix should be randomly distributed and not evenly spaced (avoid a park-like setting; TERR-JEFF-DC 03).
    - Forest matrix residual basal area may range between 20 – 100 ft^2/acre
    - Some residual, individual trees should possess structures that may provide wildlife habitat. Such structures may result from damage from pests, pathogens, fire, lightning, or other natural processes (TERR-JEFF-DC 04; Appendix B for examples).
- Preferentially remove low vigor, small diameter, and / or fire and drought intolerant tree species where possible.
    - White fir (*Abies concolor*) and lodgepole pine (*Pinus contorta*) are two fire and drought intolerant trees to be preferentially removed.
    - White fir may be retained where its live crown ratio is greater than 50 percent, DBH is greater than 16 inches, branches support healthy, green needles along a large portion of the branches, and crown form is healthy.
- Trees exhibiting the following undesirable characteristics are likely to be of low vigor and should be removed first to meet basal area and structure desired conditions:
    - Live crown ratio less than 35%.
    - Currently exhibiting bark beetle signs or symptoms.
    - Currently exhibiting *Heterobasidion* root rot signs and symptoms.
    - Hawksworth dwarf mistletoe rating greater than 2.
    - Trees less than or equal to 6-inch dbh either adjacent to a tree with a DMR of 3 or exhibiting any sign or symptoms of dwarf mistletoe.
-

Fuel management

- Protect remaining old-growth Jeffrey pines (typically large diameter, thick, platey, orange bark, large diameter branches, and a flattened top or irregularly shaped crown), including those with wildlife architecture, by removing all trees under and within 15 feet of the drip line of the large and old tree(s), which may act as a fuel ladder and represent increased competition for resources (TERR-OLD-GDL 01).
    - Trees larger than 30 inches but smaller than 40 inches may be removed under the exceptions in TERR-FW-STD 01
- Reduce surface fuel loading to between 1 and 10 tons/ac, including large diameter logs, coarse woody debris, litter and surface fuels (TERR-MONT-DC, Table 3).
    - Several logs over 15" in diameter and 8' long should be retained per acre.
    - Remaining surface fuels may be arranged in a manner that would facilitate complete broadcast burning of the unit.
- Maintain snags 20" in diameter or larger, where they can be safely maintained at 1 – 4 snags per acre (TERR-MONT-DC, Table 3).
    - Target standing dead trees, less than 20 inches in diameter, for removal and CWD fuel reduction.
    - Snag distribution will be irregular across the project area.

General Wildlife Protection Zone

- When within the GWPZ or adjacent to infrastructure or community assets, treat to minimize fuels and enhance public and firefighting safety while staying within terrestrial ecosystem desired conditions for the emphasis area.

Dry Mixed Conifer Ecosystem

The Dry Mixed Conifer ecotype is predominately situated between the Jeffrey Pine and Red Fir forest types where increasing elevation allow for more moisture availability but still represents some limited productivity and frequent fire. This increased moisture also means greater tree diversity such as white fir and lodgepole pine, but still dominated by Jeffrey pine. The Dry Mixed Conifer forest type is primarily north of the TOML and transitions into Red Fir to the west, but also in small pockets around the town.

Some areas, such as along the Mammoth scenic Loop to Inyo Craters and around the Valentine Reserve Ecological Study Area and Lakes Basin, where Dry Mixed Conifer transitions into Lodgepole Pine, tree densities have reached more than double the basal area per acre historically documented in these forests. This has led to insect outbreaks and mass mortality of trees of all sizes. These conditions are also a major risk for high severity wildfire and severely threaten the TOML. A consideration for the regeneration of these forests' composition and structure is required to ensure tree regeneration leads to these forests achieving our Desired Conditions.

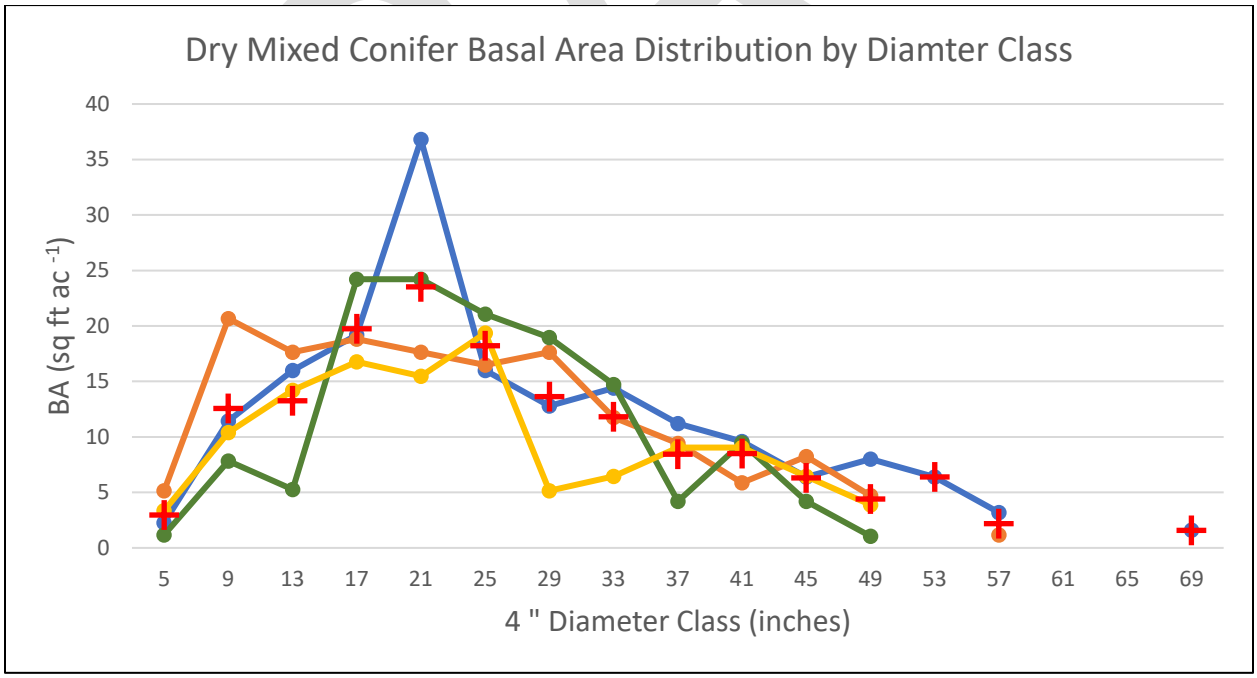


Figure 6 Distribution of basal area per acre by diameter class for forests identified as Dry Mixed Conifer ecosystem type. Each line represents common stand exam data for a stand identified as Jeffrey pine, plus signs are stand averages. Common stand exam data collected in 2020.

The goal for treatments in the Dry Mixed Conifer forest type is to promote forest structure and composition that improves the health and vigor of existing Jeffrey pine and white pines, and where desirable, white fir and lodgepole pine. Also, to improve fire resistance and resilience, maintains a fire resistant and drought tolerant composition, and maintain or increase wildlife habitat. Basal area at the stand and forest level will vary in order to restore the historical heterogeneity and create structural diversity.

