Happy Camp Community

Wildfire Protection Plan

A Collaborative Wildfire Protection Strategy for Residents, Communities, and All-Lands within the Happy Camp Planning Area

Coordinated by the Happy Camp Fire Safe Council

Happy Camp, California

February 2018

Happy Camp Fire Safe Council

Community Wildfire Protection Plan

Approval Signature Page

The following entities mutually agree with the contents of this Community Wildfire Protection Plan:

_____ _____
USDA Forest Service, Klamath National Forest Date

_____ _____
California Department of Forestry and Fire Protection Date

_____ _____
Karuk Tribe Date

_____ _____
Happy Camp Fire Protection District Date

_____ _____
Siskiyou County Board of Supervisors Date

Cover Photo by Kathy Toland: Happy Camp Complex lighting caused fire 2014. Photo is taken from Happy Camp Resource Center. The Happy Camp ambulance in foreground left and Happy Camp Elementary School parking lot is mid-ground right. The Klamath River and China Creek road separate the fire from valuable infrastructure. Fuel treatments along China Creek Road helped moderate fire behavior near the community.

Preface

This Community Wildfire Protection Plan (CWPP) provides a comprehensive strategy to address wildfire threat to community, stakeholders, and ecosystems in the 359,550 acre Happy Camp planning area (planning area). The planning area includes the Happy Camp Ranger District (HCRD) of the Klamath National Forest (KNF) and all non-National Forest System (NFS) lands within District boundaries. Most of the planning area is ancestral territory of the Karuk Tribe. This area is within the Klamath River watershed in Siskiyou County (County) on the northern border of California as shown in Map A (Vicinity Map). Map 1, Happy Camp Community CWPP Base Map, shows the planning area. The planning area follows the HCRD boundary along major ridges with short sections dropping into major drainages. The planning area is located and sized to enable planning and implementation of fire/fuels hazard reduction treatments and practices to protect the community and restore fire resiliency at the landscape scale. The planning area is a sub-part of the larger 1,197,720 acre ***Western Klamath Restoration Partnership (WKRP) planning area*** (Map 3).

Conceptual basis for the CWPP was provided by the WKRP. The WKRP facilitated gathering together a broad spectrum of community members and stakeholders including, the Karuk Tribe, Federal and State resource management agencies, environmental advocacy organizations, watershed councils, fire safe councils, the local fire department, and invited technical specialists (community and stakeholders). Development of this CWPP is the result of extensive and intensive collaboration meetings facilitated by Nature Conservancy's Western Klamath Fire Learning Network (WKFLN) from spring 2013 through fall 2014; and incorporates comments received during numerous public meetings facilitated by the Happy Camp Fire Safe Council (HCFSC) since 2013. Residents and stakeholders

worked together to determine common goals for protecting the community from adverse effects of fire; restoring fire-resiliency across the landscape; and reducing the human, environmental, and economic costs of fire management.

The WKRP and the CWPP take an 'all lands approach' in that all lands are considered in developing community defense and landscape restoration strategies regardless of land ownership or jurisdiction. Restoration strategies are developed collaboratively by a broad spectrum of stakeholders and land owners in an inclusive open process.

Private lands within the Happy Camp town core are inside the Happy Camp Fire Protection District (HCFPD) (Map 4). The Happy Camp Volunteer Fire Department (HCVFD) responds to fires in this area. Private lands outside HCFPD are State Responsibility Area (SRA), protected by the KNF under the Federal Direct Protection Area (DPA) agreement with California Department of Forestry Fire Protection (CalFire). Within the HCFPD and SRA, full suppression of wildfires is current policy.

Private lands in the planning area are surrounded by NFS lands. Management of NFS lands within the planning area is guided by the KNF Land and Resource Management Plan (LRMP). Forest-wide goals for fire management include:

- Reintroduce fire into the environment through wildland fire managed for resource benefits and prescribed fire, where Forest ecosystems evolved under the influence of wildfires.
- Reduce unacceptable fuel buildups and potential acreage of future high intensity wildfires.
- Use the appropriate minimum impact suppression methods to control wildfires.
- Develop management and protection strategies for inter-mixed State responsibility and private forest lands.

Burning of excessive fuels is the most effective and least costly method of reducing unacceptable fuel buildup. Forestwide Standard and Guide 22-10 identifies wildland fire managed for resource benefits (***managed wildfire*****)** and prescribed fire as desirable tools for managing forest resources. NFS land is divided into Management Areas for more specific guidance. Wildfire use for resource benefit is authorized in the LRMP.

The LRMP allows use of unplanned, natural ignitions to achieve land management objectives on almost all Management Areas on the Forest. When the term “prescribed fire” is used in the LRMP, by definition Wildland Fire Use (WFU) is included (using the terminology “natural ignition” or “prescribed Natural Fire”).

KNF Fire Management Plan guidance for fire suppression and management allows for options to manage a given fire. It identifies Management Areas where planning has occurred allowing WFU. The KNF Fire Management Plan provides direction, consistent with national fire policy, that unauthorized all human-caused fires will be suppressed. Fires in Management Areas not approved and fires not providing resource benefits will be considered unwanted wildland fires and receive an appropriate management response. It also provides that management and protection strategies will be developed for intermixed non-federal lands through the use of fire safe councils and cooperation with state and local governments. As fire use policies shift over time, this CWPP would be updated to reflect any substantial changes in those policies.

Phrases “**management of unplanned ignitions**” and “**managed wildfire**” are used throughout this CWPP. These phrases refer to use of natural or authorized human-caused ignitions, within burn prescription, for identified purposes such as enhancing public safety and ecosystem benefits where allowed by policies of agencies with primary jurisdiction. Management of unplanned ignitions would be used only on lands where previous agreements exist and only when fire hazard conditions are appropriate so that life, property, infrastructure, and resources of concern are not threatened. Fire hazard predictions are based on close monitoring of climatic conditions and weather forecast. As conditions change, fire suppression strategies would be adjusted to reduce risk of undesirable fire behavior and smoke pollution.

The previous version (2014) of the Happy Camp CWPP was still being developed when the 2014 Happy Camp Complex wildfires were started by lightning August 12 near Happy Camp. At a total of 134,000 acres by October, the Happy Camp Complex burned about 20% of the ***planning area***. The ***geodatabase*** developed for the 2014 CWPP was being finalized just as the Happy Camp Complex started. Then again in 2017, wildfires started by lightning burned over 100,000 acres in the Eclipse Complex

including about 28 percent of the planning area. Information in this updated 2018 CWPP has been updated to reflect the effects of those wildfires on the landscape within and surrounding the planning area.

The HCSFC has determined that the 2014 Happy Camp Complex and the 2017 Eclipse Complex wildfires did not substantially change values at risk or require alteration of the fuels reduction treatment strategy given in the 2014 CWPP. Concepts and priorities for fuels reduction treatments presented in the 2014 CWPP are still entirely applicable even though wildfire has and will continue to alter vegetation, fuels, and setting over time. Creating fire-adapted communities and restoring fire-adapted landscapes remains the primary goal of this CWPP.

The HCFSC, the Klamath National Forest, the Karuk Tribe, and the Mid-Klamath Watershed Council (MKWC) continue to pursue grant opportunities for fuels and fire hazard reduction projects in the CWPP planning area. Strategies described in this CWPP take full advantage of 2014 Farm Bill authorities and 2018 Farm Bill authorities to increase pace and scale of restorative projects.

Data and information used and generated in developing the CWPP is included as tables, maps, ***Geographic Information System*** (GIS) data layers, and aerial imagery. This information is available in digital format so maps and aerial imagery can be zoomed in and/or printed in large format on a plotter.

Note: A list of acronyms and their definitions can be found in Appendix A. Words or phrases in ***bold italic type*** are defined in the Glossary in Appendix A. Hyperlinks to the Glossary have been applied to these abbreviations and terms to help keep the reader informed.

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Executive Summary

This Community Wildfire Protection Plan (CWPP) was developed by the Happy Camp Fire Safe Council (HCFSC) to address severe fire hazard that currently threatens community and stakeholder values in the 359,550 acre planning area (Map 1). The purpose of the CWPP is to provide information and make recommendations for planning, implementing and monitoring the reinstatement of ***historic fire regimes*** on the landscape and near communities in a manner that increases protection of life and property, improves forest health, and enhances resources valued by the community and stakeholders. For more information about the HCFSC see Appendix E

The Healthy Forest Restoration ACT (HFRA, 2003) places priority on hazardous fuel reduction treatment areas identified by communities in a CWPP. The HFRA authorizes the Secretary of Agriculture to expedite development and implementation of hazardous fuel reduction projects on federal lands managed by the Forest Service (NASF, 2005). Goals for the CWPP are consistent with the three phases of the National Cohesive Wildland Fire Management Strategy (Wildland Fire Executive Council. 2013) which are: (1) *restore and maintain resilient landscapes, (2) create fire-adapted communities, and (3) safe and effective response to* wildfires.

Goals of the CWPP are:

- Prioritize and recommend fuel reduction programs coupled with prescribed fire and management of unplanned ignitions to reduce adverse fire impacts to life, property, infrastructure, and other resources of community value.
- Provide critical information to Fire Teams and other emergency response personnel that will assist in maximizing safety, effectiveness, efficiency and beneficial measures of fire management, and minimize adverse effects to resources.
- Recommend actions to reduce cost of managing large wildfires.
- Recommend measures for restoring beneficial fire to the landscape.

- Provide data and rationale to enhance possibility of obtaining private, Federal, and State grants for reducing fuels and fire hazard to protect the community and restore fire resiliency to the surrounding landscape.

The immediate goal of CWPP recommended and prioritized fuels treatment is protection of life and property. The ultimate long-term goal of CWPP recommended and prioritized fuel reduction treatments is reducing risk of adverse wildfire impacts to stakeholder values to the point where aggressive fire suppression will no longer be necessary over much of the planning area outside the SRA. Instead, prescribed fire and management of unplanned ignitions would be the primary tool used by fire managers and prescribed fire practitioners to achieve and maintain low fire hazard and to protect and restore fire resilient landscapes and other stakeholder values.

The strategic challenge in CWPP development was to define the scale and location for fuel reduction treatments to be effective at creating fire-adapted communities and restoring fire resilient landscapes at the lowest cost. The strategy for this CWPP was developed through an inclusive collaborative process applied through facilitated meetings. A broad array of residents, stakeholders, natural resource specialists, and State and Federal agency representatives worked together to develop a plan to protect the community from adverse effects of fire; restore fire-resiliency across the landscape; and reduce human, environmental, and economic costs of fire management.

The CWPP identifies priorities for reducing fire hazard within the community and restoring beneficial fire to surrounding landscape. The CWPP recommends measures that homeowners and the community can take to reduce risk to life and property from wildfire within the planning area. Priorities and projects identified in this CWPP for protection of communities and restoring beneficial fire processes include establishing and maintaining:

- Expanded home ignition zone (HIZ) buffers 500 feet out from the footprint of residences and infrastructure;
- Shaded fuelbreaks along private and Forest Service property boundaries (the Greenline);

- Shaded fuelbreaks adjacent to driveways, emergency ingress/egress roads, primary access roads, ***burn control roads***, and other identified routes in the planning area;
- Shaded fuelbreaks along ridges and existing firelines in areas where these features have been used in the past for controlling wildfires;
- New strategic fuelbreaks that would be useful in managing planned and unplanned ignitions; and
- Use of prescribed fire and managed wildfire when and where it is safe and strategically beneficial.

Fuel reduction treatments are recommended on a total of 42,600 acres (Map 5) or 12% of the planning area at an estimated cost of over 51 million dollars (Table 1). Some of these treatments have been initiated and some completed (Map 6). Future follow-up treatments are desirable long-term in most areas where treatments are recommended. Although implementing recommended treatments would be costly, overall costs of fire management in the planning area and surrounding landscape would be greatly reduced. Over the long-term, recommended fuel reduction treatments would save millions of dollars of the cost of suppressing future wildfires. The cost of implementing recommended fuel treatments would be a small fraction of the cost incurred for suppressing fires on the west-side of the Klamath National Forest since 2006. Again, one of the primary goals of the CWPP is long-term reduction in fire suppression costs.

Strategies outlined in this CWPP are a reflection of growing grassroots support for a significant shift in how communities prepare for and manage wildfires in the Western Klamath Mountains. The mid-Klamath area is one of the few regions where large landscapes could feasibly be made fire-resilient. Residents and infrastructure are generally clustered on gentle slopes along valley bottoms and near water and not widely diffused into the steep surrounding forest. This allows for the safe use of prescribed fire and ***unplanned ignitions*** upslope to protect the community and restore fire as a beneficial ecological process on the landscape surrounding the community and neighborhoods of Happy Camp.

1. Introduction

Overview

The need for the CWPP is to address severe fire hazard that currently threatens many community and stakeholder values. The Forest Service and other Federal agencies have identified Happy Camp as a community at high-risk from wildfire (Federal Register, 2001). The purpose of the CWPP is to provide information and make recommendations for planning, implementing and monitoring the reinstatement of historic fire regimes on the landscape and near communities. The goal is to protect life and property, improve forest health, and enhance resources valued by the community and stakeholders. The HCFSC coordinated production of this CWPP with the assistance of a generous grant from the KNF (Agreement #13-PA-11050500-033).

2. Stakeholder Values At-Risk from Wildfire

Life, property, and infrastructure are key values to protect during wildfire. The infrastructure has been developed to support life and property. Within the Happy Camp CWPP planning area natural resource and infrastructure values are often, though not always, in close proximity to each other. For ease of listing they are described separately here.

Infrastructure Values

1. **Electricity** – Power for Happy Camp is supplied by the Pacific Power Company. Distribution is dominantly on overhead poles. There are two feeds serving Happy Camp; approximate locations are shown on Maps 4 and 8. The main feed comes over Little Grayback Mountain and down Indian Creek to a distribution substation on the east edge of town. A secondary feed comes down the Klamath River from the east and enters the Happy Camp CWPP area east of Slater Butte as it runs over Thompson Ridge and down Indian Creek to the distribution substation on the east edge of town. In emergency situations the secondary line can provide power to the Happy Camp community. Pacific Power attempts to maintain the corridors cleared of vegetation along power-lines but are not always effective at treating slash from clearing operations. Powerline corridors are often more of a liability than an asset for

fire suppression.

2. **Communication** - Primary phone service for Happy Camp is provided by Siskiyou Telephone Company through land lines. Transmission lines come from the east along the Klamath River largely on Pacific Power poles to a telephone switching center in Happy Camp. There is also a major transmitter/receiver dish at Slater Butte Lookout. The Company is involved in a major construction project to convert the telephone transmission system to underground fiber optic lines. When conversion is complete, the system will be much more resistant to fire.

   There is also cell phone service in the Happy Camp area supplied by Verizon Wireless through their cell tower at Slater Butte Lookout. The service is designed to provide the core area of Happy Camp with cell phone coverage but a short distance out of town either way on Highway 96 is out of the service area. Upper elevations of some ridges in the planning area will get cell phone service but it is spotty.

   Radio communication is dependent on mountain top repeaters due to the rugged topography. Within the CWPP planning area, Slater Butte is the key repeater site. Every agency: Forest Service, CalFire, CHP, Sheriff's Office, County Road Department, Volunteer Fire Department, Ambulance, Verizion, Siskiyou Telephone, and numerous private entities depend on the Slater Butte communication facility which is served with commercial power from Pacific Power's down-river feed. If the electronic complex at Slater Butte were destroyed by fire, Happy Camp and the surrounding area would lose communications internally and with the rest of the world.

3. **Water** – Water is supplied to the core area of Happy Camp by the Community Services District. The source for community water is Elk Creek. The pump station is about one half mile up Elk Creek from its confluence with the Klamath River. Water is pumped from the creek into a large distribution tank to serve the community. The fire hydrant system (Maps 4 and 8) in town is limited to the area served by the water system. Outside the area served by the Community Services District, domestic water is provided by individual property owners from wells or surface sources. Few of these systems are adequate for firefighting purposes.

4. **Sanitation** – The core community is served by the Happy Camp Sanitation District which provides a sewer system and a treatment facility. The sewer system is limited to the north side of the Klamath River. The treatment facility is located on Chambers Flat on the west edge of the community. This facility will accept waste from pumper units.

5. **The CRITICAL List** – This group is made up of public and private facilities that are particularly important to keeping the community functioning, and to the functioning of fire suppression teams:

   a. County road system and maintenance station.
   b. Slater Butte Lookout and electronic facilities;
   c. Town water pumping station in Elk Creek and various distribution tanks;
   d. Electric and/or telephone transmission lines and switching facilities;
   e. Kingfisher Market grocery store;
   f. Connor Cardlock fuel station;
   g. Karuk Tribe administrative complex which houses the local doctor and dentist;
   h. HCRD office and fire station;
   i. Elementary School and High School (for evacuees);
   j. Volunteer Fire Department and Volunteer Ambulance facility;
   k. Siskiyou County Sheriff's substation;
   l. Clinic Pharmacy;
   m. Various lift pumps which move effluent through the sewer system; and
   n. Heliport.

National Forest Investment Values

The USFS Clone Bank/Sugar Pine Outplant Site located in lower East Fork Indian Creek is an ultra-high value site with superior tree stock from all over California and from numerous industrial private forests. Conifer plantations scattered throughout the HCRD are also of high value for future sustainable forest, watershed, and habitat values.

Natural Resource Values

This listing is limited to items/values that are particularly noteworthy. In the event of a wildfire, Incident Management personnel will need to be guided by the District Ranger and Resource Advisors on NFS lands; locals with knowledge of the planning area

landscape and past experience with wildfire on this landscape, and property owners on private lands. On NFS lands all management activities, including fire suppression, must follow management direction in the Klamath National Forest Land and Resource Management Plan (2010). Fire managers will also follow the annual operating agreement between CalFire and the KNF for fire suppression strategy while working on SRA lands within the KNF Direct Protection Area (DPA).

1. **Fisheries and Watershed Health/Water Quality**. Most hillsides in the CWPP planning area and surrounding lands will produce excessive sediment if burned with high intensity fire. Hillside runoff eventually drains into waters supporting fish listed as Threatened under the Federal Endangered Species Act (ESA) or administratively designated as Sensitive by the Forest Service. Watershed/Water Quality stakes are very high here as the Klamath River supports one of the best and last self-sustaining salmonid populations in the lower 48 states. While fires of lower- and mixed-severity can be beneficial for land, vegetation, and aquatic habitats; fires of higher severity over large areas can produce consequences that are detrimental to the land, vegetation, and aquatic environment. The CWPP acknowledges that fire with a mix of high-,moderate-, and low-severity has an important role to play on the landscape in maintaining biodiversity.
2. **Vegetation**: Vegetation is highly variable in the area due to widely different soil types and productivities, convergence of bioregions, slope aspect, fire history, climate history, and microclimates. This variability is illustrated by aerial photo imagery shown on Map 2. Wildlife habitat values are high, particularly for Salmonids and the Northern Spotted Owl listed as endangered under ESA. Commercially valuable conifer timber is present in varying quantities. Shade cover is important to maintain over streams to protect water quality. Again, a mosiac of low-, moderate-, and high-severity fire is often beneficial while widespread high-severity fire is detrimental.
3. **Unique areas**: The CWPP planning area and surrounding lands include a number of unique areas such as:

- culturally sensitive areas including the Inam area near the mouth of Clear Creek (shown on Map 1) and traditional gathering areas;
- areas with unique or rare vegetation such as the Brewer spruce grove along Grayback Road;
- geologic formations such as the scorpion caves in upper Thompson Creek; and
- areas with known presence of rare, sensitive, or threatened wildlife species such as bald eagle, peregrine falcon, and others.