Forest structure

- Size distribution should be shifted towards having the majority of trees in intermediate to large size classes (TERR-OLD-DC Table 4).
    - To increase tree vigor and recruit trees into larger diameter classes that are more fire resistant:
        - Basal area per acre will be reduced to less than 125 ft^2/acre on average but may range at the fine scale across the treatment units from 20 – 200 ft^2/acre (TERR-DMC-DC 04).
            - Topographic features that support more biomass may exceed 125 ft^2/acre, up to 200 ft^2/acre.
            - Stands with 20 or more trees per acre with > 30" dbh may have up to 200 ft^2/acre.
        - Emphasize retaining all trees over 20" where basal area targets can still be met, and operational safety can be maintained.
- Create irregularly shaped openings in forested stands 0.1 – 0.5 acres in size where all trees less than 30" in diameter are removed and residual canopy cover is 10% or less
    - Openings will be created on 10 – 50 percent of the treatment area (TERR-DMC-DC-05).
    - These opening can be aligned with existing rock outcrops or patches of grass, shrubs, and seedlings.
- Across no more than 20% of each stand, retain clumps of trees (3 – 16 trees), where stems are within 20' of another tree in the clump (TERR-DMC-DC 03)
    - Clumps should be scattered throughout the treatment unit and, to the extent possible, aligned with microsite features that can support the clump.
    - Trees to be retained in clumps should be healthy and vigorous
    - Basal area where clumps are present should not exceed 200 ft^2/acre
- Forest between clumps and openings (forest matrix) should be thinned so the majority of crowns are not touching, or tree canopy cover does not exceed 50% (TERR-MONT-DC-01, Table 2 TERR-DMC-DC 03, 04).
    - Individual trees in the forest matrix should be randomly distributed and not evenly spaced (avoid a park-like setting).
    - Forest matrix residual basal area may range between 20 – 125 ft^2/acre

    - Some residual, individual trees should possess structures that may provide wildlife habitat. Such structures may result from damage from pests, pathogens, fire, lightning, or other natural processes (Appendix B for examples).
- Preferentially remove fire and drought-intolerant tree species
    - White fir (*Abies concolor*) and lodgepole pine (*Pinus contorta*) are two fire and drought intolerant trees to be preferentially removed.
    - White fir may be retained where its live crown ratio is greater than 50 percent, DBH is greater than 16 inches, branches support healthy, green needles along a large portion of the branches, and crown form is healthy.

Fuel management

- Protect remaining old-growth Jeffrey pines and white firs (typically large diameter, thick, platey, bark, large diameter branches, and a flattened top or irregularly shaped crown), including those with wildlife architecture, by removing all trees under and within 15 feet of the drip line of the large and old tree(s), which may act as a fuel ladder and represent increased competition for resources (TERR-OLD-GDL 01).
- Reduce surface fuel loading to between 3 and 10 tons/ac, including large diameter logs, coarse woody debris, litter, and surface fuels (TERR-MONT-DC, Table 3).
    - Several logs over 15" in diameter and 8' long should be retained per acre.
    - Remaining surface fuels may be arranged in a manner that would facilitate complete broadcast burning of the unit.
- Maintain snags 20" in diameter or larger, where they can be safely maintained at 1 – 4 snags per acre (TERR-MONT-DC, Table 3).
    - Target standing dead trees, less than 20" in diameter, for removal and CWD fuel reduction.
    - Snag distribution will be irregular across the project area.

Red Fir Ecosystem

The Red fir ecotype is predominately situated on the west and south side of the project area, at higher elevations or where soils are deeper and most productive. These forests occur in the highest productivity class of the project area, receiving substantially more moisture than the lower elevation Dry Mixed Conifer and Jeffrey Pine forest types. This forest type transition into the Dry Mixed Conifer forest types as elevation decreases, moving from the SW to NE. This forest type covers the Mammoth Mountain Ski Area, adjoins the wilderness boundaries, and reaches into the Sherwin Scenic area. It also covers most of the Reds Meadow area and the Minaret road, the main ingress and egress route into the area.

Red fir forests in the project area currently contain a high abundance of trees and support the highest tree diversity. Site conditions usually allow for a greater amount of basal area per acre. However, forests within the project area contain an overabundance of 12-to-30-inch diameter trees which threaten the residual 30 inches or greater diameter trees not yet killed by insects, drought, pathogens, or fire. More trees 20 inches and greater in diameter may be removed from red fir stands than from Jeffrey pine or dry mixed conifer stands to meet basal area and structural heterogeneity targets because there is a larger abundance of them and higher moisture availability increases residual tree growth.

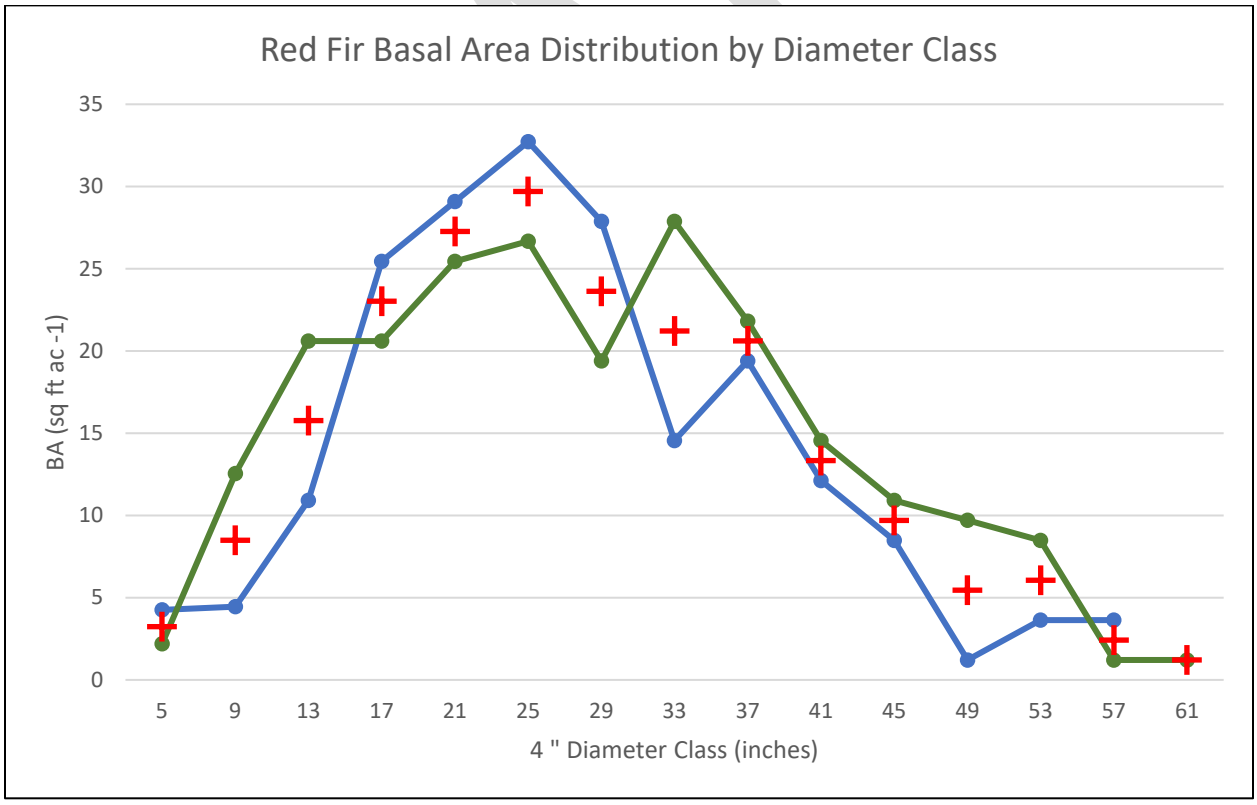


Figure 7 Distribution of basal area per acre by diameter class for forests identified as Red Fir ecosystem type. Each line represents common stand exam data for a stand identified as Red fir; plus signs are stand averages. Common stand exam data collected in 2020.

The goal for treatments in the Red Fir forest type is to restore forest structure and composition that improves the health and vigor of existing old and pre-settlement trees, improves fire resistance and resilience, and increases or maintains wildlife habitat. Residual live biomass should be located around topographic features that allow sustained higher biomass such as lower slopes, bottoms, and north and east aspects, especially where soils are deeper (TERR-OLD-DC-04).

Forest structure

- Size distribution should be shifted towards having the majority of trees in intermediate to large size classes (TERR-OLD-DC Table 4).
    - To increase tree vigor and recruit trees into larger diameter classes that are more fire resistant:
        - Basal area per acre will be reduced to less than 250 ft^2/acre on average but may range at the fine scale across the treatment units from 50 – 350 ft^2/acre (TERR-RFIR-DC 05).
            - Topographic features that support more biomass may have up to 250 ft^2/acre.
            - Stands with 30 or more trees per acre with > 30" dbh may have up to 350 ft^2/acre.
- Create irregularly shaped openings in forested stands 0.1 – 0.5 acres in size where all trees less than 30" in diameter are removed and residual tree cover is 10% or less.
    - Openings will be created on 5 – 20 percent of the treatment area (TERR-DMC-RFIR-06).
    - These opening can be aligned with existing rock outcrops or patches of grass, shrubs, fungi, and seedlings.
- Across 10 to 40% of each stand, retain clumps of trees (5 – 20 trees), where stems are within 15' of another tree in the clump (TERR-RFIR-DC 05)
    - Clumps should be scattered throughout the treatment unit and, to the extent possible, aligned with microsite features that can support the clump.
    - Trees to be retained in clumps should be healthy and vigorous
    - Basal area where clumps are present should not exceed 350 ft^2/acre
    - Clumps should include a mixture of tree sizes and ages (TERR-RFIR-DC 05).
- Forest between clumps and openings (forest matrix) should be thinned so the majority of crowns are not touching or tree canopy cover does not exceed 40% (TERR-MONT-DC, Table 2).
    - Individual trees in the forest matrix should be randomly distributed and not evenly spaced (avoid a park-like setting).
    - Forest matrix residual basal area may range between 50 – 125 ft^2/acre
    - Some residual, individual trees should possess structures that may provide wildlife habitat. Such structures may result from damage from pests, pathogens, fire, lightning, or other natural processes (TERR-RFIR-DC 04; Appendix B for examples).

- Protect remaining healthy, mature (>12" dbh) western white pines by removing small and medium diameter conifers up to 30" dbh within the dripline of the western white pine, which may act as a fuel ladder and represent increased competition for resources (TERR-MONT-DC 03).
- Trees exhibiting the following undesirable characteristics are likely to be of low vigor and should be removed first to meet basal area and structure desired conditions:
    - Live crown ratio less than 35%.
    - Currently exhibiting bark beetle signs or symptoms.
    - Currently exhibiting *Heterobasidion* root rot signs and symptoms.
    - Hawksworth dwarf mistletoe rating greater than 2.
    - Trees less than or equal to 6-inch dbh either adjacent to a tree with a DMR of 3 or exhibiting any sign or symptoms of dwarf mistletoe.

Fuel management

- Protect remaining old-growth conifers (typically large diameter, thick, platey or segmented, bark, large diameter branches, and a flattened top or irregularly shaped crown), including those with wildlife architecture, by removing all trees under and within 15 feet of the drip line of the large and old tree(s), which may act as a fuel ladder and represent increased competition for resources (TERR-OLD-GDL 01).
- Reduce surface fuel loading to between 5 and 20 tons/ac, including large diameter logs, coarse woody debris, litter, and surface fuels (TERR-MONT-DC, Table 3).
    - Remaining surface fuels may be arranged in a manner that would facilitate complete broadcast burning of the unit.
- Maintain snags 20" in diameter or larger, where they can be safely maintained at 1 – 4 snags per acre (TERR-MONT-DC, Table 3).
    - Target standing dead trees, less than 20" in diameter, for removal and CWD fuel reduction.
    - Snag distribution will be irregular across the project area.

Lodgepole Pine (Dry and Wet) Ecosystem

The Lodgepole Pine forest type occurrence is highly variable across the project area based on topographic position, slope (steepness), soil nutrient and moisture availability and a mixed-severity fire regime. For this project the dry and wet Lodgepole Pine proposed actions are combined, as a similar set of management actions will achieve the range of desired conditions for the Lodgepole Pine forest type (descriptions of dry and wet lodgepole pine forests can be found on page 30 of the LMP). However, the forest metrics and targets have been split apart to reflect the higher carrying capacity and differing disturbance regime of the wet Lodgepole Pine forest type. This forest type typically borders all other forest types, includes a mix of red fir and white pines, and commonly borders montane meadows.

Lodgepole Pine forests in the project area currently contain an overabundance of trees >25 inches in diameter which has led to increased competition among trees and mortality due to bark beetles. This is evident across the project area but most pressing north of TOML where bark beetle pockets, roughly circular patches of tree mortality, started forming during the 2012 – 2016 drought and have continued expanding their extent. The connectivity between the Lodgepole Pine type and the high elevation 5-needle pine habitat provides a pathway for the mountain pine beetles to kill those high elevation pines as well.

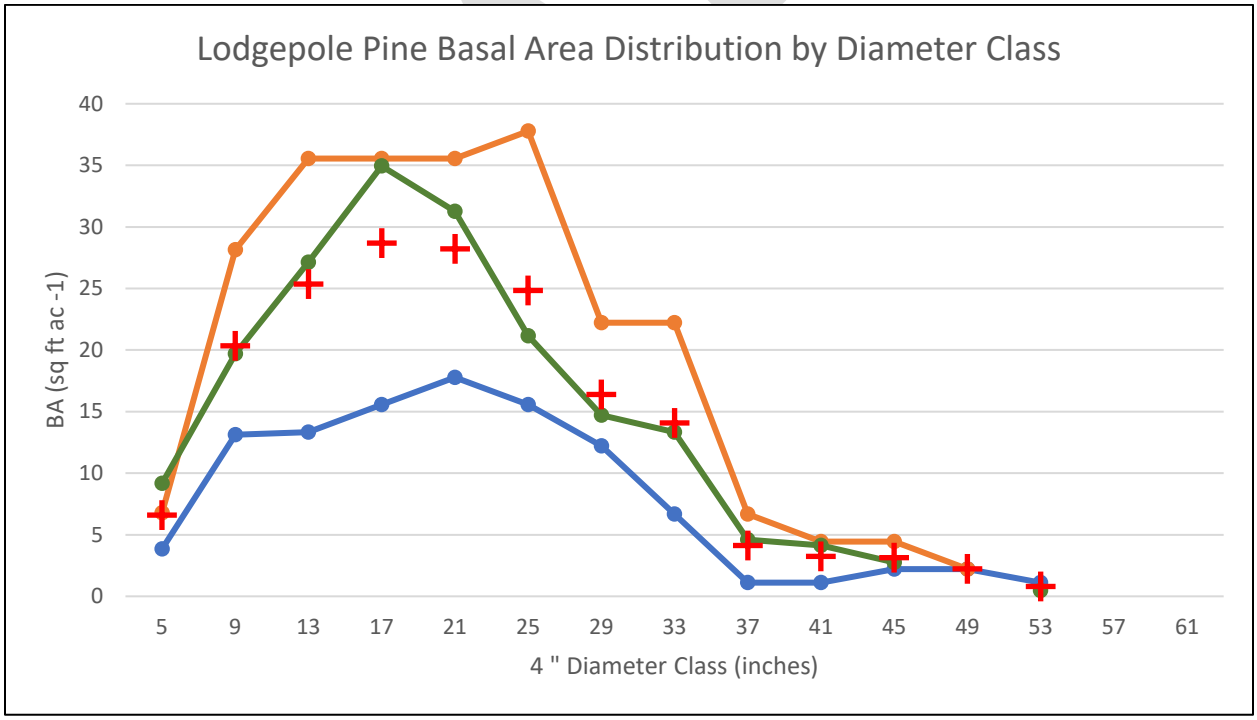


Figure 8 Distribution of basal area per acre by diameter class for forests identified as Lodgepole Pine ecosystem type. Each line represents common stand exam data for a stand identified as Lodgepole pine, plus signs are stand averages. Common stand exam data collected in 2020.