These areas have varying degrees of sensitivity to fire. The CWPP recommends that Fire managers consult with local people from the community, the Karuk Tribe, the Ranger District, and other knowledgeable sources to ensure that fuels reduction projects and suppression activities protect or restore unique values present in these areas.

4. **Biodiversity**: The landscape encompassing the community of Happy Camp lies at the heart of the Klamath Physiographic Province which is recognized as a globally significant region because of its high biodiversity. This Klamath region supports a large number of endemic, rare, and sensitive flora and fauna, has the largest strongholds of low-elevation temperate forest in the nation, and high concentration of wild and scenic rivers that support one of the strongest self-sustaining salmon and steelhead populations in the lower 48 states. Protecting and restoring this high biodiversity is an important stakeholder value. The high biological diversity is due to:
   - complex arrangements of rock and soil types;
   - large east-west precipitation and temperature gradients;
   - numerous diverse microclimates created by steep mountainous topography and deep inner gorges;
   - convergence of several distinct eco-regions;
   - lack of glaciation during the last ice age;
   - a network of large rivers and smaller streams that provide for aquatic biological connectivity between diverse watersheds and the ocean;

- uncommon east-west orientation of key mountain ranges that provide for unparalleled terrestrial biological connectivity between coastal and inland mountain ranges; and
- historic pattern of ***mixed-severity*** fire across the landscape that resulted from interactions between complex topographic, geologic, climatic, and hydrological factors.

Mixed-severity fires of variable frequency over the millennia were likely instrumental in creating patchy landscape patterns and variable age-class distributions in this region (Odion, et al., 2004). Structural diversity of forests in the Klamath Mountains is directly related to complexity of the areas' fire history and variable terrain by which fire behavior and spread has historically been constrained. Mixed-severity fires and fire regimes are hypothesized to give rise to unique patch dynamics and ecosystem responses (Halofsky et al., 2011). Widespread fire exclusion has effectively reduced diversity in these ecosystems, resulting in more homogenous forests that are vulnerable to wildfire and other disturbances (Taylor and Skinner, 2003).

Ignition Risks

Unplanned and unauthorized ignitions in the planning area are caused by lightning and humans. Map 9 shows the incidence of lightning- and unauthorized human-caused fires over the last 100 years. Humans start most of the fires in lower elevation areas of the planning area, in and around town, at camping sites, along the river corridor, and within the broad valleys of major tributaries to the Klamath River. Human-caused ignitions are primarily due to escaped fires from burn piles or controlled burns, sparks from vehicles, sparks from mowing, fires accidently started by smokers, children playing with fire, and arson. Lightning is the primary cause of ignitions on mid-slope to ridge areas and are the cause of most large fires in the planning area.

3. Goals and Objectives of the CWPP

Goal 1: ***Prioritize, recommend and implement actions to reduce adverse fire impacts to life, property, infrastructure, ecosystems, and other resources of community value.***

Objective 1: Prioritize fuels reduction treatments coupled with prescribed fire and management of unplanned ignitions to protect life, property, infrastructure and other community and stakeholder values based on a collaboratively developed fire and fuels management strategy. Add new areas of strategic fuels reduction that could be used to slow fire movement.

Objective 2: Provide information to landowners, residents, businesses, utility operators, and resource managers on actions that can be taken before wildfire occurs to minimize adverse impacts to property, infrastructure and other resources of value to the community and stakeholders.

Objective 3: Install water tanks for emergency fire suppression in neighborhoods that do not have fire hydrants.

Goal 2*:* ***Provide critical information to Fire Teams and other emergency response personnel to maximize safety, effectiveness, efficiency and beneficial measures of fire management, and minimize adverse effects from aggressive fire suppression activities on the landscape.***

Objective 1: Provide maps and geodatabase showing:

(1) Locations of structures and major powerline corridors (Maps 4 and 8);

(2) Locations of fire-hydrants and water drafting sites (Maps 4 and 8);

(3) Aerial imagery of planning area with roads superimposed (Map 2);

(4) Primary and secondary emergency access roads to occupied structures and critical infrastructure (Map 10);

(5) Solar radiation intensity (Map 11);

(6) Locations and status of existing dozer fire-lines (Maps 5 and 6);

(7) Roads potentially useful for containing or controlling wildfires (Map 10);

(8) Recently burned areas potentially useful for containing or controlling wildfire

(Map 12); and

(9) Locations of recent fuel reduction treatments potentially useful for containing or controlling wildfire.

Goal 3: ***Recommend actions to reduce cost of suppressing or managing large wildfires.***

Objective 1: Identify, maintain, and improve existing dozer fire-lines in strategic locations to use for containing large wildfires and controlling prescribed burning. Create 150-foot wide shaded fuel breaks on each side of strategic dozerlines.

Objective 2: Identify, maintain, and improve existing roads in strategic locations to use for containing large wildfires and controlling prescribed burning. Create 150-foot wide shaded fuel breaks on each side of strategic roads

Objective 3: Identify, maintain and/or implement a system of firesheds in strategic locations around the community to function as fuelbreaks to protect communities from large wildfires and give fire managers greater tactical flexibility for managing wildfire for resource benefit and reducing cost of that management.

Goal 4: Recommend measures for restoring beneficial fire to the landscape.

Objective 1: As fuel treatments listed in Goals 1 and 3 above are being completed and the community becomes increasingly fire-adapted, increase use of prescribed fire and management of unplanned ignitions for resource benefit on NFS lands. Increase use of prescribed fire on private lands where all agreements and permitting is in place.

Goals for the CWPP are consistent with the three phases of the National Cohesive Wildland Fire Management Strategy (Wildland Fire Executive Council, 2013) which are: (1) *restore and maintain resilient landscapes, (2) create fire-adapted communities, and (3) improve response to* wildfires. Community support for HCFSC fuel reduction treatments is high.

4. Fire/Fuel Hazard Reduction Treatment Priorities and Costs

The immediate goal of CWPP recommended and prioritized fuels treatment is protection of life and property. The ultimate goal is gradually reduced risk of adverse wildfire impacts to stakeholder values to the point where aggressive fire suppression will no longer be the primary choice for managers to attain low fire/fuel hazard conditions. Instead, prescribed fire and management of unplanned ignitions would be the primary tool used by fire managers and prescribed fire practitioners to achieve and maintain low fire hazard and protect and restore fire resilient landscapes and other stakeholder values.

The strategic challenge in CWPP development was to define scale and location for fuel reduction treatments to be effective at creating fire-adapted communities and restoring fire resilient landscapes at the lowest cost. The CWPP recommends fuel reduction treatments on 42,600 acres or 12% of the planning area as shown on Map 5. Total estimated cost for recommended treatments is over 51 million dollars as described in this section and shown in **Table 1** (page 35). All fuel reduction actions listed or alluded to in this CWPP are purely recommendations and in no way constitute a decision to implement work (except for CWPP recommended fuels reduction work already approved under NEPA for NFS lands).

The order of CWPP recommended fire/fuels hazard reduction priorities described below emphasizes the most pressing need is to reduce fuels and fire hazard in the vicinity of where people live and travel and to protect vital infrastructure. However, ***listed fuel reduction treatment priorities will be implemented individually or concurrently as opportunities arise***. Ideally, while fuels/fire hazard is being reduced around residences/infrastructure and primary emergency ingress/egress roads, work would concurrently be underway to complete fuelbreaks around the town core and key neighborhoods and to establish and/or maintain a strategic landscape-scale network of fuelbreaks and firesheds. As the community becomes increasingly fire adapted, more and more use of prescribed burning and managing unplanned ignitions for fuels reduction and resource benefit will be safe and feasible.

CWPP recommended fire/fuel hazard reduction treatment priorities are described below. **Table 1** (page 35) summarizes: estimated acres of private and NFS land recommended for fuels reduction treatment; estimated cost for each priority along with cumulative and total treatment cost estimates. Recommended treatments are shown in Map 5. Completed treatments are shown in Map 6. More information on the prioritization strategy can be found in Appendix F.

Priority 1

Implement fuels reduction treatments to ensure that all residences and critical infrastructure have the bare minimum protection from wildfire, and that fuels have been reduced to *reasonably safe levels* adjacent to driveways and emergency ingress/egress roads.

Priority 1a: The "home ignition zone (HIZ)" coined by Jack Cohen (USDA Research Physical Fire Scientist) in the 1990s is an area up to 200 feet from structures that includes the structure and its' immediate surroundings which if properly conditioned can protect the structure during a wildfire.

HIZ buffers are designed to provide reasonable safeguard for residences and infrastructure. Buffer width depends on existing and potential fire-control features present at the site; topographical, geologic, and hydrologic features present on-site and in the vicinity; fuel loading and composition; and degree of fuels/wildfire hazard present on and adjacent to site.

The HIZ includes a "***defensible space***" buffer that extends a distance of 100 feet from the footprint of structures. Defensible space requires that there is no flammable vegetation or fuels within 30 feet of occupied structures and that fuels are greatly reduced in the remaining 70 feet. *Defensible space buffers of 100-foot width around residences are currently required by California State law and noted by insurance companies* (see California Code for defensible space (PRC 4291) in Appendix D). The National Fire Protection Association has detailed information and instructions on the HIZ and creating defensible space and

in a publication available at http://www.firewise.org/wildfire-preparedness/be-firewise/home-and-landscape/defensible-space.aspx. Residents within the CWPP planning area are encouraged to study and follow CalFire website publication *"Being Ready - Wildfire Preparedness" available at http://www.readyforwildfire/being_ready.org/.* An excerpt from that publication can be found in Appendix C.

In many places within the planning area even a 200 foot wide HIZ is unlikely to adequately make homes and installations defensible from wildfire. This is because the surrounding forest is overly dense with high fuel loading and/or because of topographic factors, such as steep slopes and/or canyons, which funnel wind that can cause extreme fire behavior. Therefore, as a first cut, the highest CWPP recommended fuel treatment priority is to create a 200-foot HIZ buffer surrounding residences and structures critical to infrastructure; keeping in mind that even a 200-foot buffer could be woefully inadequate in many instances.

Manual fuels reduction is often employed to attain defensible space close to structures and installations but all four treatment types (described in Chapter 5) could be used to establish a 200-foot wide fuelbreak. Cost estimates for HIZ treatments are based on assumption that 70% of total acres would need treatment or be feasible to treat.

Priority 1b: As part of highest fuels reduction priority in the HIZ, the CWPP recommends reducing fuel loading in 150-foot wide buffers on each side of primary access roads to provide reasonable assurance of safe passage during most wildfires. The objective is to create a fuelbreak over 300 feet wide along primary access roads.

Primary access roads include driveways (nearly all driveways are already covered and accounted for in the 200 foot HIZ), emergency ingress/egress roads that connect occupied residences and/or critical infrastructure to the towns of Happy Camp, Seiad Valley, Somes Bar, and Oregon Highway

199. Primary access roads include main regional travel routes: State Highway 96, County roads, Grayback Road, Elk Creek Road, China Grade Road, and Gordon's Ferry Road. Primary access routes are shown on Map 10. Appendix G1 lists primary access roads in the planning area and provides mileage of primary access road segments by jurisdiction.

Manual treatment methods would be used for most roadside fuelbreaks. Mechanical methods may be used on slopes less than 35%. The CWPP estimates that 80% of total acres would need treatment or be feasible to treat. Many primary access roads are also recommended ***burn control roads*** for managing wildfires and containing underburns (burn control roads are discussed in Priority 5).

Priority 2

Implement fuel reduction treatments to ensure that all occupied residences and critical infrastructure have *reasonably adequate protection* against ignition from a wildfire.

Forest Service Fire/Fuels Specialists identified through consensus a more realistic buffer width for protecting residences and installations from wildfire in the planning area. The average width of this zone to maintain at low fuel loading is 500 feet (including the completed 200 foot HIZ). Hence, the CWPP recommends an expanded HIZ buffer extending 500 feet out from the footprints of residences and infrastructure. Although width would vary due to site conditions, CWPP used an average width of 500 feet to estimate costs of expanded HIZ buffers.

Manual fuels reduction is the primary treatment type employed to attain 500 foot wide fuelbreaks around residences and infrastructure, however, mechanical and/or prescribed fire and/or mastication is likely to be feasible and appropriate in some situations. Expanded HIZ fuelbreaks are shown on Map 5. **Table 1** (page 35) shows: (1) estimated number of acres in the "donut" of land that would expand the HIZ from 200 feet wide to 500 feet wide and (2) the estimated additional cost for expanded HIZs. The CWPP estimates that 70% of total acres would need treatment or be feasible to treat.

Priority 3

Implement fuel reduction treatments to create 500-foot wide shaded fuel breaks on boundaries between private property and NFS System Lands (the "*Greenline*"). Greenline fuelbreaks are recommended where those boundaries are in strategic locations for protecting the town core, neighborhoods, and private properties from wildfire and/or where the treatments would abut and be complimentary to recently completed or planned Forest Service fuel reduction projects. The HCFSC also recommends specific "Around Town" treatments which would fill in gaps between recently completed or planned fuel reduction projects. Around Town fuel treatments are strategic locations on NFS land where fuel reduction treatments are critical to prevent wildfire from crossing between National Forest and private property. The primary objective of greenline and Around Town fuel reduction treatments is to complete a fuelbreak around the town core.

The CWPP recommends manual, mechanical, and/or prescribed burning treatments to establish and maintain the Greenline and Around Town fuelbreak around the town core, neighborhoods, and residences. The actual width of Greenline fuelbreak needed to provide reasonable safeguard for community protection and/or prescribed burning projects depends on: existing and potential control features present at the site; topographical, geologic, and hydrologic features present on-site and in the vicinity; fuel loading and composition, and overall wildfire hazard. Although Greenline width will vary depending on site conditions, the CWPP uses an average width of 500 feet for planning purposes. Recommended treatments on Map 5 include Greenline segments and Around Town areas that are highly recommended for fuels reduction treatment based on criteria stated previously. Greenline fuelbreaks and Around Town fuel reduction treatments abut one another as shown on Map 5. **Table 1** (page 35) shows acres and costs for Greenline and Around Town treatments. The CWPP estimates that 90% of total acres would be treated.

Priority 4

Contribute to establishment and maintenance of a strategic landscape-scale network of linear and polygonal fire control features, in part, by keeping fuel loads light on existing strategically located dozerlines and creating 150-foot wide fuelbreaks on each side of the dozerlines. This will create 300+ foot wide fuelbreaks that are primarily along ridges that will be useful for managing planned and unplanned ignitions, slowing or containing large wildfires, and defining firesheds.

As part of CWPP development, a firelines ***geodatabase*** was created for the entire 1.2 million acre WKRP planning area. CWPP generated data is compatible with the Wildfire Decision Support System (WFDSS), and can be used as a strategic tool in wildfire suppression. This geodatabase has been shared with fire planning staff from the Six Rivers and Klamath National Forests and was used by Fire Incident Teams during the 2014 Happy Camp Complex and 2017 Eclipse Complex. Forest Service experts with considerable local experience and/or professional training in fuels and fire management identified and attributed firelines in the geodatabase. Existing firelines recommended as permanent fuelbreaks in this CWPP were deemed to have been useful in controlling past wildfires and/or have high potential to provide large fire containment. Fuelbreaks along existing dozerlines sometimes alternate with fuelbreaks along short segments of burn control roads (when burn control road segments are on or very near the ridge) to create contiguous linear ridgetop fuelbreaks (burn control roads are discussed in Priority 5). Existing dozerlines recommended by the CWPP to be improved into permanent strategic fuelbreaks are shown on map (Map 5). **Table 1** (Page 35) gives: (1) estimated number of acres that would need fuels reduction treatment to create 150-foot wide shaded fuelbreaks on both sides of existing dozerlines and (2) the estimated cost for implementing dozerline fuelbreaks assuming manual fuel treatment costs.

Priority 5

The CWPP recommends establishing and maintaining a strategic network of *burn control roads* that can be used alone or in conjunction with other fire control features (priorities 4, 6, 7) to manage planned and unplanned ignitions, to facilitate prescribed burning, and to create firesheds. Included in this Priority are primary roads that provide emergency ingress/egress and secondary access routes that provide alternate emergency ingress/egress and service public facilities such as campgrounds and trailheads.

The ideal would be to create 150 foot wide areas on each side of identified roads where fuels and fire hazard are greatly reduced. This would result in shaded fuelbreaks 300 feet or wider depending on site conditions.

CWPP recommended burn control roads are included on Map 5 and are listed in Appendix G2. Many of the CWPP recommended burn control roads are also primary and secondary access roads. Appendix G1 identifies which primary access roads are also recommended burn control roads. Remaining recommended burn control roads that are not also primary access roads are listed in Appendix G2.

Priority 6

The CWPP recommends greatly increasing use of prescribed fire and managed wildfire when associated risks are negligible and potential for beneficial fire effects is high. To protect the town core and neighborhoods and/or restore a fire-resilient landscape, the CWPP recommends implementing prescribed burns in the planning area where the KNF has completed NEPA and recommends additional areas for prescribed burning (Map 5).

Highest priority areas for prescribed burning to reduce excessive fuel loading and wildfire hazard in a safe manner are within and near the community. Reducing excessive fuels prior to wildfire enhances public safety during a wildfire and diminishes undesirable environmental effects. Prescribed burning is recommended for strategic locations and staged with manual and mechanical fuel treatments to create and maintain fuelbreaks and firesheds surrounding the town core and outlying neighborhoods. **Table 1** (Page 35) shows (1) the number of acres recommended for

prescribed burning and (2) the estimated cost of recommended prescribed burn treatments. Prescribed burns would have to be repeated every 3 to 12 years (more or less depending on site condition) to maintain desired condition of low fire hazard and ecological benefit.

Priority 7

The CWPP recommends prescribed burning and allowing managed wildfires to burn where safe to do so within recent wildfire footprints. This provides strategic locations for fire-adapting the community and/or restoring and maintaining fire-resilient landscapes surrounding the community.

Areas where wildfires have recently burned and fire regimes are most intact may offer an opportunity for continued restoration of fire as a natural process and the resilient forests it can create. Areas with lower departure from fire return intervals (Map 13) are where fire regimes are most intact. In recently (0 to 11 years) burned areas, the CWPP recommends that prescribed burning and managed unplanned ignitions are used to the greatest extent possible. This is to “keep the fire on the ground” thus maintaining low fire hazard and recovering forest fire resiliency and fire-dependent ecosystem processes. Keeping fire on the ground means reburning or allowing unplanned ignitions to reburn through recently burned areas as soon as enough fuel accumulates on the ground to carry a fire and produce enough heat to consume excess fuels and kill unwanted re-sprouting vegetation. Reburning is the most efficient and cost effective method to re-establish a fire resilient forest over vast areas that have recently burned. Frequent prescribed burning and/or managing unplanned ignitions for resource benefit may be the only way to prevent very severe future (decades) wildfire in vast areas of wildfire burned forest that currently have high dead fuel loading. Acres of recent wildfire footprint that should be strategically re-burned will depend on wildfire history, state of re-growth, and fuel loading at the time a project is planned. Therefore, acreage and cost estimates for reburning are not calculated in the CWPP.