The goal for the Lodgepole Pine forest type is to reduce competition among the pine, fir, and mountain hemlock tree species that occur in these forest types to reduce the risk of insect and disease outbreak such as mountain pine beetle or atropilis canker. It is also to reduce fuel loadings to levels which reduce the chance of catastrophic wildfire from carrying continuously

through this forest type. Dry lodgepole pine forests typically support lower tree densities and lower levels of surface fuels than wet lodgepole pine forests so fuel reduction activities may be more intense in drier areas. This will be accomplished through tree and surface fuel removal by mechanical means where local conditions allow, and resource damage can be minimized or by hand labor.

Forest Structure (Wet)

- Thin trees to reduce average basal area to < 125 ft^2/acre to reduce inter tree competition.
    - Basal area may range at the fine scale across the treatment units from 50 – 280 ft^2/acre.
        - Stands with 10 or more trees per acre with > 20-inch dbh may have up to 280 ft^2/acre.
    - A variable density thinning approach will be used to meet spatial heterogeneity requirements (TERR-LDGP-DC 03, 04).
        - Create and expand existing openings generally no greater than ¼ acre in size.
        - Create conditions for healthy, vigorous mid and understory trees to emerge.
        - Maintain clumps of trees > 20-inch dbh on 20 – 70% of the stand where canopy closure is above 50%.
        - Openings and clumps are randomly distributed and irregular in size and shape.
        - Emphasize species diversity by focusing removal on lodgepole pine and fir species.

Forest Structure (Dry)

- Thin trees to reduce average basal area to < 125 ft^2/acre to reduce inter tree competition.
    - Basal area may range at the fine scale across the treatment units from 50 – 280 ft^2/acre.
        - Stands with 10 or more trees per acre with > 20” dbh may have up to 280 ft^2/acre.
    - A variable density thinning approach will be used to meet spatial heterogeneity requirements (TERR-LDGP-DC 03, 04).
        - Create and expand existing openings generally no greater than ¼ acre in size.
        - Create conditions for healthy, vigorous mid and understory trees to emerge.
        - Maintain groups of large and intermediately sized trees where canopy closure is above 50%.
        - Openings and clumps are randomly distributed and irregular in size and shape.

        - Emphasize species diversity by focusing removal on Lodgepole pine and in dry sites, fir species.

Forest Structure (Both)

- A tiered system for selecting trees for removal to meet basal area target:
  1. Start with removal of trees 8 – 12 inches in diameter and below to meet basal area target.
     a. The upper diameter limit between 8 and 12 inches should be decided for the implementation unit to appropriately target structure and age classes.
     b. This will reduce the majority of ladder fuels and are in the age class that are crowding older trees.
  2. Next remove trees up to 20 inches that are in the Acceptable or Non-Desirable category or are crowding the larger dominant trees and are within 15 feet of their dripline.
  3. Lastly selectively remove trees over 20 inches, if necessary, that are in the Acceptable or Non-Desirable category or are crowding the larger dominant trees and are within 15 feet of their dripline.
- Protect remaining healthy, mature (>12 inch dbh) white pines by removing small and medium diameter conifers up to 30 inch dbh within the dripline of the white pines, which may act as a fuel ladder and represent increased competition for resources (TERR-MONT-DC 03).

Fuel Management

- Protect remaining old-growth conifers and those over 40 inch dbh, including those with wildlife architecture, by removing all trees under and within 15 feet of the drip line of the large and old tree(s), which may act as a ladder fuel and represent increased competition for resources (TERR-OLD-GDL 01).
- Reduce surface fuel loading to between 2 and 20 tons/ac, including coarse woody debris, litter, and surface fuels (TERR-MONT-DC, Table 3).
  - Remaining surface fuel distribution should be patchy
- Maintain 20" and larger diameter snags where they can be safely maintained at 1 – 4 snags per acre.
  - Remove small diameter standing dead trees, less than 20"
  - Snag distribution will be irregular across the project area

Summary of Desired Conditions for Jeffrey Pine, Dry Mixed Conifer, Red Fir, and Lodgepole Pine Ecosystems

Metrics	**Jeffrey Pine**	**Dry Mixed Con**	**Red Fir**	**Dry Lodgepole**	**Wet Lodgepole**
Avg BA	100 sq ft	125 sq ft	250 sq ft	100 sq ft	125 sq ft
BA Range	20 – 200 sq ft	20 – 200 sq ft	50 – 350 sq ft	20 – 200 sq ft	50 – 280 sq ft
Percent Stand in Clump	10%	0 – 20%	10 – 40%	0 – 30%	20 – 70%
Percent Stand in Opening	10 – 70%	10 – 50%	5 – 20%	10 – 50%	5 – 20%
Max Matrix Canopy Cover	40%	50%	40%	40%	70%
Opening Size	0.1 – 1.0 acre	0.1 – 0.5 acre	0.1 – 0.5 acre	0.1 – 1.0 acre	0.1 – 0.25 acre
Snags	1 – 4	1 – 4	1 – 4	1 – 2	1 – 4

Riparian / Aspen Ecosystems

The life cycle of aspen is closely linked to fire, where higher intensity fire is needed to consume the bulk of the canopy to trigger hormonal suckering response and regenerate stands through aspen seedling establishment. This cycle has been interrupted by fire suppression allowing an overabundance of large hazardous fuels and conifer encroachment that has detrimentally impacted the health of aspen stands and lowered their fire resilience.

The goal of these treatments is to restore aspen stand composition and structure, and riparian function. In the project area the aspen ecosystem type typically dominates the vegetation along riparian areas and as such these management activities are focused on aspen. However, increasing recruitment of hardwoods or other riparian plant species such as willow and alder, as well as increase the cover and diversity of understory shrubs and herbaceous plants is a desired outcome of these treatments.

- Encroaching conifers will be removed from aspen stands up to one and a half times the average height of aspen trees in the stand; distance required to prevent remaining adjacent conifers from shading the aspen stand; or up to 100 feet, whichever is greater (TERR-ASPN-DC 02 and TERR-ASPN-GDL 04).
    - Trees representing a limited species presence such as Sierra juniper (*Juniperus grandis*) that are > 20-inch dbh, may be retained.
- Slash piles for burning would be kept at least 15 feet away from large aspen trees to limit damage to aspen trunks. Larger piles (more than 10 feet pile width) should be farther from aspen trunks than smaller piles (TERR-ASPN-GDL 01).
- Where excessive densities of snags exist that would contribute to an increased fire risk or would directly impact aspen regeneration and mature trees from snag-fall, remove standing dead aspen and conifers within aspen stands.
- Reduce surface fuel loading (typically coarse woody debris of small to large diameters) to less than 10 tons/ac.
- In areas with fens, springs, and other sources of groundwater, only hand work will occur and in coordination with a Forest Service watershed specialist (MA-RCA-STD 09). Additional resource protection measures may be implemented such as hand carrying wood or directional falling after consultation with the specialist.
- Aspen with evidence of cultural markings or of any cultural significance should be flagged for avoidance and an operation-limiting buffer should be established around these trees to prevent damage (TERR-ASPN-GDL 02).
- Riparian areas will be treated to reduce fuel continuity, but treatments will focus on removal of encroaching conifers and reduction of accumulating dead and down fuels, to retain the crown cover and shade in water bodies (MA-RCA-STD 01).
- Skyline, cable yarding, or other suspension based yarding system that have minimal ground disturbance, may be used to reduce surface fuel loading in consultation with hydrology specialists.