Features Common to Priorities and Recommended Actions

- Fuels treatments will be tailored to site conditions. Actual treatment acres may differ and will often be less than ***GIS*** generated acres because not all ground will need fuels reduction treatment and some ground is not treatable due to excessive slope (over 80%) or other factors.
- Although average width of fuelbreaks on each side of primary access and burn control roads is estimated to be 150 feet, actual width of reduced fuel buffer on each side of a given road segment will depend on site conditions as some areas will require a wider buffer to be effective; some areas will not need treatment; and some areas cannot be feasibly treated (slopes over 80%). The CWPP estimates most acres of roadside fuelbreak would be implemented manually. Mechanical treatments may be used on slopes of 35% or less.
- Fuelbreaks, Home Ignition Zone (HIZ) buffers, Greenlines, and Around Town treatments will be tailored to the terrain, fuels, and historic fire patterns of the landscape in which they are placed. The CWPP recommends that fuelbreaks, Greenline, and Around Town buffers be shaded where forest canopy is adequate to shade out competing vegetation and where ground to live tree crown height is adequate to prevent a ground fire from igniting the canopy. For a ***shaded fuel break,*** fuels are greatly reduced by removal from site and/or burning on-site. The smallest and unhealthiest trees are thinned and removed or burned, brush is cut and burned, and ***ladder fuels*** are cut and burned. Once established, vegetation is slow to grow back under shaded fuelbreaks, reducing the amount of work required to maintain lower fuels/fire hazard conditions. Shaded fuelbreaks are also more aesthetically pleasing. Shaded fuelbreaks are known to be effective for moderating fire behavior in the conifer forests of the Klamath Mountains.
- Where feasible and safe to do so, prescribed burning is applied as the finishing treatment to areas where manual or mechanical treatments have been implemented. Prescribed burning is used where appropriate to achieve adequate fuels reduction and stand resiliency to wildfire by maintaining or moving vegetation and fuels

towards desired condition. No prescribed fire would be applied within a tree length of structures.

- Conifer plantations intersecting fuelbreaks are included as part of the fuels treatment area if such treatment is needed to secure fire-safe access routes, to achieve a functional fire control feature, and/or if the inclusion would significantly increase fire protection for structures, neighborhoods, or the town core. The CWPP recommends that existing plantations on general forest (Matrix) land be maintained for fire resiliency and stand health, and that existing plantations in riparian reserves (RRs) and late-successional reserves (LSRs) are treated, if needed, to increase fire resiliency and maintain or restore the intended function of those reserves. Costs for treating younger plantations using manual methods would be similar to costs for the adjacent fuelbreak. Costs for treating older plantations using mechanical methods are not included in CWPP cost estimation because mechanical thinning of larger commercially saleable trees in the older plantations could offset or subsidize the cost of fire/fuels hazard reduction treatments. Acres of younger (<40 years) plantations and older (>40 years) plantations that intersect fuelbreaks are shown on Map 5 and in **Table 1** (page 35).

5. Action Plan and Assessment Strategy

Wildfire Preparedness

Residents within the CWPP are encouraged to study and follow CalFire website publication *"Being Ready - Wildfire Preparedness" available at http://www.readyforwildfire/being_ready.org/*. An excerpt from that publication can be found in Appendix C. Recommendations made in this publication are consistent with the Karuk Tribe Hazard Mitigation Plan (Karuk Tribe, 2010).

Emergency Wildfire Response Capabilities

The HCRD and the HCVFD provide the local firefighting capabilities for the Happy Camp Community. Response to structural fires in the HCFPD (shown in Map 4) is the responsibility of the HCVFD. The volunteer fire department also responds to fires outside the HCFPD when needed. For fires that effect improvements, structures and/or vehicles outside the HCFPD, fire protection falls to County responsibility. Private lands

outside of the District are SRA, but protection is provided through agreement between the KNF and CalFire. This agreement is referred to as the KNF DPA and it allows the HCRD to respond to those fires.

The Forest Service is responsible for all fires on NFS lands. The HCRD is responsible for initial suppression of wildfires and has the following fire emergency response equipment:

- Three Type III Engine with 750 gallon tanks and 1,500 gpm pump rate;
- One 1,500 gallon water tender with 1,500 gpm pump rate;
- One Type II Initial Attack crew;
- Two Prevention Trucks with 150 gallon tank and pump;
- One lookout on Slater Butte; and
- One lookout on Lake Mountain located just east of the CWPP planning area.

The HCVFD has an Insurance service rating of "5" which is considered good for a rural fire department. All volunteers are trained to California State Standard S.B. 1207 (structural firefighting level). The Happy Camp Volunteer Fire Department maintains around 15 volunteer fire personnel stationed in Happy Camp year round and has the following fire emergency response equipment:

- One Type II Engine with 750 gallon tank and 1,500 gpm pump;
- One Type III Engine with 750 gallon tank and 1,500 gpm pump rate; and
- One Type I water tender with 3,000 gallon tank and 1,000 gpm pump rate.

Access to Water for Emergency Fire Suppression

Many of the neighborhoods close to the Happy Camp town center have fire hydrants or water standpipes for emergency fire suppression as shown on Maps 4 and 8. Neighborhoods further from town center do not have fire hydrants or standpipes. Very few residents in these neighborhoods have water storage tanks or access to sufficient water to adequately suppress a fire. PRC 4290 addresses water standards (see Appendix D).

The CWPP recommends installation of water storage tanks for emergency fire suppression in neighborhoods that are not served by fire hydrants. The Happy Camp Fire Safe Council has been granted funds to place eight emergency water storage tanks

in neighborhoods where adequate water supply for emergency fire-suppression is lacking. Planning and materials acquisition for installing the tanks is underway. Remote residents or clusters of residents must rely on existing or new water drafting sites in rivers and streams. Known water drafting sites in streams on NFS lands are shown on Map 8.

Non Location-Specific Action Plan

Local Skills, Knowledge, and Coordination

The CWPP recommends that the Karuk Tribe and HCRD maintain a local fuels planner that can be dedicated to planning, implementing, and monitoring fuels reduction projects. Personnel would also be available to advise fire planners of values at-risk and features of the CWPP during a wildfire.

In response to Goal 2, Map 2 provides aerial imagery of the planning area, Map 11 shows solar radiation, Map 12 provides fire History, and Map 8 provides locations of structures and drafting sites.

Education and Outreach

Provide information to landowners, residents, businesses, utility operators, and resource managers on measures and actions that can be taken before, during, and after wildfire to minimize risk of loss of life or injury and to minimize risk of loss or adverse impacts to property, infrastructure and other resources of community value. This includes California state law regarding the establishment and maintenance of defensible space (PRC 4291), for new building construction (PRC 4290), and for utility clearances (PRC 4292). A summary of this information from the CalFire website (August, 2014) is provided in Appendix D.

Train locals to be firefighters and/or prescribed burn practitioners through training and qualification such as the Nature Conservancy's Fire Learning Network TREX program. More information on TREX available at: https://www.conservationgateway.org/ConservationPractices/FireLandscapes/HabitatProtectionandRestoration/Training/TrainingExchanges/Pages/fire-training-exchanges.aspx.

Highly Visible Address Signs

Assist residents and businesses in obtaining and posting highly visible street address signs so that emergency personnel can quickly locate and identify specific properties. PRC 4290 addresses signage (see Appendix D).

Electrical Utility Corridors

Ensure that effective fuels/fire hazard reduction measures are included in operating plans and permits for powerline corridors. Maintain powerline corridors at low fuel loading levels along electricity distribution corridors particularly near structures, driveways, roads, and infrastructure. The CWPP recommends that the Forest Service require fuels reduction on powerline corridors in treatment priority areas 1 – 3 as a condition for re-issuing Special-Use Permits. PRC 4292 addresses utilities corridors and pole clearances.

Fuel Treatments for Cultural and Ecological Resource Benefit

Treat fuels when and where needed to protect tribal practices dependent on the use of fire as a land management tool and to preserve plant and animal species that depend on habitats maintained by frequent fires. To ensure that CWWP recommended actions benefit cultural and ecological resources, projects should be developed collaboratively by the WKRP based on site conditions, multiple resource benefit objectives, clearly stated goals and objectives, clearly articulated monitoring metrics, the best available science, and Karuk ***Traditional Ecological Knowledge*** (Karuk Tribe Department of Natural Resources Eco-Cultural Resource Management Plan, 2010).

Use Fire and Targeted Fuel Treatments to Protect and Restore Rare, Endemic, and/or Poorly Represented Tree Stands and Botanical Assemblages

Reduce fuels and/or use prescribed fire to protect and/or restore locally- and globally-significant stands of rare, endemic, and/or poorly represented native tree stands or botanical assemblages that are at-risk due to fire exclusion. Local examples of this restoration includes: (1) thinning conifers that have encroached into stands of foxtail pine due to fire exclusion; (2) removing conifers that have encroached onto meadows due to fire exclusion; (3) allowing beneficial fire to burn into Baker cypress stands where

reproduction is dependent on fire; and (4) removing conifers that have encroached into and over-topped hardwood stands.

Restore Roosevelt Elk Populations

Healthy elk populations were identified as an important community and stakeholder value that is at-risk due to past fire exclusion and current fire suppression policies. It is recommended that fuels and fire hazard are reduced to protect and restore elk habitat by removing conifers that have encroached onto meadows and into stands of white and black oak due to fire exclusion.

Location-Specific Action Plan

In response to goals and objectives established through collaborative process, the CWPP recommends specific fuel reduction projects for immediate and future development, implementation, and monitoring.

All fuel reduction actions listed or alluded to in this CWPP are purely recommendations and in no way constitute a decision to implement work. No fuels reduction work will be implemented on private land without the involvement and expressed permission of property owners. Large or potentially controversial projects will be collaboratively developed at the project-site scale by property owners, community members, the Karuk Tribe, other stakeholders, and interested members of the WKRP. This ensures that agreement in principle is successfully transferred into agreement in practice with agreed upon monitoring objectives.

Where feasible, fuel reduction treatments will be implemented in a manner that achieves multiple ecological, social, and economic objectives that support as many of the WKRP Target Shared Values as possible (for more info see Harling and Tripp, 2014): *Fire-Adapted Communities; Restored Fire Regimes; Sustainable Local Economies; Cultural and Community Vitality; Biodiversity, and Healthy River Systems*.

The following is a list of immediate priority fuel reduction projects that were developed through collaborative process. Most of these projects cross property boundaries to achieve desired conditions. Any treatments on NFS lands require compliance with the

National Environmental Policy Act (NEPA) and Endangered Species Act (ESA). Map 5 indicates areas where NEPA (including ESA compliance) has been completed as of February 2018. Treatment methods are described in more detail after the list of projects and are summarized in **Table 1** (page 35).

Many site-specific projects have been approved by property owners, regulatory compliance has been initiated if not completed, and work in some cases has commenced.

Name, location, and description of projects that cross property boundaries between Karuk and NFS lands:

Happy Camp North Fuelbreak – Greenline Project (Priorities 3, 5)

Use manual fuel reduction treatments with follow-up prescribed burning to expand upon previous work. Complete northern perimeter town core shaded fuelbreak from the junction of Indian Creek Road and Indian Meadows Road east to Highway 96.

Name, Location, and Description of Projects that cross property boundaries on private and NFS lands:

Happy Camp South-West Fuelbreak – Greenline Project (Priorities 1, 2, 3, 5, 6)

Implement manual, mechanical, and prescribed burning fuel reduction treatments to complete the south-west perimeter of the Happy Camp town core fuelbreak. Manual and mechanical fuels reduction treatments along roads and around structures will expand existing treated areas, retreat selected areas, treat new ground, and prepare for a continuous underburn from Benjamin Creek Road north to the south rim of Doolittle Creek drainage. This underburn includes most of Little Grider Creek and Perkins Gulch drainages. A small portion of Doolittle Creek drainage in included to use existing fire control features associated with Doolittle Creek Road. The project will also prepare for and implement the Happy Thin underburn project. **The WKRP has recommended that this be the first WKRP collaboratively developed, implemented, and monitored project in the Happy Camp CWPP area.**

Indian Creek West Fuelbreak – Greenline Project (Priorities 1, 2)
Strengthen and expand manual fuels reduction treatments along driveways and around structures on private land. Implement shaded fuelbreak buffer on the west side of Indian Creek, upslope from private property extending from Doolittle Creek to Deer Lick Creek. This is ongoing work that will continue to expand on and maintain previous treatments in selected areas. This work will protect private property and residences and will facilitate prescribed burning on NFS lands upslope

Happy Camp South-East Fuelbreak – Greenline and Around Town Project
Implement manual and prescribed burning fuel reduction treatments to complete the south-east perimeter of the Happy Camp town core fuelbreak. Use manual fuels reduction treatments along roads and around structures to expand existing treated areas and retreat selected areas. Develop a shaded fuelbreak to prepare for prescribed burning south of the Curly Jack neighborhood on NFS lands. Re-burn recently burned polygons including areas within the 2014 Happy Camp Complex areas.

Indian Creek East Fire Hazard Reduction (Priorities 1, 2)
Implement manual fuels reduction treatment (described in following section) with follow-up prescribed burning around structures and adjacent to roads and driveways in the following locations:
(1) Along Indian Creek Road from junction of Indian Creek Road and Indian Meadows Road north to South Fork Indian Creek Road;
(2) Along the county portion of East Fork Indian Creek Road up to the furthest residential property boundary;
(3) Along FS roads 18N12/18N13 that serve as the driveway to the Davis residence beyond the County portion of East Fork Indian Creek Road;
(4) Surrounding the Driskell residence and along FS Road 18N18 that serves as driveway to the Driskell residence; and
(5) Surrounding the Garrahan residence and along FS Road 18N52 and the 18N24 spur that serve as driveway to the Garrahan residence.

China Grade Neighborhood Fire Hazard Reduction (Priorities 1, 2, 5)
Implement manual fuels reduction treatment and follow-up prescribed burning around structures and adjacent to roads and driveways along China Grade Road extending from Elk Creek Road in Happy Camp to the HCFSC WUI boundary at little Horse Creek. Follow-up

prescribed burning, no closer than a tree length from structures, would be used where appropriate to achieve desired conditions. This project crosses into the Seiad planning area since China Grade Road is a primary access route to Seiad. This is ongoing work that will continue to expand on and maintain previous treatments in selected areas.

Gordons Ferry Neighborhood Fire Hazard Reduction (Priorities 1, 2)

Private: Strengthen and expand manual fuels reduction treatments and prescribed burning along roads, driveways, and around structures in the Gordons Ferry neighborhood.

National Forest: ***Complete NEPA*** then implement a fuelbreak (shaded where possible) and fuels treatments along Gordons Ferry Road on NFS land complementary to fuelbreak on private parcels.

Elk Creek Neighborhood Fire Hazard Reduction (Priorities 1, 2, 5)

Complete manual fuels reduction treatment and follow-up prescribed burning around structures and adjacent to roads and driveways along Elk Creek Road extending from Curly Jack Road in Happy Camp to Sulfur Springs Campground. Work will expand previous treatments and rework selected areas. Much of the hillslope north of Elk Creek Road from Happy Camp to East Fork Elk Creek burned in the 2014 Happy Camp complex and will need maintenance treatments.

Crawford Creek Neighborhood Fire Hazard Reduction (Priorities 1, 2, 5, and 6)
(MOU with Karuk Tribe for Inam needed)

This project is designed to provide WUI protection to residences and primary access roads and to restore wildlife and cultural use values including restoration of habitats for elk, oak, tan-oak, and other cultural-use plants.

Private: Implement manual with follow-up prescribed fire, mechanical, and/or prescribed burning fuels reduction treatment along roads, driveways, and around structures in the Crawford Creek neighborhood.

National Forest: Implement manual with follow-up prescribed fire, mechanical, and prescribed burning fuel reduction treatments along and between FS roads, near private property and residences, and in strategic locations on NFS land parcels in the WUI surrounding the Crawford Creek neighborhood and its primary access roads.

Name, Location, and Description of Projects on NFS lands:

HCFP Phase II (Priorities 1b, 5, 6)

Implement manual thinning and underburning. The project includes areas near Cade Creek and the 180 degree turn on Highway 96 just west of Cade Creek.

Happy Camp WUI Prescribed Burning (Priority 6)

Implement prescribed Underburning for areas on Map 5 that are not already covered under Happy Camp South-West Fuelbreak and Happy Camp South-East Fuelbreak projects.

Ridgetop Fuelbreaks (Priority 4)

Implement ridgetop fuelbreaks along:

(1) Thompson Ridge Road;

(2) Grider Ridge Road and/or existing dozer-line on or near the ridge;

(3) Fryingpan Ridge and/or existing dozerline on or near the ridge;

(4) Titus Ridge Road and/or existing dozer-line on or near the ridge, and

(5) along other existing dozerlines included on Map 5.

(6) Along the ridge at the top of Perkins Gulch to connect to burn control roads.

Fuels Hazard Reduction Treatment Methods

The following is a detailed description of fuels reduction treatment methods recommended to reduce fuels and fire hazard that will be used to complete site specific projects. A breakdown of treatment methods, acreages, and estimated costs are shown in **Table 1** (page 35).

(1) **Manual fuel reduction treatment** includes thinning small understory trees, cutting back or removing brush, pruning branches and other ***ladder fuels***, mowing, and chipping and/or hand-piling and burning existing and activity fuels. Target fuels condition for post-manual fuel treatment areas is reduced stand density, increased height from ground to lower tree branches or crown, little to no ladder fuel, and low amounts of ***ground fuel*** and/or ground ***fuel geometry*** that will support only low flame lengths. Fuelbeds remaining after treatment are shallow so tree roots or soils are not scorched when prescribed fire or wildfire passes through. Snags or hazard trees that could compromise effectiveness of fuel reduction treatments or fuelbreaks in a wildfire

are felled as part of manual fuel hazard reduction treatments. Manual treatments are implemented by hand using chainsaws and pole saws. Manual thinning is limited to smaller trees (usually 6 inches diameter or less) that can be thinned and moved by hand. Fuels generated from manual thinning are hand-piled and burned and/or chipped and/or lopped and scattered.

The CWPP does not recommend lop-and-scatter method of fuels abatement in situations where excessive fuels left on the ground after thinning or fuels reduction treatment would decrease effectiveness of fire hazard reduction or fire would scorch residual trees, tree roots, or soils.

Manual fuel reduction treatment is most commonly employed to reduce fuels/fire hazard to create and maintain ***fuelbreaks*** and ***shaded fuelbreaks*** near homes and infrastructure, along driveways, and other places where it is impractical, infeasible, unsafe and/or uneconomic to use mechanized equipment and/or prescribed fire.

Based on KNF contracting records and experience implementing CWPP projects, 2018 costs to complete manual fuels treatment is estimated at $1,500 per acre. Subsequent pile burning is estimated at $300 per acre for a total cost of $1,800 per acre for this CWPP.

Manual fuels reduction treatment and subsequent pile burning is recommended for approximately 14,800 acres in the CWPP planning area. Another 3,800 acres of plantations abutting recommended fuelbreaks may also need manual treatment.

(2) **Mechanical Fuel Treatment** is the mechanical removal or modification of fuels and includes tree thinning, mastication (see #4 for this section), machine-piling, and pile burning. Target fuels condition in post-mechanical fuels treatment areas includes reduced stand density, decreased ladder fuels, reduced crown bulk density, and low amounts of ground fuel and/or ground fuel geometry that will support only low flame lengths. Snags or hazard trees that are likely to compromise the effectiveness of fuelbreaks during a wildfire should be felled as part of mechanical fire/fuel hazard reduction treatments.