Meadow Ecosystem

The goal of these treatments is to restore meadow hydrology and functionality through the removal of encroaching conifers, armoring of headcuts, and bank stabilization (as suggested in the 2019 land management plan, p. 145, Aquatic and Riparian Ecosystems proposed and possible actions).

- Live conifers less than 30 inches in diameter will be considered for removal (RCA-MEAD-DC 07).
    - Larger trees, up to 40 inches, can be felled or girdled if they are a seed source and their removal would benefit meadow restoration (TERR-FW-STD 01(b)).
- Generally, conifers growing on upland features such as slightly elevated landforms which do not exhibit features of a meadow will be retained.
    - Features which qualify may include slightly elevated landforms which support vigorous conifer growth and appear to be persistent on the landscape. These may take the form of elevated tree 'islands' or 'stringers' or abrupt meadow edges with a substantial change in understory vegetation.
- Conifers will only be removed where operations will not irreparably damage meadow hydrologic, soil, and vegetative function and structure. Soil and vegetation protection measures will be used for removal of larger trees such as hand carrying or hauling over-snow.
- Residual slash from conifers may be piled and burned a minimum of 25' from any meadow or watercourse, chipped so that chips are removed or blown away from the meadow, lopped and scattered, or removed from site.
    - Up to 5 – 10 trees per acre over 16 inches in diameter at breast height (DBH) may be felled and lopped and scattered within meadows.
    - Trees will be bucked and limbed so the boles lie flush with the meadow to promote decomposition.
- Downed woody material resulting from conifer removal activity may be left in place where it won't impede meadow hydrologic function or vegetation growth (Expected Design Criteria: Hydrology; Botany).
- Where found, armor headcuts to stop further migration. Armoring will be done with natural materials such as rock and/or wood. Material would be collected adjacent to the surrounding meadow.

Sagebrush and Sagebrush-Jeffrey Pine Interface Ecosystem

The goal of these treatments is…

- Remove encroaching conifers up to 30" to improve habitat and habitat connectivity for sage grouse (TERR-SAGE-DC 04; SPEC-SG-DC 05).
- Mow shrubs where the risk of high severity fire is too high or would pose a danger to people, infrastructure, and inhibit safe egress.
    - Mowing would be completed by machinery where operability is suitable such as slopes less than 30 percent or areas with limited rocks and boulders.
    - Otherwise, hand removal of shrubs through chainsaws or hand tools will be permitted.

- Leave clumps of shrubs within area to be mowed in irregular patterns.
- Retain a diversity of shrub and ground cover species of different sizes, age and growth habit.
- Increase bunch grass component, early seral habitat, reduction of old seral sagebrush, seeding or install container plants, outplanting.
    - Include something in here about annual control or small size/scope of project
    - Tier to forestwide invasive plant EA as needed if invasive annual grass treatments are determined required (Expected Design Feature: Botany).
    - Language about timeline of treatment?

<u>Whitebark Pine / Subalpine / High 5-Needle Pine Ecosystems</u>

The goal of these treatments is to maintain and/or enhance conditions in stands of whitebark pine and other five-needle pine species. Whitebark pine extent within the project area is limited to high elevation locations in the South and West.

-
- Remove competing conifer species where encroachment into whitebark pine habitat is occurring based on field surveys and consultation with the forest botanist
- Reduce surface fuel continuity to reduce likelihood of fire spread (TERR-ALPN-DC 02)
- Retain and promote healthy white pine species such as whitebark pine, western white pine, and limber pine in all units where they occur especially healthy mature cone-bearing trees (TERR-FW-DC 03, TERR-ALPN-DC 03 and 04),
    - Actions to promote white pine species could include: reducing encroaching species such as fir and lodgepole, creating openings to facilitate seed caching, reducing fuels, or sanitation thinning in areas of insect/disease outbreak or high mortality following consultation with the FS botanist or forest health protection officer.
    - Slash piles should be constructed at a minimum of 25 ft away from live Whitebark pine, including seedlings and saplings. Pile construction sites will be surveyed for seedling/sapling prior to pile construction.

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Inventoried Roadless Areas

2001 Roadless Area Conservation Rule online

Tie to high severity fire risk and fuel reduction

Expected Design Criteria

The following design criteria would be required under the proposed in order to reduce or eliminate potential negative impacts of the proposed action to individual resources. These criteria are general in nature; the specific action to be taken will be determined by pre-implementation surveys of resources to be impacted (see Implementation Plan).

Air Quality

Burning piles?

Botany

Survey for at-risk species and special habitats and use findings to inform prescription development, treatment implementation, and effects monitoring (SPEC-FW-STD 03).

Implement measures to avoid or minimize impacts to known occurrences of at-risk plants and special habitats, such as:

a. Flag and avoid for ground disturbance (e.g., heavy equipment travel, piling, staging).
b. Directional felling away from site.
c. Adjust timing of treatments to after plants have senesced and/or dispersed seed, or other times/situations that are favorable for survival of individuals and/or propagules.
d. Limit activities within occurrences to avoid damage to roots, woody tissue, and/or soil seed bank.

Monitor at-risk plant occurrences pre- and post-treatment if effects are not well known, to inform future treatment prescriptions (SPEC-FW-STD 02).

Retain *Juniperus grandis* greater than 20 inches in diameter.

Invasive Nonnative Plants

Vegetation treatments are designed to promote native species and to hinder invasive plant species spread. Prior to implementation, field conditions are assessed by a USFS Botanist to locate areas with existing infestations; these areas may be excluded from treatment or treated differently to minimize spread, depending on invasive species ecology (INV-FW-GDL 01).

Incorporate invasive plant prevention measures during implementation, such as:

a. Flag and avoid infestations of high priority species.
b. All off-road equipment is clean before moving into the project area to ensure it is free of soil, seeds, vegetative material or other debris that could contain propagules of invasive plants;
c. Staging areas for equipment, material, and crews are located outside of invasive plant infestations;
d. Piles are not created on or immediately adjacent to known infestations where they could prohibit treatment or facilitate spread during or after pile burning;

Implement invasive plant treatment/control measures prior to project activities to minimize spread and facilitate project objectives, or as a follow-up treatment to attain site-specific objectives, using methods approved under the Forestwide Invasive Plants Treatment Project EA (USDA 2019a) or other decision (INV-FW-GDL 01).

Cultural Resources

Cultural surveys and evaluation of protection measures. Outside of the CSROs?

Fisheries

Disrupting stream flows? Sedimentation?

Hydrology and Soils

Temp bridges? BMPs and design criteria from plan. Mechanical equipment use

WTR-01 Prohibit storage of fuels and other toxic materials except at designated administrative sites and sites covered by special use authorization. Prohibit refueling within riparian conservation areas (RCAs) except when there are no alternatives (MA-RCA-STD 03).

WTR 02 Designate equipment exclusion zones within riparian conservation areas when designing projects. The default is half of the riparian conservation area width (150 feet for perennial streams, 75 feet from intermittent and ephemeral streams). These widths can be adjusted on a project-by-project basis in consultation with a watershed specialists and aquatic biologist (MA-RCA-STD 13).

WTR 03 When working in RCAs/Waterbody Buffer Zones (WBBZs), all ground-based equipment will be excluded a distance of 25ft from all waterbodies. Work done with within the 25ft exclusion zone will be done by hand, with trees felled away from the stream channel.

WTR 04 Chipped material will not be discharged to waterbodies or deposited in locations where such material may discharge to a waterbody.

WTR 05 Construction of temporary bridges may be required for equipment to access and remove biomass from certain treatment areas because there is no access other than over a perennial stream. It is anticipated that temporary bridges will be needed to access these treatment areas. Temporary bridges would be constructed using down logs to span the stream, with decking material laid across the log spans. These temporary bridges would be placed as to minimize alteration of the stream channel or banks and would be removed if a high flow event is predicted, in order to prevent obstruction of flow. If any stream banks or channels are damaged, they will be repaired before winter or predicted high flows.