Generally, stands with trees over 40 years old are too large to be manually thinned so mechanical means must be employed. Mechanical fuel treatments are implemented with heavy ground-based equipment including tractors, feller bunchers, and cable yarding systems. Helicopters are infrequently used due to high cost. Mechanical fuel reduction treatments normally involve thinning understory, sub-dominate, and/or diseased trees. When stands are mechanically thinned, the CWPP recommends yarding whole trees where possible to remove branches and tree tops from treated areas and removing as much activity fuels as possible from treated areas. Remaining excess fuels after thinning are piled and burned

Mechanical fuel reduction treatment is most commonly employed to create linear fuelbreaks along roads, property boundaries and ridges. It is used to reduce fuels in plantations, natural stands, burned areas and other places where it is practical, feasible, economical and safe to use mechanized equipment. For this CWPP it is assumed that ground-based mechanical equipment could be used on slopes 35% or less. Using helicopters is much more expensive (and consequently seldom used for fuels reduction projects) but cost is usually offset by timber value.

The CWPP assumes that cost for mechanical fuels reduction treatment would be similar to manual treatment at $1500 per acre. Subsequent pile burning is estimated at $300 per acre for a total of $1,800 per acre. This cost estimate may be high because commercial product value could partially or completely subsidize mechanical treatment cost and may even subsidize manual fuels reduction treatments in project areas. Mechanical fuels reduction treatment with subsequent pile burning could be used on approximately 3,700 acres in the CWPP planning area. There are another 3,800 acres of plantations abutting recommended fuelbreaks where mechanical treatment and pile could be used.

(3) Prescribed Burning is a tool for reducing fuels and restoring fire as an ecosystem process to landscapes that historically experienced fire. Prescribed burning is deliberate burning of wildland or WUI fuels in either a natural or modified state and under specified environmental conditions which allows fire to burn at desired intensity

and be confined to a predetermined area. Prescribed burning includes ***underburning*** or ***broadcast-burning*** (which are both low to moderate intensity fires set within well-defined boundaries that consume ground fuels, brush, and small trees), ***jackpot burning*** (burning of natural and modified concentrations of fuels), and pile burning (burning of hand- or machine-piled fuels). Prescribed burning projects often include creation of small fuelbreaks (***handline***) to contain subsequent underburns or broadcast burns. In most instances a stand or area will need two or more underburns to achieve desired condition because fuels generated due to the first burn or burns (brush and small trees that are killed but not consumed in the first fire or two) and re-sprouting vegetation will need to be treated.

Underburning is conducted under conditions that will produce low to moderate severity burn. Underburns are hot enough to kill unwanted brush and small trees but not so hot as to destroy forest floor duff or excessively scorch desired residual trees. Variation in fire severity is an important source of structural and compositional diversity (Taylor and Skinner, 2003) and prescribed burning resulting in some mixed severity is acceptable and desirable. When low- to moderate-intensity fire with some small spots of torching is not possible to achieve due to excessive fuels and/or high tree density then some fuels are manually and/or mechanically removed, chipped or piled-and-burned before prescribed burning is implemented.

Use of prescribed fire is an integral component of fuel management strategies designed to reduce high fuel loads, reduce the risk of high-severity fire, and to restore fire as an ecosystem process in highly altered fire-suppressed mixed-conifer forests – the scale of prescribed fire projects should match the scale and arrangement of landscape features and topographic controls (Taylor and Skinner, 2003). Scaling up the size of prescribed fire can reduce costs, increase ecological benefits, and provide for future maintenance through managed fire (North et al., 2012). Increased use of prescribed fire and ecologically beneficial management of wildfires will be necessary to restore fire-adapted landscapes (North et al., 2012; Ryan et al., 2013).

While threat of catastrophic fire looms larger than ever, the option is still available to shift towards a more sustainable model of fire prevention and suppression; one that recognizes the role of fire in the complex ecosystems of the western Klamath Mountains and allows for fire-dependent ecosystem processes, while still protecting life and property. Fire could again be a powerful tool for managing diverse ecosystems that, when used properly, can be one of the most cost effective methods of reducing fire hazard to the community and ensuring the continuing resilience of our forests. Need to increase the use of prescribed fire as a tool to protect communities was expressed throughout WKRP workshops. Restoring healthy fire-adapted landscapes in the western Klamath Mountains will require widespread use of prescribed fire and managed unplanned ignitions under appropriate conditions on NFS lands. Implementing prescribed burning at optimum times of year will result in less environmental harm and nuisance smoke than current wildfires have been causing. To expand use of prescribed burning to the scale it is needed requires incorporating science, policy, public understanding and sentiment, economics, and mechanisms for risk management that are currently being developed locally and throughout Northern California (much more information on these topics is available on the Northern California Prescribed Fire Council website at http://www.norcalrxfirecouncil.org.

Prescribed fire is recommended as follow-up to manual and prescribed fire treatments where appropriate. Prescribed burning is recommended as primary treatment on 20,360 acres in the CWPP planning area (Maps 5 and 6). Strategic locations have been identified for:

- Reducing fire hazard to the community and neighborhoods;
- Maintaining/restoring fire resiliency to the surrounding landscape; and/or
- Containing future wildfires.

CWPP estimates cost to implement prescribed burning at approximately $450 per acre.

(4) Mastication is used to reduce fuel bed depth, increase height from ground to lower tree branches or crown, reduce fuel geometry, and increase fuel-ground contact to promote decomposition. Mastication chips/shreds small trees, limbs, and brush thereby reducing fuel geometry and potential flame length and fire hazard. Mastication grinding

apparatus is mounted on rubber tired or tracked vehicles, and vehicles so equipped are called masticators. Masticators cannot be used on slopes exceeding 35% to 45%. Masticators can be effective at reducing fire hazard and thinning small trees but can limit or prevent attainment of other vegetative and ecological management objectives.

Care must be taken to ensure that mastication does not result in excessively deep dense fuel beds that in a wildfire or prescribed burn could burn so hot and long as to scorch residual trees, tree roots, or soil. Field reconnaissance and collaboration necessary to determine ground, vegetative, fuels, and ecological conditions, and cultural considerations, appropriate for mastication will receive special attention during project development. Some of the ground recommended for manual fuel treatments may turn out to be suitable for mastication (at much lower cost). The cost range for mastication in the Mid-Klamath region is not well known because so little mastication has been implemented here. On a large piece of gently sloping ground mastication is likely to be under $1,000 per acre. No areas are recommended for mastication at this time because the necessary field surveys and collaboration to determine if and where mastication is desirable have not been started.

Summary of treatment methods: Estimated acreage and costs for implementing priorities are shown in **Table 1**. Acreages and costs will vary depending on actual site conditions. For cost estimates, the HCFSC uses a cost factor (CF) which is the best estimate of the percentage of total acres more likely to receive recommended fuels treatment. Some entries are not included in cost estimation due to need for further assessment of site-specific objectives, actual acreages, and/or costs. Entries not included in cost estimate are highlighted in gray. Locations for re-burning recent fire footprints will be based on meeting strategic criteria for protecting and fire-adapting the town core, neighborhoods, and residences; and for restoring and maintaining resilient landscapes. Locations and acreage for re-burning will be established as projects are further developed as described previously in Priority 7 on Page 19.

Table 1. Summary of Fuels Reduction Treatment Priorities, Acreages, and Estimated Costs							
Priority	**Ownership and Treatment Location (National Forest if not otherwise indicate)**	**Total Acres**	**Fuels Treatment Type***	**CF**	**Treatment acres Rounded**	**Cost per Acre $**	**Sub-Total Cost $**
1a	Private - HIZ within 200 feet of structures	1,283	Man	0.7	900	1,800	1,620,000
1a	Public - HIZ within 200 ft of structures	314	Man	0.7	220	1,800	396,000
1a	Karuk - HIZ within 200 ft of structures	106	Man	0.7	70	1,800	126,000
1b	Private - Primary access 300ft fuelbreak	1,098	Man/Mech	0.8	880	1,800	1,584,000
1b	Public - Primary Access 300ft fuelbreak	3,511	Man/Mech	0.8	2,810	1,800	5,058,000
1b	Plantations under 40yrs along Primary Access	1,520	Man/Mech	0.8	1,220	1,800	2,196,000
1b	Plantations over 40yrs along Primary Access	923	Mech/UB				
Total Priority 1		**8,755**			**6,100**		**10,980,000**
2	Private - HIZ 200-500 feet from structures	1,294	Man	0.7	910	1,800	1,638,000
2	Public – HIZ 200-500 feet from structures	812	Man	0.7	570	1,800	1,026,000
2	Karuk – HIZ 200-500 feet from structures	130	Man	0.7	90	1,800	162,000
Total Priority 2		**2,236**			**1,570**		**2,826,000**
Cumulative Total Priorities 1 and 2		**10,991**			**7,670**		**13,806,000**
3	Public – HCFSC Around Town Treatments	1,724	Man/Mech	0.9	1,550	2,250	3,487,500
3	Public – 500 foot Greenline Fuelbreak	3,737	Man/Mech	0.9	3,360	2,250	7,560,000
Total Priority 3		**5,461**			**4,910**		**11,047,500**
Cumulative Total Priorities 1, 2, and 3		**16,452**			**12,580**		**24,853,500**
4	Dozerlines - 300ft fuelbreak	3,530	Man	1	3,530	1,800	6,354,000
Cumulative Total Priorities 1- 4		**19,982**			**16,110**		**31,207,500**
5	Private - Burn Control Roads 300ft fuelbreak	29	Man/Mech	0.8	20	1,800	36,000
5	Public - Burn Control Roads - 300ft fuelbreak	4,401	Man/Mech	0.8	3,520	1,800	6,336,000
5	Plantations under 40yrs along Burn Control Rds	3,242	Man/Mech	0.8	2,590	1,800	4,662,000
5	Plantations over 40yrs along Burn Control Rds	3,818	Mech/UB				
Total Priority 5		**11,490**			**6,130**		**11,034,000**
Cumulative Total Priorities 1-5		**31,472**			**22,240**		**42,241,500**
6	Prescribed fire/underburning	20,358	UB	1	20,360	450	9,162,000
Cumulative Total Priorities 1-6		**51,830**			**42,600**		**51,403,500**
7	Re-burn recent fire footprints		UB			450	

Maintaining Effectiveness of Completed Fuels Reduction Treatments

Completed manual fuel reduction treatments will need to be refreshed every 5 to 12 years to maintain effectiveness for reducing fire/fuels hazards. Refreshment of manual

fuel treatments is approximately half the cost of initial treatment. Assuming that all fuels reduction treatments recommended in this CWPP are included in projects and implemented (which is unlikely), and assuming that manual fuels reduction maintenance treatments are repeated every ten years at half the cost, annual estimated cost for maintaining fuels reduction treatments over the next 10 years would be $2,570,000. Over time (years to decades), as fire/fuels hazards are reduced enough to safely increase the use of prescribed fire and to safely manage unplanned ignitions, maintenance costs for areas that were initially treated by manual means should decline.

Completed mechanical fuels reduction treatments will need to be refreshed every 10 to 30 years to maintain effectiveness. Re-treatment of mechanically treated areas is less expensive than initial treatment and follow-up prescribed burning. Maintenance of mechanically thinned areas that do not need additional thinning can often be achieved through prescribed burning alone at relatively low cost. The CWPP assumes that maintenance costs for areas that had mechanical fuel reduction treatments will be offset by the commercial value of timber removed.

Completed prescribed burning fuel reduction treatments will need to be refreshed every 4 to 12 years. Each subsequent prescribed burn is approximately the same cost as the initial prescribed burn. Therefore, the CWPP estimates that maintenance costs for re-treatment of recommended prescribed burned areas will be approximately 100% of initial treatment costs every ten years or $916,200 annually. Over time (years to decades), as fire/fuels hazards are reduced enough to safely increase the use of prescribed fire and to safely manage unplanned ignitions, maintenance costs for re-burning is expected to decline.

Effectiveness Monitoring and Assessment Strategy

Based on local empirical observations in the Klamath Mountains, proposed fuel reduction treatments are expected to be highly effective in protecting life and structures, and moderately effective in slowing or containing wildfire, in most wildfire situations. Fuels reduction work in Happy Camp, Seiad Valley, and Butler Flat has aided firefighters in saving structures and/or creating anchor points to control wildfire. Shaded

fuelbreaks in Seiad Valley have worked to contain a large wildfire and protect life and property.

Fuels reduction work is routinely implemented by firefighters to protect structures from an approaching wildfire because it is well known that reducing fuels reduces hazard, moderates fire behavior, increases the likelihood of success in slowing or stopping a fire and saving a structure, and increases firefighter safety.

The advantages of proactively completing fuels reduction work prior to an approaching wildfire are:

(1) The work can be done for less cost;

(2) Ecological, social and cultural considerations of vegetative management and ground fuels can be more carefully planned and appropriately implemented;

(3) Proactive treatment increases safety for firefighters responding to fire;

(4) Some protection will be in place if a wildfire approaches a residence before fire suppression personnel arrives; and

(5) The pre-treated ground is likely to be in better condition after a wildfire than if it was not pre-treated.

Agee and Skinner (2005) examined empirical evidence of the efficacy of fuel reduction treatments at five sites in the west (two of the sites were in the Klamath Mountains) and concluded that thinning and prescribed fire fuel reduction techniques, and prescribed fire alone, could effectively reduce fire hazard if applied at appropriate landscape scales. Agee and Skinner emphasize that thinning alone is often inadequate to reduce fire hazard and can even increase fire hazard if not followed up by prescribed underburning. Chipping and/or piling and burning of activity fuels from thinning and excess pre-existing ground fuels would reduce fire hazard by reducing surface fuel or by rearranging fuels. Prescribed underburning generally reduces surface fuels, especially fine fuels too small to pile or chip, to a greater degree than other treatments and has greater ecological benefits.

This CWPP adopts a monitoring and assessment strategy designed by the WKRP. Participants recognized that monitoring can be a powerful way to build trust and agreed that projects proposed from the WKRP planning effort should employ collaboratively developed monitoring protocols. This will allow for shared learning and discussion about the pros and cons of implemented projects, and will provide a mechanism for these lessons to shape future projects to better achieve desired conditions. Therefore, monitoring plans for all WKRP collaboratively developed projects will be agreed upon by the WKRP during project development. Participants agreed that all WKRP collaboratively developed projects would have three essential components of monitoring:

- Implementation Monitoring: Were project treatments implemented as agreed during the planning process?
- Effectiveness Monitoring: Did project treatments meet on-the-ground project objectives?
- Validation Monitoring: Evaluates whether the hypothesized cause and effect relationship between treatments and response are correct: Are site-specific/resource-specific prescriptions achieving desired/predicted project outcomes?

Fuels reduction projects designed in partnership with WKRP will have implementation and effectiveness monitoring that will assess fuels conditions in treated areas before and after treatment. Implementation monitoring for treated areas will be documented in a geodatabase and effectiveness monitoring will be qualitatively documented before and after treatment using photographs which will be geo-referenced in the geodatabase. Qualitative documentation and geo-referenced data will be reviewed to validate outcome and treatments will be adjusted as needed.

Validation monitoring for fuel reduction treatments recommended in this CWPP where the WKRP is not a partner will not be formally conducted. However, cause and effect relationships of CWPP derived projects become apparent over various temporal and spatial scales. Are communities and neighborhoods becoming more fire-adapted and are landscapes becoming more fire-resilient over time? In a sense, many of the

recommended CWPP treatments have been validated on the local level – examples are:

- Fuelbreaks in Happy Camp, Butler Flat on the Salmon River, and Seiad Valley have been effective in serving as anchor points for managing wildfires, containing wildfires, and protecting life and property.
- Fuels reduction treatments around homes in Orleans were effective in enabling fire fighters to save these homes during the 2012 Dance Fire. A nearby home where the owner declined fuels reduction work offered by the OSBFSC was not defendable and burned down.
- Forest areas where fuels reduction treatments have been implemented generally burn with less severity.
- The Little Grider fire in 2007 burned close to homes on the west side of Happy Camp; fire suppression operations used fuels reduction treatments completed by the HCFSC as anchor points to contain wildfire and protect homes.
- During the 2014 Happy Camp Complex and 2017 Eclipse Complex, KNF and HCFSC fuels reduction projects aided firefighters and helped minimize adverse effects of wildfire and suppression. Treatments completed by the HCFSC were used to contain wildfire and protect homes.

The CWPP recommends continued research and development of monitoring programs for fuel reduction treatments with WKRP collaborators. Fire behavior and resulting severity is a product of interactions between weather, fuels, and topography (Agee, 1993). These three drivers of fire severity in the Klamath Mountains result in fire behavior that is difficult to predict (Halofsky, 2011), and therefore difficult to model. Nevetheless, in 2014 the model FlamMap (Finney 2006; Stratton 2006) was run for pre- and post-treatment scenarios.

The FlamMap runs *suggest* that proposed treatments would change ***torching fire*** to ***ground fire*** in: (1) the town core and most densely populated neighborhoods, (2) strategic locations along the greenline for protection of Happy Camp town core, (3) along the most heavily traveled ingress/egress routes, and (4) areas that would have

prescribed underburns. Most fire/fuels specialists believe that FlamMap models underestimate beneficial effects of fuel treatment for this region.

6. Communities and Land Use

The CWPP planning area has a landscape footprint area of 359,550 acres of which over 95% are forested NFS lands and the rest is privately-owned residences and small ranches, Karuk Tribe property, and small land parcels owned by State and County agencies and non-profit organizations. Forested NFS land comprises upslope areas and most non-NFS land occurs within narrow linear bands within a half-mile of the Klamath River or a major Klamath River tributary. Non-NFS lands are completely surrounded by forested NFS land up to ridgelines. A small percentage of private small ranches and residences are located away from valley floors in mid-slope locations. These properties are generally located on large dormant landslide benches where the land is flat to gently-sloping.

Most of the planning area is ancestral territory of the Karuk Tribe. The Karuk Tribe has lived on this landscape for thousands of years – virtually since time immemorial. Tribal land management systems are discussed in the Past Fire Environment section (Appendix H).

Collaboration and the Role of the HCFSC in CWPP Development

History of the HCFSC and projects completed can be found in Appendix E. The primary role of the HCFSC in development of the CWPP was to procure and provide information and to promote and facilitate consultation with the community and other stakeholders. By determining shared values, assessing fire-related threats to those values, and developing strategies to reinstate historic beneficial fire regimes on the landscape and near communities, the HCFSC provides for increased protection of life and property, improved forest health, and enhanced resources valued by the community and stakeholders.

In June of 2013, the HCFSC was provided funding to complete a new CWPP through a participating agreement with the Klamath National Forest. The Orleans/Somes Bar Fire

Safe Council (OSBFSC) was simultaneously given funding to supplement their existing CWPP. These agreements gave the HCFSC greater ability to expand outreach to community members, the Karuk Tribe, Federal, State, and local agencies with regards to strategies for maintaining fire-adapted communities and a more ***fire-resilient*** landscape. Since 2002 the HCFSC has built trust with the local community. By planning and implementing fuels reduction projects on private property, property owners are becoming increasingly aware of hazardous conditions in their neighborhoods.

From August into September 2013, the HCFSC held a series of seven public meetings for the Happy Camp community to discuss concerns and potential resolutions related to wildfire threat. Public meetings drew interested groups of people, some who had no previous knowledge about the HCFSC. Also in attendance were local agency representatives who could directly answer questions from the public. Attendees agreed there was a common desire to reduce fuels along ingress and egress routes, around and near homes, and around infrastructure both on private and NFS lands. Concerns were expressed about people who could not accomplish their own treatments. People also expressed desire for improved networks for staying informed during a wildfire or emergency evacuation. A list of specific places that were of concern including both locations of fuels hazards and special resource concerns was developed. This information was used to plan and prioritize fire/and fuels hazard reduction treatment priorities and practices that are recommended in this CWPP.