WTR 06 Retain at least 75% of the overstory and 50% of the understory canopy of native riparian vegetation. Native riparian vegetation will be retained in a well distributed multi-storied stand composed of a diversity of species similar to that found before the start of treatments.

WTR 07 Vegetation removal that could reduce stream shading and increase stream temperature will be avoided (MA-RCA-STD 01).

WTR 08 Ground-based skidding equipment would be used only on slopes averaging less than 30%, unless otherwise determined by a Forest Service Watershed Specialist. On pumice soils, all main skid trails within the project area should be subsoiled or backbladed to reduce erosion potential. On slopes greater than 20%, backblade or rake out any trail with ruts greater than 6 inches in depth.

WTR 09 To prevent further use, all skid trails intersecting roads would be disguised by raking and spreading slash and duff.

WTR 10 Any areas receiving detrimental soil compaction as a result of tree removal operations would be sub-soiled or backbladed.

WTR 11 In most cases, work would be completed using only low ground pressure equipment or hand labor within Riparian Conservation Areas (RCAs)/Waterbody Buffer Zones (WBBZs). RCAs/WBBZs are defined and mapped based on stream type, stream gradient and beneficial uses, and those within treatment units will be field verified before implementation. Traffic with higher ground pressure equipment would be avoided in these areas by using methods such as end-lining and directional felling, except at designated stream crossings.

WTR 12 Mechanical equipment used for tree removal would not be operated for ground-based skidding when wet weather operations or wet soil conditions would adversely affect soil porosity, hydrologic function, or runoff potential. Ground-based skidding shall be limited to when the soil is dry to 6 inches, or suitable conditions determined by a Forest Service Watershed Specialist.

WTR 13 Main skid trail pattern (spacing and placement) would be agreed upon prior to any tree removal operations. Where feasible, old skid trails and roads would be used. Skid trails should avoid running straight up and downhill where possible, and should not be placed in swales where

drainage cannot get off the trail. When skid trails are created within RCAs and WBBZs, their location will be designated with assistance from a watershed specialist, and will be designed so that any runoff flows away from the creek instead of toward it.

WTR 14 Prevent disturbance to streambanks and shorelines of lakes and ponds from exceeding 20 percent of stream reach, or 20 percent of natural lake and pond shorelines (MA-RCA-07).

Recreation

Coordinate implementation. Don't damage infrastructure

Don't use trails for hauling or skidding

Silviculture

- In order to reduce the risk of the root disease *Heterobasidion annosus*, Jeffrey pine, true fir, lodgepole pine, and mountain hemlock stumps greater than 3 inches in diameter within 300 feet of infrastructure, and greater than 14 inches in diameter everywhere else will be treated with sodium tetraborate dechahydrate (commonly known as borax).
    - Stumps will be treated according to manufacturer's specifications.
    - Borax would be applied within 4 hours of stump creation and would not be applied on rainy days or within 300 feet of waterbodies.
    - Exceptions to minimum application distances may be granted only after consultation with a line officer and Forest Service watershed specialist.
- Where fuelwood collection is desired, stumps may be flush cut where possible to aid cross-country travel and fuelwood collection.

Wildlife

Aquatics (AQU)

AQU-01 In ***T/E amphibian suitable habitat and critical habitat*** the following restrictions apply:

A USFS Forest Wildlife/Aquatic Biologist will review treatment sites that are within Sierra Nevada yellow-legged frog, mountain yellow-legged frog or Yosemite toad designated critical habitat or within suitable habitat with high likelihood for occurrences. Treatment strategies in these areas, including applying buffers, limited operating periods, and relocating individual amphibians, will be developed collaboratively to ensure treatment efforts minimize impacts to frog and toad populations and suitable habitat.

AQU-02 In ***T/E amphibian occupied habitat*** the following restrictions apply:

Immediately prior to any treatment activities, a USFS Forest Wildlife/Aquatic Biologist who is trained in identifying and handling rare amphibians will survey the area for Sierra Nevada

yellow-legged frog, mountain yellow-legged frog and Yosemite toad. If individuals are found, they will be relocated to a safe location that is nearby but out of potential harm's way from treatment activities. In most cases this will be less than 100 feet from the original location of the amphibian.

General & At-Risk Wildlife

WLF-01 Any additional at-risk species occurrences discovered prior to or during implementation would be evaluated for protection measures by a USFS Wildlife Biologist (SPEC-FW-STD 01, SPEC-CSO-GDL 01, SPEC-SMPF-GDL 03)

Avian

WLF-02 Prior to project implementation each year, conduct nesting raptor surveys in and immediately adjacent to known nesting areas. If indications of nesting raptors are detected, a USFS Wildlife Biologist will be consulted and will recommend appropriate mitigations during nesting activity (SPEC-FW-GDL 01).

WLF-03 During annual raptor surveys and monitoring, incidental observations of neotropical migratory bird nesting behaviors will be flagged and, possibly, avoided. Disturbance to nesting birds will be avoided or mitigated, to the extent possible to meet project objectives (SPEC-FW-GDL 01).

WLF-04 Annual protocol surveys will continue for California Spotted Owl (2021, 2022, 2023). If individuals are detected, implement the California Spotted Owl direction in the Inyo National Forest Land Management Plan to protect California Spotted Owl and their habitat (SPEC-CSO-STD 03).

WLF-05 When treatments fall within nesting habitat for at-risk avian species or raptors, including goshawk territories, consult a USFS Wildlife Biologist (SPEC-FW-GDL-01).

Fisher and Marten (design criteria below are from fisher programmatic Appendix C conservation measure crosswalk with inf plan components)

WLF-06 Limited operating periods (LOPs) will be used to protect females and ensure breeding success. The following LOPs will be in place within marten high value reproductive habitat unless a qualified wildlife biologist and line officer determine treatment benefits outweigh and mitigate risk to fishers:

a. March 1 to June 30 - prohibiting mechanical vegetation treatment activities, including chainsaw hand work.

WLF-07 In mapped marten and/or fisher habitat (as defined in USDA 2019b):

a. In drainages, swales and canyon bottoms and on north- and east-facing slopes, retain a patchy mosaic of shrubs and shade-tolerant understory vegetation, separated by more open areas (i.e., meadows), to reduce fuel continuity, increase habitat heterogeneity, support prey, and provide hiding cover, with a goal of 10 to 20 percent shrub cover

within these topographic features at the home range scale when thinning and/or broadcast burning.

WLF-08 When hazard trees greater than 24-inch DBH are felled, they will be left intact.

***Need Bi-state Sage Grouse DC

Surveys for nests, migration corridors, LOPs

Maintain denser tree cover in small patches.