During fall of 2013, the HCFSC, OSBFSC, MKWC, and Karuk Tribe joined forces using funding from Forest Service agreements and other sources to participate in WKRP workshops. Facilitators from *The Nature Conservancy's Fire Learning Network* used the process described in the Open Standards for the Practice of Conservation (Conservation Measures Partnership, April 2013) to facilitate collaboration and manage workshops. Invitations were extended to all potentially interested parties from local, state, federal, tribal entities, community members, non-governmental organizations, environmental advocacy groups, and other stakeholders. The purpose of the WKRP workshops was to build broad-based support for upslope restoration actions that will expedite creation of fire-adapted communities and healthy fire-resilient landscapes

surrounding those communities. While not all stakeholders were able to attend due to the extensive time commitment this process required, they have expressed support for the purpose of this planning effort. Meeting notes are shared with all stakeholders whether they were able to attend or not and the extensive list of collaborators is continuing to grow. For more information on WKRP collaboration using the Open Standards Process please see Western Klamath Restoration Partnership: A Plan for Restoring Fire Adapted Landscapes (Harling and Tripp, 2014).

During facilitated meetings and workshops, HCFSC and other WKRP members developed or reviewed priorities, processes, and projects for the Happy Camp CWPP. Actions recommended in the CWPP are a combination of projects already proposed and analyzed on NFS lands by the Forest Service, projects recommended by the WKRP, and projects recommended by community members and other stakeholders. For the WKRP to give continued support to actions, implementation of projects should be consistent with and/or promote social, economic and ecologic conservation values agreed to during the 2013-2014 collaborative workshops including:

- *Fire adapted communities;*
- *Restored fire regimes;*
- *Healthy river systems;*
- *Resilient bio-diverse forests/plants/ and animals;*
- *Sustainable local economies; and*
- *Cultural and community vitality*.

Strategies and projects recommended in this CWPP are consistent with these values.

7. Present Fire Environment

A detailed description of the past and current fire environment can be found in Appendix H. Fire occurrence and annual burn area declined dramatically with the onset of effective fire suppression (1920-1945). Over the 400 years prior to effective fire suppression, there are no comparable fire-free periods when large landscapes experienced decades without fires. Fire History and Fire Return Interval Departure Maps (Maps 9, 12, and 13) illustrate that much of the planning area went many decades without burning over the last 100 years. These are missed fire cycles. Even with recent large wildfires, many acres of the planning area have not burned in over 100 years. Exclusion of fire has changed landscape vegetation patterns over time. These changes have led to more intense fire behavior with more severe fire effects over larger areas.

Before suppression, fires of higher spatial complexity created openings of variable size within a matrix of forest that was generally more open than today (Taylor and Skinner, 1998). This heterogeneous pattern has been replaced by a more homogenous pattern of smaller openings in a matrix of denser forests (Skinner, 1995). However, during the period of 1910 to 2008 there has been a broad trend of increasing average fire size, maximum fire size, and total annual area burned in northwestern California. Between 1987 and 2008, fire size, maximum fire size, and area burned all increased to levels above any recorded since the United States Forest Service (USFS) began keeping records at the beginning of the 20th century (Miller et al., 2012). Researchers believe that this more recent pattern is the product of a changing climate plus increasing and more fire-prone fuels in some forest types, the latter driven by a combination of human (e.g., fire suppression, management practices) and climate-related (e.g. warming temperatures, drier fire seasons) factors. Despite this increase, average annual area burned by wildfires remains below those identified from research for the period before fire suppression became USFS policy. In the same period from 1987 to 2008, Miller et al. found no clear trend in the percentage of forest area burning at high severity. However, recent wildfires (2008 Panther Fire blow-up, 2014 Happy Camp Complex, and 2017 Eclipse Complex) in or near the planning area that burned large areas at high severity are atypical of Klamath Mountains historic fire regimes described by fire ecologists.

For California, scientist Malcolm North recently predicted the rise of “megafires” across the state as fuel loading and climate change combine to overwhelm the most technologically advanced firefighting force in history. The Klamath region is predicted to have four times more fires by 2085 given current climate predictions. Recent large fires on the Klamath National Forest in 2012 and 2014, 2016, and 2017 lend credence to the theory that wildfires are increasing in size, severity, and frequency.

In the Happy Camp area over the last half century, large fires have burned in 1966, 1987, 1994, 2001, 2006-2008, 2012, 2014, and 2017. On several occasions fires encroached on or were uncomfortably close to the Happy Camp community. The 1966 Indian Ridge and 1987 Slater fires burned to the north edge of town and threatened neighborhoods in lower Indian Creek. Fires in 1987 and 2014 threatened China Grade and Elk Creek neighborhoods burning to the edge of ingress/egress roads and into private property. Fires in 2017 threatened neighborhoods on the west side of Happy Camp along the Klamath River and the northeast side near Thompson Ridge. Over the last several decades other small fires, including some arson fires, have burned within the Happy Camp core area and surrounding neighborhoods. Happy Camp has not yet experienced any major loss of structures to wildfire but potential for loss is high.

The 2014 Happy Camp Complex fires burned about 20% of the planning area. Initially *temperature inversion* over the region led to cooler temperatures and higher humidity in the river valley. No structures burned in or adjacent to the Happy Camp community. Early stages of the Happy Camp Complex could be characterized by mixed-severity fire, beneficial to forest values. Later, when the fire moved east out of the planning area and upslope, the inversion lifted bringing extreme fire weather conditions with higher temperatures and lower humidity and large areas of forest burned at high severity. Blowup of the Happy Camp Complex fire during extreme fire weather conditions burned down eight structures including four homes along Scott River Road south of Scott Bar many miles away. Extreme wind-driven fire could conceivably cause a structure conflagration in Happy Camp similar to the 2014 wind-driven conflagration that burned over 150 structures in Weed, California on the east side of the Klamath Mountains.

The KNF has a recent history of large expensive and destructive fires which have had negative effects on many forested environments and watersheds and threatened to adversely affect the community. The USFS and other Federal agencies have identified Happy Camp as a community at high-risk from wildfire (Federal Register, 2001). Fire suppression costs on the Klamath National Forest are very high ranging from 15.7 to over 175 million dollars for one fire season between 2006 through 2014. Table 2 gives the cost per acre to suppress wildfires on the KNF from 2001 to 2010 (USFS, 2014).

Table 2. Historical Fire Suppression Costs on KNF from 2001 to 2010

Size Class	Size (acres)	Cost /Acre ($)
A	0 to 0.25	$25,800
B	0.26 to 9.9	$21,000
C	10 to 99	$9,100
D	100 to 299	$4,700
E	300 to 999	$7,700
F	1,000 to 4,999	$1,800
G	5,000 to 10,000	$350

A rough estimate of the average cost per acre of fire suppression across all size classes listed in Table 2 is $10,075 per acre (USFS 2014). The cost of large wildfires (20,000 acres or more) on the western side of the Klamath National Forest near Happy Camp since 2008 is as follows:

- The 2008 Elk Complex cost approximately $1,900 per acre
- The 2012 Goff Fire cost $1,130 per acre
- The 2014 Happy Camp Complex that burned 134,000 acres cost $90 million which is about $670 per acre.
- The 2017 Eclipse Complex that burned over 100,000 acres cost $46 million which is about $460 per acre.

The cost of creating fire-adapted communities and restoring and maintaining fire-resilient landscapes is high but in the long run will be an order of magnitude lower than continued long-term cost of suppressing wildfire on landscapes where fire-adapted forest conditions have not been restored. It was expressed throughout the WKRP process that if just a fraction of the hundreds of millions of dollars spent fighting wildfires in the western Klamath Mountains over the past thirty years were spent implementing

CWPPs fear from that puff of smoke rising above the ridge behind our homes the day after a summer thunderstorm would diminish. Long-term costs of fire management would decrease. The forest landscape would be in better condition because fire for restoration and fuels control using prescribed burning at optimum times of the year would moderate fire behavior as opposed to burning at high severity in July and August.

8. Desired Fire Environment

The desired fire environment in the CWPP area is:

(1) A fire-adapted community where homes, businesses, and facilities have adequate clearances/fuel treatments to make them defendable from wildfire and minimize damage or loss from wildfire; and

(2) A fire-resilient landscape where fire is allowed to perform its ecological function of maintaining biodiversity.

The WKRP and the CWPP envision a management scenario where land managers choose to maintain desired ecological conditions and low fire hazard by applying prescribed fire and managing beneficial unplanned ignitions for resource benefit when safe to do so. The desired fuels environment is one where:

- Wildfires in wildlands burn at historical mixed-severity and do not burn large areas at high severity;
- Wildfire threat to the community is low;
- Effects of wildfire are socially and ecologically beneficial; and
- Fuels/fire management costs are low relative to current fire suppression costs.

Over time and repeated burns, forest cover would become more open than present day while becoming more resistant to mortality from fire or drought. Overall, forest management costs could remain similar to todays' levels but with a major change in emphasis from high fire suppression costs and low to modest management investment to low fire suppression costs and higher levels of management investment. As communities become fire-adapted and landscapes become more resilient to fire over decades, management costs will decrease. Funds will be invested wisely in forest health and fire prevention. Trends towards ever higher fire suppression costs along with severe natural resource degradation will be reversed.

Strategies outlined in this CWPP reflect growing grassroots support for significant shift in how communities prepare for and manage wildfires in the Western Klamath Mountains. With sufficient preparation using manual and/or mechanical fuel treatments, prescribed fire and unplanned ignitions can be safely used upslope from the community to make large landscapes fire-resilient for community protection and ecological restoration.

Appendix A

List of Acronyms

CalFire: California Department of Forestry Fire Protection

CF: Cost Factor

County: Siskiyou County, California

CWPP: Happy Camp Community Wildfire Protection Plan

DPA: Federal Direct Protection Area

ESA: Endangered Species Act 1973

FIMT: Fire Incident Mapping Tool

FlamMap PC-based fire behavior mapping and analysis program that computes potential fire behavior characteristics (spread rate, flame length, fireline intensity, etc.).

FSC: Fire Safe Council

GIS: Geographic Information System

HCFPD: Happy Camp Fire Protection District

HCFSC: Happy Camp Fire Safe Council

HCRD: Happy Camp Ranger District, Klamath National Forest

HCVFD: Happy Camp Volunteer Fire Department

HIZ: Home Ignition Zone

KNF: Klamath National Forest

LRMP: Klamath National Forest Land and Resource Management Plan

LSR: Late Successional Reserve

Matrix: General forest

MKWC: Mid-Klamath Watershed Council

NACUA: Native American Cultural Use Area

NEPA: National Environmental Policy Act

NFS: National Forest System

OSBFSC: Orleans/Somes Bar Fire Safe Council

Planning Area: CWPP planning area includes the Happy Camp Ranger District of the Klamath National Forest and all non-National Forest System lands within District boundaries.

PRC: Public Resource Code

RAC: Siskiyou County Resource Advisory Committee

RR: Riparian Reserve

SRA: State Responsibility Area

TEK: Traditional Ecological Knowledge

TREX: Klamath River Prescribed Fire Training Exchange

USDA: United States Department of Agriculture

USFS: United States Forest Service

WFDSS: Wildfire Decision Support System

WFU: Wildland Fire Use

WKFLN: Western Klamath Fire Learning Network

WKRP: Western Klamath Restoration Partnership

WUI: Wildland-Urban Interface

Glossary of Terms

Anchor Point
An advantageous location, usually a barrier to fire spread, from which to start constructing a fireline.

Aspect
Compass direction toward which a slope faces.

Biodiversity
The variety of life in the world or in a particular habitat or ecosystem.

Burn Control Features
Landscape attributes that could be used to slow or contain a fire or otherwise modify fire behavior (e.g. ridges, ridge roads, footprints of recent fires, and major streams).

Burn Control Road
A road along which fuels have been greatly reduced and that can be used as a fuelbreak or anchor point.

Temperature Inversion
Deviation from normal decrease in temperature with altitude. Temperature inversion is an increase in temperature with altitude leaving lower elevations cooler than higher elevations.

Community Base Map
A map having essential outlines and onto which additional geographical or topographical data may be placed for comparison or correlation.

Community Wildfire Protection Plan (CWPP)
A CWPP addresses issues such as community preparedness, hazard mitigation, structure protection, and wildland fire response. The process of developing a CWPP can help communities clarify and refine their priorities for the protection of life, property, and critical infrastructure in the wildland-urban interface (Source: *Preparing a Community Wildfire Protection Plan*. March, 2004).

Crown Fire:
A fire that advances from top to top of trees or shrubs more or less independent of a surface fire. Crown fires are sometimes classed as running or dependent to distinguish the degree of independence from the surface fire.

Crown Bulk Density
Canopy bulk density describes the density of available canopy fuel in a stand. It is defined as the mass of available canopy fuel per canopy volume unit.

Defensible Space
Area between an improved property and potential wildland fire where combustible materials and vegetation have been removed or modified to reduce potential for fire spread to or from wildland fuels. Safe working area for fire fighters protecting life and improved property from wildland fire.

Fire Environment
Conditions, influences, and modifying forces of topography, fuel, and weather that determine fire behavior.

Fire Regime
A fire regime is the pattern, frequency, and intensity of wildfires that prevail in an area over long periods of time. It is an integral part of fire ecology, and renewal for certain types of ecosystems.

Fire Risk
For the purposes of this document, fire risk is based on fuel hazard, risk of wildland fire occurrence and firefighting capability, and the consequences of wildland fire. Fire Risk = Fire Hazard X Potential Fire Consequences.

Fireline
Part of a fire containment or control line that is scraped or dug to mineral soil. Hand fireline is a few feet wide and dug by a crew with handtools and chainsaws. Dozer fireline is implemented with bulldozers and can be from eight feet to over 50 feet wide.

Fireshed
"Firesheds" are large landscapes, delineated based on fire regime, topography, condition class, fire history, fire hazard and risk, and potential wildland fire behavior. For this CWPP firesheds are small drainages or can be small polygons of land between existing burn control features where fire and fuels can be managed through prescribed burning or management of unplanned ignitions for resource benefit.

Fuelbreak
Fuelbreaks are wide strips of land on which trees and vegetation have been permanently reduced or removed. These areas can slow, and even stop, the spread of a wildland fire because they provide fewer fuels to carry flames. They also provide firefighters with safe zones to take a stand against a wildland fire, or retreat from flames if the need arises. Fuelbreaks need to be tailored to the terrain, fuels, historic fire regimes and expected weather conditions of the landscape in which they are placed. A fuelbreak may be natural (e.g., a talus slope, a river, or a deciduous stand) or man-made (also see Shaded Fuelbreak).

Fuel Geometry
The shape properties of a material (thickness, density, and curve shape—flat, convex, or concave) that determine how the material transfers heat and how it burns compared to differently shaped materials. For example, a pile of kindling has greater fuel geometry than the wedge of wood that the kindling was split from.

Fuel Hazard
A fuel complex defined by volume, type, condition, arrangement, and location that determines the degree of ease of fire ignition and of resistance to fire control.

Geographic Information System (GIS) and Geodatabase
GIS is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. GIS can show many different kinds of data on one map, such as streets, buildings, and vegetation. A geodatabase is a collection of GIS datasets of various types held in a common file system.

Greenline
Strategic locations for shaded fuelbreaks to protect the town core, neighborhoods, and private properties from wildfire and/or where the treatments would abut and be complimentary to recently completed or planned Forest Service fuel reduction projects

Ground Fuel
Fuels lying on the ground.

Ground Fire – see Surface Fire

Height to Live Crown
The vertical distance in feet from the ground to the base of the live crown, measured to the lowest live branch-whorl or lowest live branch excluding water sprouts.

Historic Fire Regime
A fire regime includes the frequency of fire occurrence, fire intensity and the amount of fuel consumed. A historic or natural fire regime in the Klamath Mountains and North America is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning.

Jackpot Fuels
A large concentration of discontinuous fuels in a given area, such as a slash pile or fallen trees.

Ladder Fuels
Ladder fuels are live or dead vegetation that allows a fire to climb up from the forest floor into the tree canopy. Common **fuel ladders** include tall grasses, shrubs, and tree branches, both living and dead.

Mixed-Severity (M-S) Fire
Mixed severity fire regimes are defined as a combination of low- to high-severity fire effects within the perimeter of a single fire. Their ecology may not be simple intermediate between the two; rather, M-S fires and fire regimes are hypothesized to give rise to unique patch dynamics and ecosystem responses (Agee, 2005). M-S regimes are characterized by widely varying fire intervals and combinations of surface, torching, and crown fire behavior both within and between fires, resulting in intermixed patches of live and dead understory and overstory vegetation. The concept of M-S fire is scale dependent and is typically defined forest stand and low-order watershed scales.

Planning Area
The planning area refers to the Happy Camp planning area which includes the entire Happy Camp Ranger District plus all non-National Forest lands within District boundaries. The planning area boundary follows major ridges with short sections dropping into major drainages. The planning area boundary is appropriately located and sized to enable planning and implementation of fire/fuels hazard reduction treatments and practices to protect the community and to restore fire resiliency to the surrounding landscape.

Reasonably Adequate Protection or Reasonably Safe Levels
“Reasonable’ refers to the fact that there is a limit to the practicality and affordability of

treating fuels to create fuelbreaks that can slow or stop all wildfires. It is not practical or affordable to attempt to treat fuels enough to withstand wildfires that are in the 90th to 95th percentile of extreme fire conditions.

Shaded Fuelbreak
A shaded fuelbreak is the same as a fuelbreak with the exception that tree canopy is retained. Shaded fuelbreaks are possible only in stands where there is adequate canopy to shade out competing vegetation and where ground to live crown distance is adequate to prevent a ground fire from igniting the canopy. Shaded fuelbreaks largely shade out understory vegetation thereby extending the time before maintenance treatment is needed; however, there are situations where crown density will also need thinning to reduce potential for crown fire to jump the shaded fuelbreak.

Snag
A standing, partly, or completely dead tree; often missing a top or most of the smaller branches.

Stakeholder
For this CWPP, a stake holder is any person, agency or organization with particular interest - a stake - in management of this landscape and its natural and cultural resources, fire safety, and protection of assets from wildland fires.

State Responsibility Area (SRA)
The State Board of Forestry and Fire Protection classifies areas in which the primary financial responsibility for preventing and suppressing fires is that of the state. These include: lands covered wholly or in part by timber, brush, undergrowth or grass, whether of commercial value or not; lands which protect the soil from erosion, retard run-off of water or accelerated percolation; lands used principally for range or forage purposes; lands not owned by the Federal government; and lands not incorporated. By Board regulations, unless specific circumstances dictate otherwise, lands are removed from SRA when housing densities average more than 3 units per acre over an area of 250 acres. CalFire has SRA responsibility for the protection of over 31 million acres of California´s privately-owned wildlands. However, fire suppression in the Happy Camp planning area SRA is the responsibility of the KNF as per agreement between CalFire and the KNF.

Surface Fire
Fire that burns loose fuels on the surface, which include dead branches, blowdown timber, leaves, and low vegetation, as contrasted with *torching* or *crown fire.*

Surface Fuels (or Ground Fuels)
Loose fuels on the ground surface, which include dead branches, blowdown timber, leaves, and low vegetation.

Torching Fire
Not to be confused with ***crowning,*** is when a single or small group of trees "torch" or go up in flames. Torching and group torching are more of a nuisance whereas crown fire is of much greater concern.

Traditional Ecological Knowledge (TEK)
Knowledge base acquired by indigenous and local peoples and passed down from generation to generation, through changes of ecosystems over hundreds or thousands of years, to the present day. TEK provides a unique and valuable perspective on ecological restoration: what were local ecosystems like before the disturbances of the modern era (from Lomakatski Restoration Project website, 2014).

Klamath River Prescribed Fire Training Exchange (TREX)
The objective of TREX is to provide communities along the Klamath River with experience and training on how to plan and implement controlled burns, protect communities from wildfires, and prepare for managing wildfires for resource benefits.

Training is designed to integrate a diverse group of fire practitioners with varying degrees of knowledge and experience. Participants include interested individuals, tribal members, local contractors, federal and state firefighters, volunteer firefighters, non-profit organizations including The Nature Conservancy staff and volunteers, university students, county/regional regulators and out-of-region and international guests and fire workers.

Underburning
A controlled burn of fuels below the forest canopy, intended to remove fuels from on-coming or potential fires.

Values At-Risk
Assets at risk due to wildland fires in California include life and safety; timber; range; recreation; water and watershed; plants; air quality; cultural and historical resources; unique scenic areas; buildings; wildlife; and ecosystem health.

Wildfire
An unplanned ignition caused by lightning, volcanoes, unauthorized, and accidental human-caused actions and escaped prescribed fires.

Wildland Fire
Wildland fire can be either wildfire (unplanned ignitions) or prescribed fire (planned ignitions). “Use of wildland fire” is a term meaning the management of wildfire or prescribed fire to meet objectives in land and resource management plans.

Wildland-Urban Interface (WUI)
The wildland–urban interface (WUI) is commonly described as the zone where structures and other human development meet and intermingle with undeveloped wildland and wildland fuels.

Appendix B

Development of the CWPP Base Map

The base map shows the planning area and surrounding landscape. The planning area includes the entire Happy Camp Ranger District plus all the non-National Forest lands within the District boundaries. The planning area is inclusive of all Happy Camp ***Wildland-Urban Interface*** (WUI) areas ("Happy Camp WUI") and a fair sized portion of the Seiad Valley FSC WUI. The CWPP planning area is a sub-part of the larger 1,197,720 acre ***Western Klamath Restoration Partnership (WKRP) planning area*** (Map 3).

The Happy Camp WUI was established in two ways: (1) to increase protection for the town core and connected neighborhoods, the WUI was defined as the area that would encompasses all fuels/fire hazard reduction actions that could reasonably be recommended and implemented to directly increase protection for structures and infrastructure, and other values of community importance, and (2) to increase protection for structures or clusters of structures isolated from town. A WUI boundary buffer of ¼ mile width was generally designated, however, the actual buffer width was adjusted on a site-by-site basis depending on fuels/fire hazard at each location and feasibility of safely implementing effective fuels reduction treatments in those locations. WUI boundaries primarily follow ridges and roads. The Inam Cultural Area is included in the WUI buffer to include any fuels treatments proposed under Memorandum of Understanding between the Karuk Tribe and the KNF.

The planning area was established by determining the smallest area surrounding the Happy Camp Community that would encompasses fuels/fire hazard reduction actions that could reasonably be recommended and implemented to effectively protect the community from wildfire and to restore fire resiliency to the surrounding landscape. The west, north, and east boundaries of the planning area are the closest major ridgelines surrounding the community; and the southern boundary is also defined by major ridges as well as the mainstems of Dillon Creek, Ukonom Creek, and the Klamath River (Map 1). The planning area includes all recommended ridgetop fuelbreaks that straddle both sides of a ridge.

Appendix C

Recommendations for Defensible Space and Wildfire Preparedness at Home

This following section was taken in from the CalFire website publication "Being Ready - Wildfire Preparedness" available at http://www.readyforwildfire/being_ready.org/. Recommendations made in this publication are consistent with the Karuk Tribe Hazard Mitigation Plan (Karuk Tribe, 2010).

Being ready for wildfire starts with maintaining adequate ***Defensible Space*** and ***hardening your home/business/infrastructure*** *(defensible space and hardening are explained below).* It takes the combination of both Defensible Space and the hardening to really give your *home/business/infrastructure* the best chance of surviving a wildfire.

Creating Defensible Space

Creating defensible space is essential to improve your home's chance of surviving a wildfire. Defensible space is the buffer you create between a building on your property and the grass, trees, shrubs, or any wildland area that surround it. This space is needed to slow or stop the spread of wildfire and it reduces the chance of your home catching fire – either from direct flame contact or radiant heat. Defensible space is also important for the protection of the firefighters defending your home.

In California, if you live within SRA, you are responsible for ensuring that your property is in compliance with California's building and fire codes that call for homeowners to take proactive steps to protect their property from a wildfire. California law requires that homeowners in SRAs clear out flammable materials such as brush or vegetation around their buildings to 100 feet (or the property line) to create a defensible space buffer. This helps halt the progress of an approaching wildfire and keeps firefighters safe while they defend your home.

Two zones make up the required 100 feet of defensible space:

Zone 1

Zone 1 extends 30 feet out from buildings, structures, decks, etc.

- Remove all dead plants, grass and weeds (vegetation).
- Remove dead or dry leaves and pine needles from your yard, roof and rain gutters.
- Trim trees regularly to keep branches a minimum of 10 feet from other trees.
- Remove branches that hang over your roof and keep dead branches 10 feet away from your chimney.
- Relocate wood piles into Zone 2.
- Remove or prune flammable plants and shrubs near windows.
- Remove vegetation and items that could catch fire from around and under decks.
- Create a separation between trees, shrubs and items that could catch fire, such as patio furniture, wood piles, swing sets, etc.

Zone 2

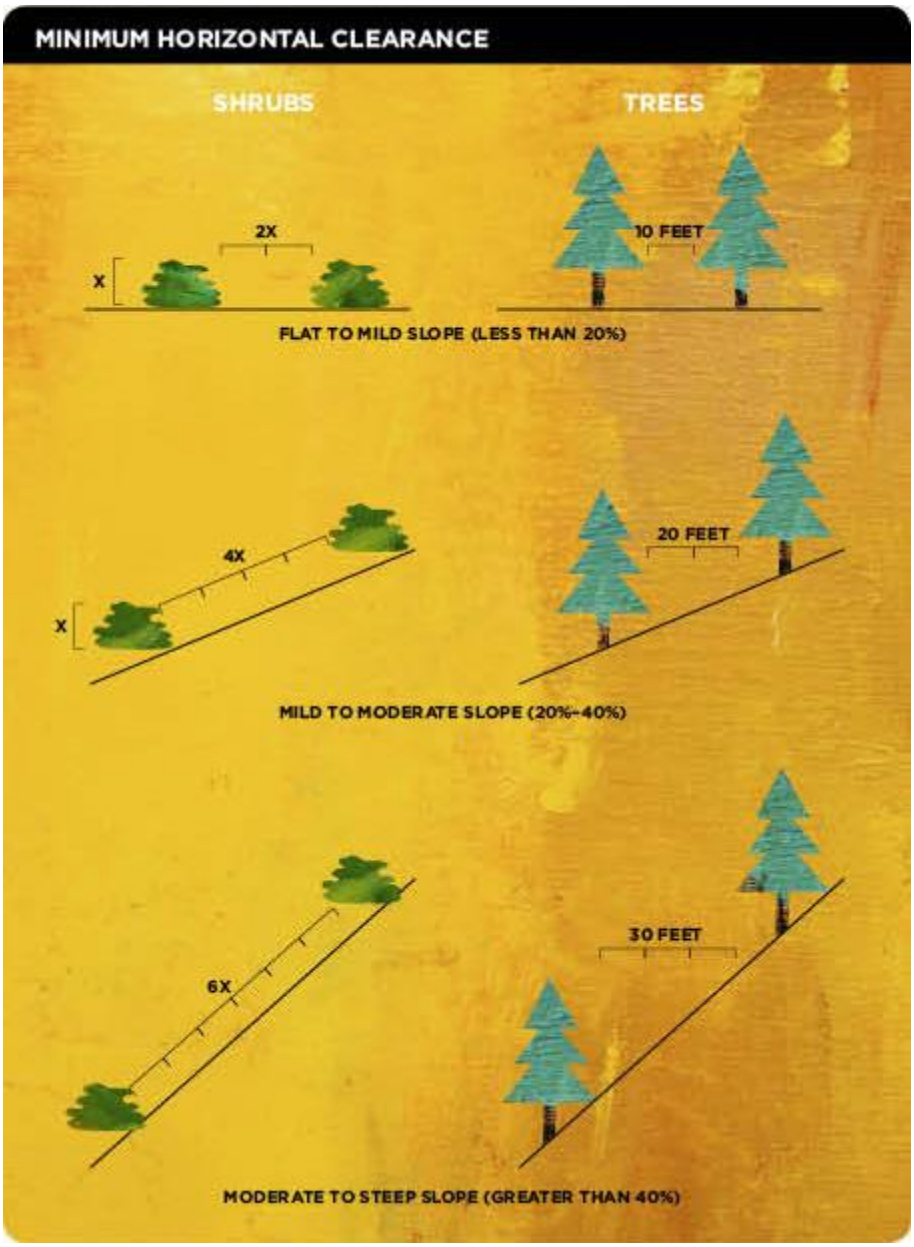
- Cut or mow annual grass down to a maximum height of 4 inches.
- Create horizontal spacing between shrubs and trees.
- Create vertical spacing between grass, shrubs and trees.
- Remove fallen leaves, needles, twigs, bark, cones, and small branches (this organic forest litter is permitted to a depth of 3 inches)

NOTE: To provide reasonably adequate structure protection from wildfire and provide for firefighter safety, **many homes in the Happy Camp area will need substantially larger (than 100 feet) defense zones due to dense forest vegetation and/or steep terrain**. Contact the Happy Camp Fire Safe Council, Happy Camp Volunteer Fire Department, Happy Camp Ranger District, or CalFire for assistance with designing adequate defensible space around your structure or infrastructure.

Plant and Tree Spacing in Defense Zone: The spacing between grass, shrubs, and trees is crucial to reduce the spread of wildfires. The spacing needed is determined by the type and size of brush and trees, as well as the slope of the land. For example, a property on a steep slope with larger vegetation requires greater spacing between trees and shrubs than a level property that has small, sparse vegetation.

Vertical Spacing in Defense Zone: Remove all tree branches at least 6 feet from the ground. Allow extra vertical space between shrubs and trees. Lack of vertical space can allow a fire to move from the ground to the brush to the tree tops like a ladder. To determine the proper vertical spacing between shrubs and the lowest branches of trees, use the diagram and formula in the example below.

Example: A five foot shrub is growing near a tree. 3x5 = 15 feet of clearance needed between the top of the shrub and the lowest tree branch.



Horizontal Spacing
Horizontal spacing depends on the slope of the land and the height of the shrubs or trees. Check this chart to determine spacing distance.

Fire Resistant Landscaping:

- A fire safe landscape uses fire resistant plants that are strategically planted to resist the spread of fire to your home. Check your local nursery, landscape contractor, county extension service, or watershed council for advice on fire resistant plants that are suited for your environment. There are no "fire-proof" plants. Select high moisture plants that grow close to the ground and have a low sap or resin content.
- Create fire-safe zones with stone walls, patios, swimming pools, and roadways.

Hardening Your Home or Structure

Flying embers destroy homes up to a mile or more from where wildfires are burning. Hardening your home means taking the steps necessary to make your home or structure more fire-resistant before fire starts.

Here are measures you can take to harden your home and make it more fire resistant:

Roof: The roof is the most vulnerable part of your home. Homes with wood or shingle roofs are at high risk of being destroyed during a wildfire. Build your roof or re-roof with materials such as composition, metal or tile. Block any spaces between roof decking and covering to prevent embers from catching. Keep roof free of flammable debris such as leaves, branches, and moss.

Vents, Eaves, and Soffits: Vents, eaves, and soffits create openings for flying embers. Cover all vent openings with 1/8-inch to 1/4-inch metal mesh. Do not use fiberglass or plastic mesh because they can melt and burn. Protect vents in eaves or cornices with baffles to block embers. (Mesh is not enough.)

Windows: Heat from a wildfire can cause windows to break even before the home ignites. This allows burning embers to enter and start fires inside. Single-paned and large windows are particularly vulnerable. Install dual-paned windows with one pane of tempered glass to reduce the chance of breakage in a fire. Consider limiting the size and number of windows that face large areas of vegetation.

Walls: Wood products, such as boards, panels or shingles are common siding materials. However, they are combustible and not good choices for fire-prone areas. Build or remodel your walls with ignition resistant building materials such as stucco, fiber cement, fire retardant treated wood, or other approved materials. Be sure to extend ignition resistant materials from the foundation to the roof.

Decks: Surfaces within 10 feet of the building should be built with ignition-resistant, non-combustible, or other approved materials. Ensure that all combustible items are removed from underneath your deck.

Rain Gutters: Screen or enclose rain gutters to prevent accumulation of plant debris. Keep gutters cleaned and free of combustible debris.

Patio Cover: Use the same ignition resistance materials for patio coverings as a roof.

Chimney: Cover your chimney and stovepipe outlets with a non-combustible screen. Use metal screen material with openings no smaller than 3/8 inch and no larger than 1/2 inch to prevent embers from escaping and igniting a fire.

Garage: Have a fire extinguisher and tools such as a shovel, rake, bucket, and hoe available for fire emergencies. Install weather stripping around and under the garage door to prevent embers from blowing in. Store all combustible and flammable liquids away from ignition sources.

Fences: Consider using ignition resistant or non-combustible fence materials to protect your home during a wildfire.

Driveways and Access Roads: Driveways should be built and maintained in accordance with state and local codes to allow fire and emergency vehicles to reach

your home. Consider maintaining access roads with a minimum of 10 feet of clearance on either side, allowing for two way traffic. Ensure that all gates open inward and are wide enough to accommodate emergency equipment. Trim trees and shrubs overhanging the road to allow emergency vehicles to pass.

Address: Make sure your address is clearly visible from the road.

Water Supply: Consider having multiple garden hoses that are long enough to reach all areas of your home and other structures on your property. If you have a pool or well, consider getting a pump.

Create a Wildfire [Re]action Plan

Your Wildfire [Re]action Plan must be prepared and familiar to all members of your household well in advance of a wildfire. Use the checklist below to help create your plan. Each family's plan will be different, depending on a variety of issues, needs, and situations.

Create an **evacuation plan** that includes:

- A designated emergency meeting location outside the fire or hazard area. This is critical to determine who has safely evacuated from the affected area.
- Several different escape routes from your home and community. Practice these often so everyone in your family is familiar in case of emergency.
- Have an evacuation plan for pets and large animals such as horses and other livestock.
- A Family Communication Plan (see following page) that designates an out-of-area friend or relative as a point of contact to act as a single source of communication among family members in case of separation. (It is easier to call or message one person and let them contact others than to try and call everyone when phone, cell, and internet systems can be overloaded or limited during a disaster.)

Be Prepared:

- Have fire extinguishers on hand and train your family how to use them (check expiration dates regularly).
- Ensure that your family knows where your gas, electric, and water main shut-off controls are located and how to safely shut them down in an emergency.
- Assemble an Emergency Supply Kit (see following page) for each person, as recommended by the American Red Cross.
- Maintain a list of emergency contact numbers posted near your phone and in your emergency supply kit.
- Keep an extra Emergency Supply Kit in your car in case you cannot get to your home because of fire or other emergency.
- Have a portable radio or scanner so you can stay updated on the fire.

Family Communication Plan

Fill out this form and place it near your telephone where it can easily be found by everyone in your household. Copy the form and keep it in your Emergency Supply Kits. This will allow all family members to have access to this key information in case you get separated:

WHEN WE HAVE TO EVACUATE, WE WILL MEET AT:

OUR OUT-OF-AREA EMERGENCY CONTACT PERSON IS:
Name: Relationship:
Home Phone #: Cell Phone #:
E-mail:

OTHER IMPORTANT NUMBERS ARE:
Emergency 911: Local Police:
Local Fire Department: Other:

OUR TWO EVACUATION ROUTES ARE (SKETCH ROUTES BELOW):

Assemble an Emergency Supply Kit

Put together your emergency supply kit long before a wildfire or other disaster occurs and keep it easily accessible so you can take it with you when you have to evacuate. Plan to be away from your home for an extended period of time. Each person should have a readily accessible emergency supply kit. Backpacks work great for storing these items (except food and water) and are quick to grab.

EMERGENCY SUPPLY KIT CHECKLIST

- Three-day supply of non-perishable food and three gallons of water per person
- Map marked with at least two evacuation routes
- Prescriptions or special medications
- Change of clothing
- Extra eyeglasses or contact lenses
- An extra set of car keys, credit cards, cash or traveler's checks
- First aid kit
- Flashlight
- Battery-powered radio and extra batteries
- Sanitation supplies
- Copies of important documents (birth certificates, passports, etc.)
- Don't forget pet food and water!

Items to take if time allows:

- Easily carried valuables
- Family photos and other irreplaceable items
- Personal computer information on hard drives and disks
- Chargers for cell phones, laptops, etc.

Pre-Evacuation Preparation Steps

When an evacuation is anticipated, follow these checklists (if time allows) to give your home the best chance of surviving a wildfire.

Inside the House

- Shut all windows and doors, leaving them unlocked.
- Remove flammable window shades and curtains: close metal shutters.
- Move flammable furniture to the center of the room, away from windows and doors.
- Shut off gas at the meter. Turn off pilot lights.
- Leave your lights on so firefighters can see your house under smoky conditions.
- Shut off the air conditioning.

Outside

- Gather up flammable items from the exterior of the house and bring them inside (patio furniture, children's toys, door mats, trash cans, etc.).
- Turn off propane tanks.
- Move propane BBQ appliances away from structures.
- Connect garden hoses to outside water valves or spigots for use by firefighters. Fill water buckets and place them around the house.
- Don't leave sprinklers on or water running, they can affect critical water pressure.
- Leave exterior lights on so your home is visible to firefighters in the smoke or darkness of night.
- Put your Emergency Supply Kit in your vehicle.
- Back your car into the driveway with vehicle loaded and all doors and windows closed. Carry your car keys with you.
- Have a ladder available and place it at the corner of the house for firefighters to quickly access your roof.
- Seal attic and ground vents with pre-cut plywood or commercial seals.
- Patrol your property and monitor the fire situation. Don't wait for an evacuation order if you feel threatened.
- Check on neighbors and make sure they are preparing to leave.

Animals

- Locate your pets and keep them nearby.
- Prepare farm animals for transport and think about moving them to a safe location early.

Evacuation Steps

When immediate evacuation is necessary, follow these steps as soon as possible to get ready to go.

1. Review your Wildfire [Re]action Plan.
2. Ensure your Emergency Supply Kit is in your vehicle.
3. Cover-up to protect against heat and flying embers. Wear long pants, long sleeve shirt, heavy shoes/boots, cap, dry bandanna for face cover, goggles or glasses. 100% cotton is preferable.
4. Locate your pets and take them with you.

When to Evacuate

Leave as soon as evacuation is recommended by fire officials to avoid being caught in fire, smoke or road congestion. Don't wait to be ordered by authorities to leave. Evacuating the forest fire area early also helps firefighters keep roads clear of congestion, and lets them move more freely to do their job. In an intense wildfire, they will not have time to knock on every door. If you are advised to leave, don't hesitate!

- Officials will determine the areas to be evacuated and escape routes to use depending upon the fire's location, behavior, winds, terrain, etc.
- Law enforcement agencies are typically responsible for enforcing an evacuation order. Follow their directions promptly.
- You will be advised of potential evacuations as early as possible. You must take the initiative to stay informed and aware. Listen to your radio/TV for announcements from law enforcement and emergency personnel. Frequently check the following website for information and evacuation announcements: http://inciweb.nwcg.gov/state/5/.