Maintain sensitive riparian areas to avoid damaging sensitive meadow or riparian habitats. (This should be covered by hydrology Design Critera)

Decision Matrix

The decision matrix will aid planners in implementing these proposed actions on the ground. This is necessary because across the project area's 55,000 acres requiring treatment, forest conditions, even within an emphasis area, can vary in the required intensity and extent of treatment. Additionally, restoration objectives such as landscape-level heterogeneity are most effectively achieved through fine scale prescriptions. Through varying stocking regimes, species composition, and forest structural elements, one stand at a time, a landscape will develop sustained complexity between active management entries (GTR 270). When land is identified for implementation, the forester or other lead specialist should make several determinations in order to use this decision matrix / implementation plan:

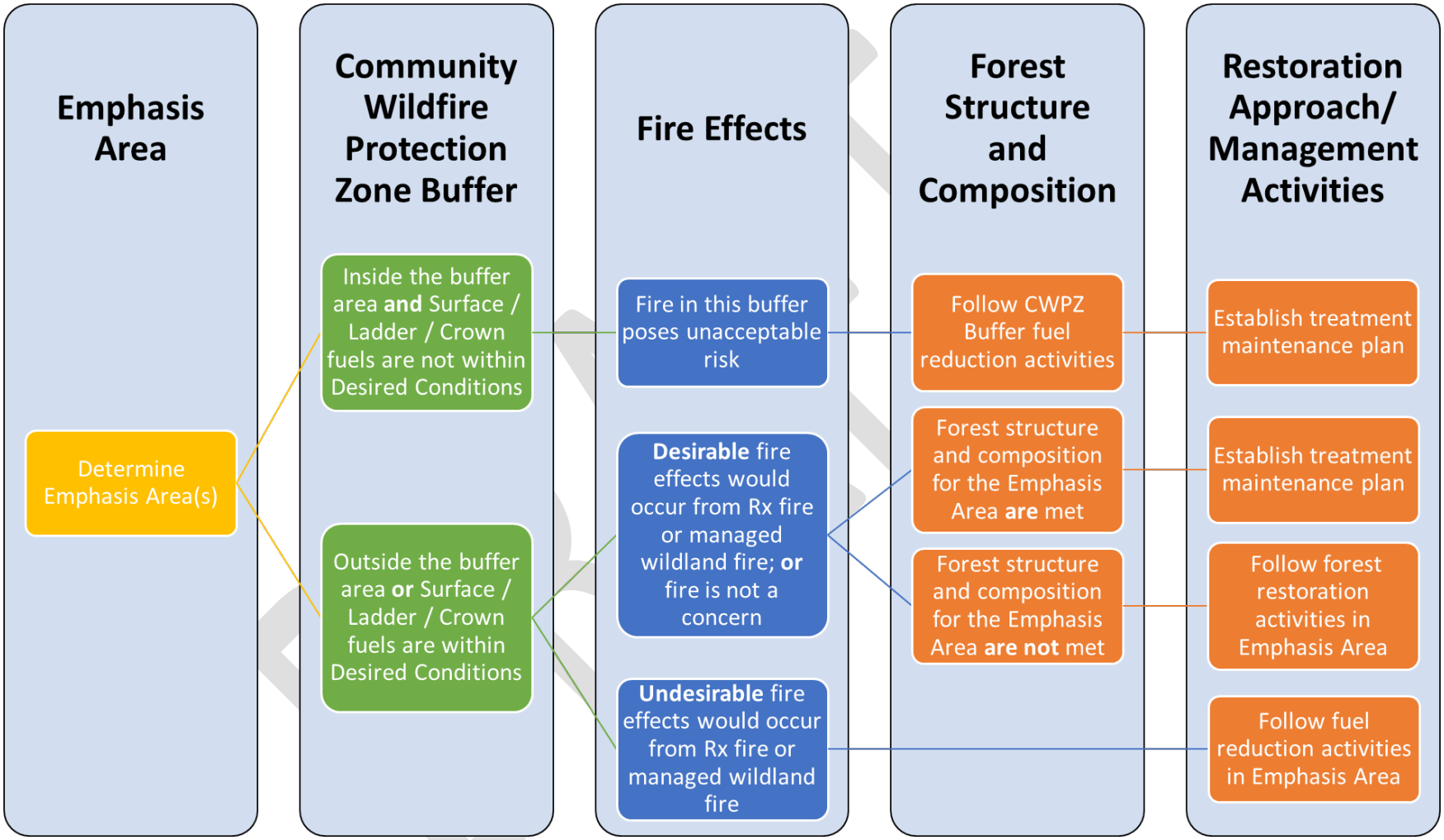
- Strategic Fire Management Zone
- Proximity to communities
- Accessibility
- Ecotype
- Landscape position
- Current conditions
- History of fire and forest management
- Proximity to past treatments
- Time since last disturbance

This chart represents the rationale for implementing treatments based on the risk of fire and departure from the desired conditions outlined in the Land Management Plan. The Emphasis Area groups the ground into similar treatment types based on their forest type, dominant vegetation, or specific desired conditions for animals or plants. Project acres within the Community Wildfire Protection Zone Buffer or other specific concerns such as evacuation routes will receive more specific, intensive treatment to reduce the risk to life and property and improve firefighting operations. Treatments are structured to and to restore forest structure and composition, and reduce undesirable fire effects.

Genberal outline of implementation plan to include with scoping package some bullets, include the decision matrix(?)

Actual implementation plan will be included after summer 2022 with lessons learned from Rx fire NEPA

Decision Space / Matrix for implementing the proposed actions



Appendices

Appendix A – Plan Components

The Inyo National Forest Land Management Plan (2019) has set forth desired conditions, guidelines, standards, and potential management approaches for the emphasis areas outlined in this document. Those plan components are reflected in the proposed actions to ensure consistency with the LMP. Relevant plan components for each emphasis area are listed in the table below.

Emphasis Area	LMP Desired Conditions and Objectives	Other LMP components
Community Wildfire Protection Zone Buffer	MA-CWPZ-DC 01	MA-CWPZ-GOAL 01, 02 MA-CWPZ-GDL 01
Marten, Raptor, or Other Special Habitat	TERR-OLD-DC 02 TERR-SH-DC 01, 02, 03	
Cultural Resource Improvements	TERR-FW-OBJ 03 TERR-FW-DC 11 TERR-PINY DC 05	
Jeffrey Pine Ecosystem	TERR-JEFF-DC 01, 03, 04, 05, 07 TERR-MONT-DC 01, 02, 03 Tables 1-4 TERR-OLD-DC 01, 04, 05, 06, 07	
Dry Mixed Conifer Ecosystem	TERR-DMC-DC 01, 03, 04, 05, 06 TERR-MONT-DC 01, 02, 03 Tables 1-4 TERR-OLD-DC 01, 04, 05, 06, 07	
Red Fir Ecosystem	TERR-RFIR-DC 01, 03, 04, 05, 06, 07 TERR-MONT-DC 01, 02, 03 Tables 1-4 TERR-OLD-DC 01, 04, 05, 06, 07	
Lodgepole Pine (Dry and Wet) Ecosystem	TERR-LDGP-DC 01, 03, 04, 05, 06, 07, 08, 10 TERR-MONT-DC 01, 02, 03 Tables 1-4 TERR-OLD-DC 01, 04, 05, 06, 07	

Sagebrush and Sagebrush-Jeffrey Pine Interface Ecosystem	TERR-SAGE-DC 04 SPEC-SG-DC 01, 05, 07	SPEC-SG-STD 01, 06, 07
Riparian / Aspen Ecosystems	TERR-ASPN-DC 01, 02, 03 MA-RCA-DC 08 RCA-RIV-DC 06	TERR-ASPN-GDL 01, 02, 03, 04 MA-RCA-STD 02, 09 MA-RCA-GDL 02
Meadow Ecosystem	RCA-MEAD-DC 01, 07, 08	MA-RCA-STD 09
Whitebark Pine	TERR-ALPN-DC 02	
Landscape Considerations		
Terrestrial Ecosystems	TERR-FW-DC 01 – 07, 09 - 11 TERR-FW-OBJ 01 TERR-MONT-DC 01 - 03	TERR-FW-STD 01 TERR-FW-GDL 01, 02 TERR-OLD-GDL 01 TERR-FW PMA's
Fire Management	FIRE-FW-DC 03	FIRE-FW GOAL 01, 03, 05, 07, 08, 10 MA-CWPZ-GDL 01, 02
Animal and Plant Species Invasive Species	SPEC-FW-DC SPEC-SG-OBJ 01 SPEC-SMPF-DC 01, 02	SPEC-FW-STD-01, 02, 03 INV-FW-STD-03 INV-FW-GDL-01
Conservation Watershed	MA-CW-DC 02 MA-CW-OBJ 01	MA-CW PMA's
Timber Planning and Suitability	TIMB-FW-DC 01, 02 TIMB-FW-OBJ 01	TIMB-FW-GDL 01-03 TIMB-FW PMA's
Community Engagement	LOC-FW-DC 01, 02, 04, 05	LOC-FW-GOAL 02

Appendix B – Individuals, Clumps, and Openings

Individuals, clumps, and openings is a description of a forest structural composition and a management approach to restoring forest heterogeneity in dry forest ecosystems where fire was a frequent occurrence. The abundance of each of these components is not derived specifically from the pattern but should be guided by moisture availability and carrying capacity of each forest. For example, valley bottoms and low slopes are likely to contain greater moisture availability and so could contain a higher abundance of trees (TERR-FW-GDL 01, TERR-OLD-DC 04). The higher end of a basal area target is to allow for the presence of many large diameter trees.

Figure B-1 – A Jeffrey pine ecosystem type displaying desired spatial pattern and heterogeneity. On the left a clump of Jeffrey pines with little surrounding vegetation or ladder fuels. Right of center an individual tree is growing in full sun with only two small trees nearby which may end up as a clump in the future. On the right an opening in full sun allows small Jeffrey pine regeneration. *Photo by: Marc Meyer*

Figure B-2 – A red fir ecosystem type displaying desired spatial pattern and heterogeneity. There is a higher stem density here but mostly composed of large diameter trees. A higher proportion of clumps exist and are composed of pine and fir tree species but still maintain space between them where regeneration can grow with few individuals. Snags and other structures exist that are beneficial for wildlife habitat. *Photo by: Marc Meyer*

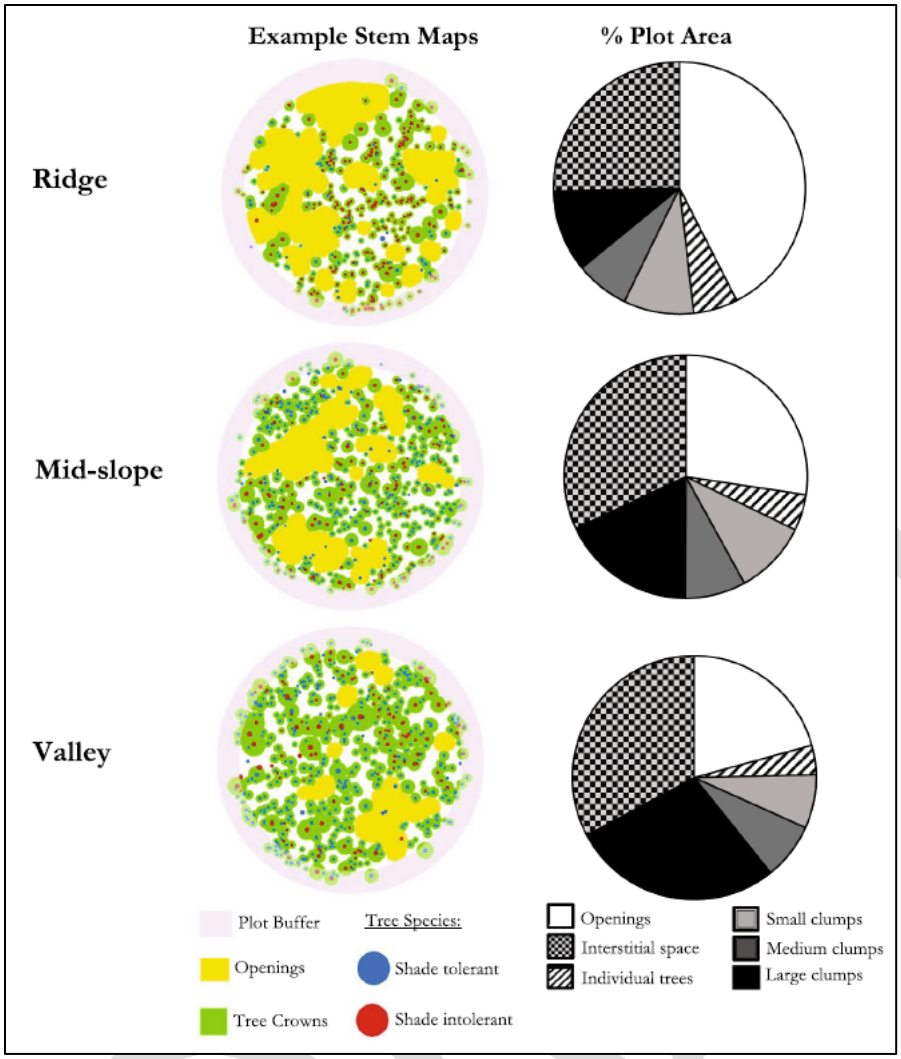


Figure B-3 – A diagrammatic representation of forest structure and species composition according to landscape position. Ridges tend to have little available moisture while mid-slopes have more available moisture and valleys have the most. The increase of shade intolerant trees also indicates a longer fire return interval allowing these trees to survive to maturity. *Graphic from Ng et. al., 2020*

Appendix C – Forest Structures Beneficial to Wildlife

Pictures and descriptions are from:

Walsh, D. and M. North. 2012. Appendix: Examples of forest structures that may provide wildlife habitat. Pages 177-184 in M. North (ed.) Managing Sierra Nevada Forests, General Technical Report PSW-GTR-237. USDA Forest Service, Pacific Southwest Research Station, Albany, CA. 184 pp.

Dana Walsh

Figure C-1—Live tree with hollow structure. The tree has an old dead top with cavity nests and a new healthy top leader grown up alongside, providing some shelter. The tree is healthy overall with a high live crown ratio and no ladder fuel concern.

Figure C-2—Live tree with decay. The tree has a potential platform nest site that is somewhat protected by adjacent trees. This site could be used for nesting or could break and provide a platform for nests or for roosting.

Appendix D – Desirable, Acceptable, Undesirable Trees

These are physical characteristics to consider when selecting trees to retain. The emphasis on Desirable trees for retention is to ensure healthy and vigorous trees are recruited into larger size classes and that these trees are most likely to survive increasing drought, fire, and bark beetle stressors. However, Acceptable and Non-Desirable trees play an important role in the ecosystem and will not be completely removed.

Evaluation Criteria	Desirable	Acceptable	Non-Desirable
Live Crown Ratio	>40% for Jeffrey pine >50% for other species	25 – 40% for Jeffrey pine 35 – 50% for other species	<25% for Jeffrey pine <35% for other species
Crown Class	Dominant or Co-dominant	Intermediate	Suppressed or Overtopped
Form Defects	NONE	MINOR – (no significant weakening or toppling of the tree anticipated resulting from crooks, sweeps, or tight forks etc.)	MAJOR – (significant weakening or toppling of tree anticipated; severe sweeps, crooks, or forks in lower 2/3 of tree)
Hawksworth Dwarf Mistletoe Rating (DMR)	NONE	Jeffrey pine – DMR < 3 Other species – DMR < 2	Jeffrey pine – DMR > 3 Other species – DMR > 2 Trees < 6” dbh with any signs of dwarf mistletoe infection Trees < 6” dbh immediately adjacent to DMR > 3 trees
Damaging Agents	NONE	Bark missing from < 50% of tree bole circumference Some evidence of bark beetle activity along tree bole; tree appears healthy Fire kill of cambium on < 50% of bole circumference or crown scorch on the lower 2/3 of tree crown	Bark missing from > 50% of tree bole circumference Bark beetle activity along majority of tree bole Fire kill of cambium on > 50% of bole circumference or crown scorch on the lower 3/4 of tree crown

Wildlife Trees – Trees > 20” with existing cavities, dead tops, lightning scars, or structures beneficial to wildlife, and any trees with raptor nests, are considered desirable and should be retained.

Appendix E – References

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