Do not return to your home until Fire officials determine it is safe. Notification that it is safe to return home will be given as soon as possible considering safety and accessibility. When you return home:

- Be alert for downed power lines and other hazards.
- Check propane tanks, regulators, and lines before turning gas on.
- Check your residence carefully for hidden embers or smoldering fires.

What to do if You Become Trapped

While in your vehicle:

- Stay calm.
- Park your vehicle in an area clear of vegetation.
- Close all vehicle windows and vents.
- Cover yourself with wool blanket or jacket.
- Lie on vehicle floor.
- Use your cell phone to advise officials—Call 911.

While on foot:

- Stay calm.
- Go to an area clear of vegetation, a ditch or depression on level ground if possible
- Lie face down, cover up your body
- Use your cell phone to advise officials—Call 911.

While in your home:

- Stay calm, keep your family together.
- Call 911 and inform authorities of your location.
- Fill sinks and tubs with cold water.
- Keep doors and windows closed, but unlocked.
- Stay inside your house.
- Stay away from outside walls and windows.

Appendix D

California State Public Resource Code for Defensible Space

California State Public Resource code (PRC) for defensible space requires compliance with Public Resource Code 4290 (Building codes) and Code 4291 (100 foot defensible space). These codes apply to all parcel owners with habitable structures.

To access the full text of these state statutes on the CalFire WEB site go to the CalFire home-page at http://www.fire.ca.gov/. Click "Programs" at the top of the page. Under programs, click "Fire Prevention". In the block that appears in the left margin, click the "Wildland Hazard and Building Codes " link. Then in the second block that appears, click the "Wildland-Urban Building Codes" link. Under the section on "Fire Safe Regulations", are the links to PRC 4290 and 4291 and Title 14 covering state responsibility area (SRA) fire safe regulations.

Article 2. Emergency Access

1273.10. Driveways
All driveways shall provide a minimum 10 foot traffic lane and unobstructed vertical clearance of 15 feet along its entire length. (a) Driveways exceeding 150 feet in length, but less than 800 feet in length, shall provide a turnout near the midpoint of the driveway. Where the driveway exceeds 800 feet, turnouts shall be provided no more than 400 feet apart. (b) A turnaround shall be provided at all building sites on driveways over 300 feet in length, and shall be within 50 feet of the building.

1273.11 Gate Entrances
(a) Gate entrances shall be at least two feet wider than the width of the traffic lane(s) serving that gate. (b) All gates providing access from a road to a driveway shall be located at least 30 feet from the roadway and shall open to allow a vehicle to stop without obstructing traffic on that road. (c) Where a one-way road with a single traffic and provides access to a gated entrance, a 40 foot turning radius shall be used.

Article 3: Signing and Building Numbering

1274.00. Intent

1274.01. Size of Letters, Numbers and Symbols for Street and Road Signs
Size of letters, numbers, and symbols for street and road signs shall be a minimum 3 inch letter height, 3/8 inch stroke, reflectorized, contrasting with the background color of the sign.

1274.02. Visibility and Legibility of Street and Road Signs
Street and road signs shall be visible and legible from both directions of vehicle travel for a distance of at least 100 feet.

1274.03. Height of Street and Road Signs
Height of street and road signs shall be uniform county-wide, and meet the visibility and legibility standards of this article.

1274.04. Names and Numbers on Street and Road Signs
Newly constructed or approved public and private roads and streets must be identified by a name or number through a consistent countywide system that provides for sequenced or patterned numbering and/or non-duplicating naming within each county. All signs shall be mounted and oriented in a uniform manner. This section does not require any entity to rename or renumber existing roads or streets, nor shall a roadway providing access only to a single commercial or industrial occupancy require naming or numbering.

1274.05. Intersecting Roads, Streets and Private Lanes
Signs required by this article identifying intersecting roads, streets and private lanes shall be placed at the intersection of those roads, streets and/or private lanes.

1274.06. Signs Identifying Traffic Access Limitations
A sign identifying traffic access or flow limitations, including, but not limited to weight or vertical clearance limitations, dead-end road, one-way road (or single land conditions) shall be placed: (a) at the intersection preceding the traffic access limitation, and (b) no more than 100 feet before such traffic access limitation.

1274.07. Installation of Road, Street, and Private Lane Signs
Road, street and private land signs required by this article shall be installed prior to final acceptance by the local jurisdiction of road improvements.

1274.08. Addresses for Buildings
All buildings shall be issued an address by the local jurisdiction which conforms to that jurisdiction's overall address system. Accessory buildings will not be required to have a separate address; however, each dwelling unit within a building shall be separately identified.

1274.09. Size of Letters, Numbers and Symbols for Addresses
Size of letters, numbers, and symbols for addresses shall be a minimum 3 inch letter height, 3/8 inch stroke, reflectorized, contrasting with the background color of the sign.

1274.10. Installation, Location and Visibility of Addresses
(a) All buildings shall have a permanently posted address, which shall be placed at each driveway entrance and visible from both directions of travel along the road. In all cases, the address shall be posted at the beginning of construction and shall be maintained thereafter, and the address shall be visible and legible from the road on which the address is located. (b) Address signs along one-way roads shall be visible from both the intended direction of travel and the opposite direction. (c) Where multiple addresses are required at a single driveway, they shall be mounted on a single post. (d) Where a roadway provides access solely to a single commercial or industrial business, the address sign shall be placed at the nearest road intersection providing access to that site.

Article 4. Emergency Water Standards

1275.00. Intent

Emergency water for wildlife protection shall be available and accessible in quantities and locations specified in the statute and these regulations, in order to attack a wildfire or defend property from a wildfire. Such emergency water may be provided in a fire agency mobile water tender, or naturally occurring or manmade containment structure, as long as the specified quantity is immediately available.

1275.01. Application

The provisions of this article shall apply when new parcels are approved by a local jurisdiction. The emergency water system shall be available on-site prior to the completion of road construction, where a community water system is approved, or prior to the completion of building construction, where an individual system is approved.

1275.10 General Standards

Water systems that meet or exceed the standards specified in Public Utilities Commission of California (PUC) revised General Order #103, Adopted June 12, 1956 (Corrected September 7, 1983, Decision 83-09-001), Section VIII Fire Protection Standards and other applicable sections relating to fire protection water delivery systems, static water systems equaling or exceeding the National Fire Protection Association (NFPA) Standard 1231, "Standard on Water Supplies for Suburban and Rural Fire Fighting," 1989 Edition, or mobile water systems that meet the Insurance Services Office (ISO) Rural Class 8, 2nd Edition 3-80, standard shall be accepted as meeting the requirements of this article. These documents are available at CDF Ranger Unit Headquarters. Nothing in this article prohibits the combined storage of emergency wildfire and structural firefighting water supplies unless so prohibited by local ordinance or specified by the local fire agency. Where freeze protection is required by local jurisdiction, such protection measures shall be provided.

1275.15 Hydrant/Fire Valve

(a) The hydrant or fire valve shall be 18 inches above grade, 8 feet from flammable vegetation, no closer than 4 feet nor farther than 12 feet from a roadway, and in a location where fire apparatus using it will not block the roadway. The hydrant serving any building shall: (1) be not less than 50 feet nor more than 1/2 mile by road from the building it is to serve, and (2) be located at a turnout or turnaround, along the driveway to that building or along the road that intersects with that driveway. (b) The hydrant head shall be brass with 2 1/2 inch National hose male thread with cap for pressure and gravity flow systems and 4 1/2 inch draft systems. Such hydrants shall be wet or dry barrel as required by the delivery system. They shall have suitable crash protection as required by the local jurisdiction.

1275.20 Signing of Water Sources

Each hydrant/fire valve or access to water shall be identified as follows: (a) if located along a driveway, a reflectorized blue marker, with a minimum dimension of 3 inches shall be located on the driveway address sign and mounted on a fire retardant post, or (b) if located along a street or road, (1) a reflectorized blue marker, with a minimum dimension of 3 inches, shall be mounted on a fire retardant post. The sign shall be within 3 feet of said hydrant/fire valve, with the sign no less than 3 feet nor greater than

5 feet above ground, in a horizontal position and visible from the driveway, or (2) as specified in the State Fire Marshal's Guidelines for Fire Hydrant Markings Along State Highways and Freeways, May 1988.

Article 5. Fuel Modification Standards

1276.00. Intent

To reduce the intensity of a wildfire by reducing the volume and density of flammable vegetation, the strategic siting of fuel modification and greenbelts shall provide (1) increased safety for emergency fire equipment and evacuating civilians; and (2) a point of attack or defense from a wildfire.

1276.01. Setbacks for Structure Defensible Space

(a) All parcels 1 acre and larger shall provide a minimum 30 foot setback for buildings and accessory buildings from all property lines and/or the center of a road. (b) For parcels less than 1 acre, local jurisdictions shall provide for the same practical effect.

1276.02. Disposal of Flammable Vegetation and Fuels

Disposal, including chipping, burying, burning or removal to a landfill site approved by the local jurisdiction, of flammable vegetation and fuels caused by site development and construction, road and driveway construction, and fuel modification shall be completed prior to completion of road construction or final inspection of a building permit.

1276.03. Greenbelts Subdivisions and other developments, which propose greenbelts as a part of the development plan, shall locate said greenbelts strategically, as a separation between wildland fuels and structures. The locations shall be approved by the inspection authority.

1299. Defensible Space

The intent of this regulation is to provide guidance for implementation of Public Resources Code 4291(a) and (b), and minimize the spread of fire within a 100 foot zone around a building or structure.

(a) A person that owns, leases, controls, operates, or maintains a building or structure in, upon, or adjoining any mountainous area, forest-covered lands, brush-covered lands, grass-covered lands, or any land that is covered with flammable material, and is within State Responsibility Area, shall do the following:

(1) Within 30 feet from each building or structure maintain a firebreak by removing and clearing away all flammable vegetation and other combustible growth pursuant to PRC § 4291(a). Single specimens of trees or other vegetation may be retained provided they are well spaced, well-pruned, and create a condition that avoids spread of fire to other vegetation or to a building or structure.

(2) Within the 30 feet to 100 feet zone (Reduced Fuel Zone) from each building or structure (or to the property line, whichever is nearer to the structure), provide a fuel break by disrupting the vertical and/or horizontal continuity of flammable and combustible vegetation with the goal of reducing fire intensity, inhibiting fire in the crowns of trees, reducing the rate of fire spread, and providing a safer environment for firefighters to suppress wildfire pursuant to PRC § 4291(b).

(b) Any vegetative fuels identified as a fire hazard by the fire inspection official of the authority having jurisdiction shall be removed or modified provided it is required by subsection (a)(1) & (a)(2).
(c) Within the intent of the regulations, the fire inspection official of the authority having jurisdiction may approve alternative practices which provide for the same practical effects as the stated guidelines.
(d) Guidance for implementation of this regulation is contained in the publication: "General Guidelines for Creating Defensible Space" as published by the Board of Forestry and Fire Protection by resolution adopted on February 8, 2006.

Residents of Siskiyou County must follow county defensible space and fire safety codes found in **Title 3- Public Safety** of the County municipal code (§ I, Ord. 460, eff. May 9, 1968). Location of County Codes: http://library.municode.com/index.aspx?clientId=16630. County WEB site: http://www.co.siskiyou.ca.us/default.aspx

Title 3- Public Safety

CHAPTER 3. - FIRE HAZARDS AND FIRE PERMITS
Sec. 3-3.02. - Firebreaks: Removal of flammable materials. Any person who owns, leases, controls, operates, or maintains any building or structure in, upon, or adjoining any mountainous area or forest-covered land, brush-covered land, grass-covered land, or any land which is covered with flammable materials shall at all times conform to the requirements set forth in this chapter.

Sec. 3-3.02.1. Maintenance of firebreaks. All persons shall maintain around and adjacent to such buildings or structures within the area defined in Section 3-3.02 of this chapter firebreaks made by removing and clearing away, for a distance of not less than thirty (30′) feet on each side thereof or to the property line, whichever is nearer, all flammable vegetation or other combustible growth. The provisions of this subsection shall not apply to single specimens of trees, ornamental shrubbery, or similar plants which are used as ground cover if they do not form a means of rapidly transmitting fire from the native growth to any building or structure.

Sec. 3-3.02.2. Removal of flammable materials near buildings and structures. All persons shall maintain around and adjacent to such buildings or structures within the area defined in Section 3-3.02 of this chapter additional fire protection or firebreaks made by removing all brush, flammable vegetation, or combustible growth which is located from 30 feet to 100 feet from such buildings or structures or to the property line, whichever is nearer, or as may be required by an authorized official if he finds that, because of extra hazardous conditions, a firebreak of only thirty (30') feet around such building or structure is not sufficient to provide reasonable fire safety. Grass and other vegetation located more than thirty (30') feet from such buildings or structures, and less than eighteen (18″) inches in height above the ground, may be maintained where necessary to stabilize the soil and prevent erosion.

Sec. 3-3.02.3. Removal of trees near chimney outlets. All persons shall remove that portion of any tree which extends within ten (10') feet of the outlet of any chimney or stovepipe, and such persons shall maintain any tree adjacent to or overhanging any building free of dead or dying wood. All persons shall maintain the roof of any structure free of leaves, needles, or other dead vegetative growth.

Appendix E

History of the Happy Camp Fire Safe Council

The HCFSC is a formally organized, non-profit 501(c) corporation with six board members including President, Vice-President, Treasurer, and Secretary. The HCFSC was organized on November 12, 2002 and incorporated on August 28, 2003. The HCFSC has no paid director or administrators. Board members are not paid and have no financial interests in HCFSC business. Board members perform all aspects of HCFSC planning and operations, and have produced this CWPP. The HCFSC owns all the tools necessary for manual fuels reduction treatments, several chippers, and a crew truck. When grant funding is awarded the HCFSC employs a five- to six-person crew. The HCFSC has and does receive a great deal of technical support and encouragement from the KNF and the HCRD. Grant funding has enabled the HCFSC to do significant fuel treatments in the community. These grants have come from Forest Service programs through the Siskiyou County RAC (Resource Advisory Committee) and the National Fire Plan. In addition to grant monies, the HCFSC has raised a few thousand dollars through donations and fund-raising activities. HCFSC fuel reduction projects include manual fuels reduction around residences/driveways/access roads. HCFSC projects continue to be ongoing. A sample of HCFSC completed projects are listed in **Table E1**. Projects completed as of February 2018 and shown in Map 6.

Table E1. Completed HCFSC Fuel Reduction Projects Around Residences, Driveways, and Access Roads

Year	Project Name	Acres
2002	Downtown, including River Park and public schools	8
2003	Indian Creek Fuel Reduction Project Phase 1	11
2004	Buckhorn/Curley Jack Fuels Reduction Project	104
2005	Fowler/Meadow Fuel Reduction	34
2006	Indian Creek Road Fuel Reduction Project Phase 2	11
2007	Gordons Ferry Fuel Reduction	15
2008	Happy/Seiad Hazardous Fuels Reduction	36
2009	Happy Camp Fuel Treatment	115
2009	Happy Camp Fuel Treatment - maintained	27
2010	Happy Camp Fuels Treatment	52
2010	Happy Camp Fuels Treatment - maintained	33
2010	Water Tank Project - maintained	13
2012	Westside Perimeter	65
Total		**524**

Appendix F

CWPP Prioritization Strategy

Through outreach and involvement of local, state, tribal and federal entities, the Western Klamath Fire Learning Network (WKFLN) was formed to address the need for increased education and communication around fire and fire management. In 2013, the US Fire Learning Network agreed to provide high level facilitation to convene the WKRP. WKFLN facilitators assisted diverse stakeholders to come together to work through the Open Standards Process for Conservation (Conservation Measures Partnership, April 2013) to identify "zones of agreement" where all parties agree upslope restoration needs to occur.

As previously described, the WKRP is an open group comprised of Federal, Tribal, and non-governmental organizations, community members and other stakeholders, and facilitators with the inclusion of invited specialists for certain phases of the Open Standards Process. Invitations were extended to all potentially interested parties from local, state, federal, community, and tribal entities within the planning area, and meeting minutes are shared with an extensive list of interested parties that continues to grow. While many interested parties are not able to attend every meeting or any of them due to the extensive commitment of time this process requires, they have expressed support for the purpose of this planning effort: to build broad based support for upslope restoration actions that will expedite the creation of fire-adapted communities and fire resilient surrounding landscapes.

It is the intent of the WKRP to conceptualize, implement, and monitor fuel/fire hazard management actions and practices in a manner that demonstrates implementation of the National Cohesive Strategy in terms defined by tribal and local communities with consideration of regional and national goals. Recommended treatments in this CWPP were derived directly from concepts developed by the WKRP. For more information on WKRP collaboration, the Open Standards Process, and fuels/fire hazard reduction concepts that were developed in the WKRP workshops, please see Western Klamath Restoration Partnership: A Plan for Restoring Fire Adapted Landscapes (Harling and Tripp, 2014).

WKRP values were incorporated into a GIS overlay assessment that utilized both existing data and data created through WKRP workshops to visually represent where the WKRP felt fuels/fire hazard reduction treatments should be focused. The overlay represents WKRP zones of agreement for prioritizing locations for fuels reduction treatments in the WKRP planning area for multiple social, ecological, and economic benefits. Fuel reduction treatments prioritized and recommended in this CWPP in Chapter 4 are consistent with WKRP fuel treatments prioritizations as shown on the WKRP GIS Prioritization Overlay (Map 7). Criteria and rankings used in the WKRP GIS Prioritization Overlay are as follows:

1. Creating defensible space around structures and critical infrastructure through manual and prescribed burning fuels reduction treatments. Mechanical treatments were considered for the 500' buffer. The structures layer was updated 2014 for the entire planning area by the Karuk Department of Emergency Services:
    a. Structures layer
        i. 100 foot buffer: 1 point
        ii. 500 foot buffer: 2 points
2. Safe and reliable access and egress routes will be maintained my manual, mechanical and prescribed burning treatments (if implemented, will also provide cost effective linear features to contain wildfires and prescribed fires):
    a. Critical access/egress routes (300' buffer): 2 points
    b. Complete road system layer (public and private) (300' buffer): 1 point
3. Public/Private boundary layers (Green Line – buffer applied from edge of private property onto public lands). Revisiting residential properties to create fuelbreaks along public-private boundary allows both federal and private landowners to have more certainty fires, especially prescribed fires, don't inadvertently spread across property lines where not authorized. Additionally, work with land owners to create fuelbreaks that cross private property where that would be the most effective location to protect residences:
    a. 200 foot buffer: 2 points
    b. ¼ mile buffer: 1 point
4. Fuelbreaks along existing firelines, ridges, and trails. This helps tie in road and streams to establish Firesheds: areas where fires (both controlled and wildfires) can be contained. Control features outside the WUI should also be addressed to slow the spread of large fires. These actions could be as simple as conducting controlled burns in the fall along significant ridges to break up fuels at the landscape level.
    a. Existing firelines (300 foot buffer): 2 points
    b. Current and Historic Trails: 1 point
    c. Upper 1/3rd Slopes: 1 point
5. Maintaining existing fuels treatments on public and private lands to increase fuelbreak effectiveness. This data was derived from private land treatment layers from Happy Camp, Salmon River and Orleans/Somes Bar FSC's, and from the Region 5 Facts database, with additions from HCRD staff Kevin Osborne (Seiad FSC treatments are not included):
    a. 0-3 Years Since Treatment: 1 point
    b. 3-10 Years Since Treatment: 2 points
    c. 11+ Years Since Treatment: 1 point

6. Targeted fuel treatments for cultural and ecological resource benefits to protect tribal practices dependent on use of fire as a land management tool, and to preserve plant and animal species that depend on habitats maintained by frequent fires. Much of these wildlife areas and Landfire Biophysical Setting (BpS) areas are not likely to rank moderate or high priority for treatment because these areas are not near other values that would cumulatively increase overall ranking. These areas are high priority for restoration regardless of low overall ranking because they are of high cultural and ecological value.
    a. Wildlife Layers
        i. Elk Winter Range Restoration Potential
            1. Low (0.8): 1point
            2. High (0.9 or 1.0): 2 points
        ii. Spotted Owl Nest Sites Buffer (1/2mi. diameter): 1 point
    b. Vegetation Layers BpS
        i. Klamath Mixed Evergreen BpS (Tanoak Distribution): 1 point
        ii. Klamath Siskiyou Lower Montane Serpentine Woodland: 1 point
        iii. Black Oak BpS: 1 point
        iv. White Oak BpS: 1 point
        v. Baker Cypress Stands: 2 points
    c. Native American Cultural Use Areas (NACUA's): 1 point

Topography is important in determining intensity and spread of fire across the landscape. Aspects that face south and southwest are more prone to water deficits and low fuel moisture during dry periods. Aspect is just one consideration in the amount of solar radiation that falls on a location, in addition to factors like slope and topographic shading.

a. Topography Layers
    i. Solar radiation over high to very high (see map 11); watts per m^2 per year > 1,194,457 (natural data break): 1 point
    ii. South and southwest aspects: 1 point

Considering the level of departure from reference (pre-European-settlement) fire return intervals (see Appendix H), recent wildfires can present an opportunity to "reset" to a more frequent fire regime that keeps the landscape more resilient to fire. As such, treatments may be done strategically within recent fire footprints to avoid an unwanted trajectory of overly dense, fire prone stands.

a. Areas burned in a wildfire from 2007-2017: 1 point

Stands managed as plantations have often become particularly dense, and self-pruning and self-thinning often result in unusually heavy fuel loads. These stands often also have low crown bases, making them susceptible to torching and crown fires.

a. Managed stands—those resulting from planting of desired timber species:1 point

Dense stands of mid-mature conifers can also be prone to extreme fire behavior, with an abundance of surface and ladder fuels and high canopy bulk density.

a. Stands with conifer cover over 10% and average diameter between 10 and 30 inches: 1 point

The following areas were excluded from treatment prioritization—given zero points: slopes over 80%, landslide areas, and inner gorges.

Appendix G

Table G1. Identification and Mileage of Primary Access Roads by Jurisdiction
Bolded road segment names indicate that these road segments are also recommended burn control roads. (Additional burn control roads are listed in Table G2).

Road Number	Name	Jurisdiction	Length (miles)	Purpose for Access
15N19	Bear Peak	USFS	1.67	to Crawford neighborhoods
17N16	**Benjamin Creek**	USFS	0.87	to Benjamin Ck properties
17N28	Brownies	USFS	0.66	to SF Indian Property
46N03	**China Creek**	USFS	2.89	China Grade Rd: HC to Seiad
	Unnamed Spur	USFS	1.22	to upper China Crk properties
15N32	**Clear Creek**	USFS	1.61	to Wingate Ck Property
15N23A	Crawford	USFS	0.64	to Crawford neighborhood
15N23	Crawford	USFS	2.61	to Crawford neighborhood
15N38	Custer	USFS	2.66	to Crawford Neighborhood
15N54	Custer Tie	USFS	1.19	to Crawford neighborhood
18N13	**East Indian**	USFS	1.26	to EF Indian and Davis properties
16N05	**Elk Creek**	USFS	8.28	to Elk Ck properties and Sulfur Springs
17N07	**Fearless**	USFS	1.93	to Slater Butte
48	**Grayback**	USFS	8.90	Happy Camp to Oregon
19N07	**Greens Creek**	USFS	0.35	to Garrahan property
18N18	**Kemper Gulch**	USFS	0.18	to Driskell property
18N52	King Bill	USFS	0.87	to Garrahan property
	Unnamed Spur	USFS	0.30	to Garrahan property from 18N52
15N11	Malone Road	USFS	0.36	to Rivera
18N10	**Middle West Thompson**	USFS	0.87	to Slater Butte
18N24	**Mill Creek Ridge**	USFS	0.43	to Garrahan property
18N12	**Rhodonite**	USFS	0.82	to Davis property
17N08	**Shinar Tie**	USFS	0.61	to Slater Butte
17N48	**Slater Butte L.O.**	USFS	1.65	to Slater Butte
17N14	**Slater Butte**	USFS	1.30	To Slater Butte
17N32	**South Indian**	USFS	4.46	to SF Indian properties
18N01	**Thompson Creek**	USFS	1.81	to Slater Butte
19N01	**Thompson Ridge**	USFS	6.12	to Slater Butte
15N10	Titus Ridge	USFS	1.98	to Rivera property
46N73	Pig Tail	USFS	0.81	to upper China Creek properties
46N75	Arndt	USFS	2.44	to upper China Creek properties
Subtotal		***USFS***	***61.75***	
N/A	**Itroop Drive**	Karuk	1.19	to Karuk Tribe housing
N/A	Jacobs Way	Karuk	0.45	to Karuk Tribe housing
Subtotal		***Karuk***	***1.64***	
7C008	Airport Road	County	0.43	to Airport
7C005	Buckhorn Road	County	1.25	to Buckhorn Creek neighborhoods
7C002	**China Grade Road**	County	12.29	Tie between HC, properties, and Seiad

Table G1. Identification and Mileage of Primary Access Roads by Jurisdiction
Bolded road segment names indicate that these road segments are also recommended burn control roads. (Additional burn control roads are listed in Table G2).

Road Number	Name	Jurisdiction	Length (miles)	Purpose for Access
7C006	Curly Jack	County	1.01	Curly Jack Neighborhood
7C02	Davis Road	County	0.16	Market and Post Office
7C001	Elk Creek Road	County	0.49	to Elk Creek Neighborhoods
7C001	**Elk Crk Road**	County	4.95	to Elk Creek Neighborhoods
7C014	Gordons Ferry Road	County	1.91	Neighborhood Access
8C005	**Cade Mountain**	County	0.40	From Highway 96 to Private Property
7C003	**Indian Creek Road**	County	11.30	to Indian Ck watershed neighborhoods
8C006	Indian Meadows Drive	County	0.72	to Indian Meadows neighborhood
8C004	Doolittle Creek Road	USFS	0.30	Neighborhood Access
7C035	Lower Airport Road	County	0.20	to Airport, FS bays, and properties
7C032	Park Way	County	0.38	To Elementary School and River Park
7C12	Second Avenue	County	0.23	town core neighborhoods
8C001	South Fork Road	County	1.04	to SF Indian Ck property
Subtotal		***County***	***37.06***	
96	State Route 96	***State***	***34.74***	**From I-5 to State Hwy 299**
Total Primary Access Roads			***135.19***	

Table G2. Other Identified Roads by Jurisdiction Recommended as Burn Control Roads.

Road Number	Name	Owner	Length (miles)	Purpose for Access:
17N10	**Applegate Flat**	USFS	5.00	Outplant Site to Slater Butte
17N15	**Baker**	USFS	2.55	Outplant Site to Luther
17N16	**Benjamin Creek**	USFS	20.09	Benjamin Ck to Doolittle Ck
17N28	**Brownies**	USFS	0.32	SF Indian property high route
17N28	Brownies	USFS	2.05	SF Indian property high route
15N06	**Buckhorn Bear**	USFS	3.31	to Upper Bear Ck TH in Elk
15N06	Buckhorn Bear	USFS	2.47	to Upper Bear Ck TH in Elk
15N30	**Pony Peak Ridge**	USFS	3.70	to near Pony Peak from 15N19
15N32	**Clear Creek**	USFS	6.41	to No Mans TH
17N11	**Doolittle**	USFS	12.47	Doolittle Ck to Tennessee Gl
45N19	**East Fork Elk**	USFS	9.43	EF Elk to Fryingpan Ridge
45N19	East Fork Elk	USFS	0.74	EF Elk to Fryingpan Ridge
46N78Y	East Grider	USFS	2.20	Grider Ridge
16N05	Elk Creek	USFS	3.33	to Norcross Trailhead
45N85	**Fryingpan Ridge**	USFS	11.89	Alternative Route Between Happy Camp and Seiad
19N07	**Greens Creek**	USFS	3.84	Route to Grayback on E side of Indian Ck
46N77	**Grider Ridge**	USFS	10.42	Along Grider Ridge; entirety of road
17N22	**Hooker**	USFS	6.88	Little Grider Ridge
15N17Y	**Independence Creek**	USFS	1.21	Independence Bridge to Titus Ridge

Table G2. Other Identified Roads by Jurisdiction Recommended as Burn Control Roads.				
Road Number	**Name**	**Owner**	**Length (miles)**	**Purpose for Access:**
15N17Y	Independence Creek	USFS	3.82	Independence Bridge to Titus Ridge
16N30	**Jack Grider**	USFS	4.07	Curly Jack Ck to N Perkins Gl
18N34	Kelly Lake	USFS	0.80	to Kelly Lake Rec area
18N24	**Mill Creek Ridge**	USFS	5.97	Mouth of Mill Ck N towards Spees Peak
16N10	**Oak Flat**	USFS	2.26	Benjamin Ck Ridge
17N45	Outplant Loop	USFS	0.55	NE loop around outplant site
18N33	**Poker Flat**	USFS	7.38	to Poker Flat rec site
18N12	**Rhodonite**	USFS	2.20	to Outplant site
18N30	**Sutcliffe**	USFS	13.57	to Kelly Lake Rec area
17N23	**Tennessee**	USFS	2.10	Tennesse Gl to west
15N10	Titus Ridge	USFS	8.10	Titus Ridge
16N04	**Woods Creek**	USFS	2.36	EF Elk to Fryingpan Ridge
Total Identified Burn Control Roads		***USFS***	***161.79***	

Appendix H

Fire Environment

Topography, Slope, Elevation, Aspect

The planning area is located within the western Klamath Mountains in Northwestern California. Topography of the planning area consists of steep slopes (55-85%) that dominate the terrain, and dispersed benches up to 500 acres in size of moderate slope gradients (5-55%). Elevation ranges from around 800 feet in the Klamath River corridor to over 6,000 feet on the highest ridges bordering the planning area. Geologically diverse, steep, incised drainages have created a landscape with a multitude of various slope, aspect and elevation combinations (Skinner, 2006). Fire behavior in the Klamath Mountains is very complex with many influential factors, however, topography strongly influences fire behavior because fires burn faster uphill and because south and west aspects with greater solar radiation intensity (Map 11) are consequently hotter and drier in fire season. Before fire suppression, southwest facing slopes and ridges were markedly less forested than northeast facing slopes primarily because of difference in solar radiation intensity. Southwest to northeast differences in forest density and species composition are still quite apparent today but less marked due to fire suppression which has allowed fire-intolerant conifers (primarily Douglas-fir) to spread onto and/or increase in density on south and west facing slopes, and due to stand-replacement forestry that established conifer plantations on south and west facing slopes where hardwood/pine species associations and/or small openings in the forest canopy had previously existed.

Climate

The planning area is influenced by a Mediterranean climate characterized by warm, dry summers and cool, wet winters. The local expression of this climate regime is variable even within the planning area due to a strong west to east moisture and temperature gradient caused by proximity to the Pacific Ocean and steep elevation gradients that influence temperature and spatial pattern of precipitation. The contemporary climatic phase appears to have become established about 3,500-4,000 years ago (Skinner et

al., 2006). Within the planning area, approximately 90% of the precipitation falls from October through May with the remainder coming from occasional summer thunderstorms (Skinner, 1995). Dry summers create severe fire weather in most years between July and September. Annual precipitation at the Happy Camp Ranger Station during the period of record (1914 to present) ranges from 23 to 88 inches. Average annual precipitation at the recording station is about 51 inches. Precipitation generally increases as elevation increases in the mountains surrounding Happy Camp. The precipitation record is characterized by two distinct climate trends. These alternating periods of wet and dry conditions have in the past lasted for a few decades. The drier periods are of approximately 40 inches average annual precipitation; the wetter are of approximately 60 inches (USDA, 1999). In the recent past, the period from 1976 to 1994 was dry and the period from 1995 to around 2005 was wet. The present decade and a half has generally been dry with precipitation for the winter of 2013/2014 being one of the lowest on record with record low snow pack.

Past Fire Environment

Both lightning and anthropogenic fires have been an integral process in the renewal and diversification of the planning area landscape and Klamath Mountains for thousands of years and has been a major component of the ecosystem (Skinner et al., 2006, Anderson, 2006). In the Klamath-Siskiyou region, fires' influence as an evolutionary force can be seen in "forest structure, species composition, soil properties, wildlife habitat, landscape patterns, watershed hydrology, nutrient cycling and numerous other ecosystem processes" (Frost and Sweeney, 2000).

FIRE REGIME

Evidence suggests that the Klamath Mountains, including the planning area, historically supported a fire regime (the frequency, extent, and severity of fires) of frequent, low- to moderate-intensity fires (Skinner et al., 2006). Past fires occurred at a frequency of about every 12-22 years in the planning area. The median fire return intervals (FRI) were found to be shorter on south-facing (8 years) and west-facing (13 years) aspects than on northern (15 years) and eastern (16.5) aspects within a large study area just north of Happy Camp (Taylor & Skinner, 1998). South and west aspects had more

frequent fires and were less heavily forested than north and east aspects this is primarily because of greater solar radiation intensity (Map 11). Fire history studies in the Klamath Mountains describe fire regimes over the last few centuries and indicate there are two periods with distinctly different fire regimes: (1) the Native American period, which usually includes both pre-historic and European settlement periods, and (2) the fire suppression period which began around 1905 in the mid-Klamath region. Fire suppression became effective in more-accessible areas by the 1920's and became effective in more remote areas after 1945 (Skinner, 2006).

For the study area just north of Happy Camp, the median FRI's were found to be longer (21.8 years) during the suppression period (1905-1992) than in the settlement period (1850-1904) (12.5) or pre-settlement (1627-1849) (14.5) period. Currently, large portions of the planning area has not had any recorded fires in more than 100 years. Map 13 shows missed FRIs by area where fire occurrence has departed from historic FRIs. Table H1 summarizes data acquired from FRI departure analysis showing approximate acres by departure category.

Table H1 Acres by FRI Departure Category

Fire Return Interval Departure from Median Reference Interval	Acres in Planning Area	Percentage of Planning Area
66% or greater more frequent	59	0.02
33% to <66% more frequent	3,421	0.9
Not Significantly Departed	6,538	1.8
33% to <66% less frequent	95,090	26.4
66% or greater less frequent	245,754	68.4
Reference Interval Not Defined	8,690	2.4

For Douglas-fir dominated forests in the Klamath Mountains, historical fire regimes strongly influenced development and dynamics of stand conditions. Frequent fires of mixed low- and moderate-severity killed some overstory trees, initiated recruitment of woody debris to the forest floor and stream channels, and thinned or killed understory stems. These mixed-severity fires created multi-aged stands where tree establishment was associated with more severe fires that killed parts of the canopy. Large severe fires were uncommon (Taylor & Skinner, 1998). Regular burning in California black oak and other hardwood stands maintained dominance of the hardwoods by killing or

thinning invading conifers and maintaining light fuel beds under oak stands. Shrub, grass lands, and meadows were also maintained by fires that killed invading trees or decadent brush and facilitated the growth of younger, more vigorous plants.

FIRE IGNITION HISTORY

Fires set by indigenous peoples in the Klamath Mountains are well documented (LaLande and Pullen, 1999; Pullen, 1996; Lewis, 1993; and Lake, 2007). Tribal management systems were major factors in creating and maintaining species composition of low-elevation grasslands, chaparral, oak woodlands and ponderosa pine forests (LaLande & Pullen 1999; Sugihara et al., 2006; and Anderson, 2005, 2006). In the lower Mid Klamath sub-basin, the Karuk people historically developed intricate strategies of forest management that ensured production of beneficial resources in perpetuity. Traditional Ecological Knowledge (TEK) was developed through experiences with changing climate, natural processes, vegetation, and associated fire effects (Lewis, 1993; Stewart, 2002; and Anderson, 2005). Fire was an integral part of Karuk management of these forests, with lasting effects that survive the past century of fire suppression (De Rijke, 2001 and Lake, 2007).

Between the years of 1992 and 2015 within the CWPP area, there were 393 fire ignitions by lightning and 180 by human causes (Map 9). Estimates of the total acres burned from resulting fires (including areas burned outside the CWPP boundary) were 239,856 acres for lightning-caused and 2,958 acres for human-caused fires (Short 2017). Of the human-caused fires starting within the CWPP area, 34 were attributed to arson (20 acres burned), 26 to campfires (2,102 acres, with the Pony Fire of 1995 accounting for 2095 of these), 15 to children (7 acres), 24 to debris burning (180 acres), 7 to equipment use (321 acres, with 308 of these attributed to one fire of 2012 that became part of the Dillon Complex), 63 to ‘miscellaneous’ (318 acres), and 11 fires (9 acres) attributed to smoking. Out of the human-caused ignitions within the Happy Camp CWPP area, 128 (71%) started within the WUI.

Going back to 1951, the Fire and Resource Assessment Program (FRAP) data through 2016, paired with USFS estimates from the 2017 Oak, Cedar, and Buck fires (Eclipse

Complex), approximately 631,989 acres have burned in lightning-caused wildfires that have at least overlapped the Happy Camp CWPP area. A parallel estimate of the acreage from human-caused fires is 57, 378 acres. The five largest of the lightning-ignited fires that have overlapped the planning area were:

1) Happy Camp Complex of 2014 (133,180 acres),
2) Oak fire of 2017 (90,730 acres; the total of the Eclipse Complex of 2017 was 129,942 acres),
3) King Titus fire of 1987 (68,072 acres),
4) Mill fire of 2008 (65,882 acres), and
5) Panther fire of 2008 (44,497 acres).

The largest of the human-ignited fires was the Indian Ridge Fire of 1966, which burned 11,744 acres and was attributed to arson.

Fire history for the planning area is shown on Map 12 (only fires 500 acres or greater are included). Table H2 provides a breakdown of acres in the planning area by decade. Ash shown in Table H2, greater portions of the planning area have burned since 1980. As shown on Map 12, large portions of the planning area burned by lightning-caused fire in 1987.

Table H2 Fire History by Decade

Decade	Acres in HCFSC Planning Area	Percentage of HCFSC Planning Area
1910 through 1919	5,914	1.6
1920 through 1929	0	0
1930 through 1939	359	0.1
1940 through 1949	595	0.2
1950 through 1959	7,523	2.1
1960 through 1969	11,821	3.3
1970 through 1979	787	0.2
1980 through 1989	102,154	28
1990 through 1999	20,396	5.7
2000 through 2009	75,296	21
2010 through 2017	121,849	34

Since 1910 wildfire has occurred on about 231,400 acres (total fire footprint) or 64% of the 359,550 acre planning area. As shown on maps 12 and 14 some of areas within this total fire footprint have burned more than once during this period (thus the sum of acres in Table H2 is more than the total footprint).

Map 14 shows number of overlapping fires since 1908. Table H3 provides approximate acres by number of fires.

Table H3 Number and acres of Fires Since 1908

Number of Fires	Acres in Planning Area	Percentage of HCFSC Planning Area
0	127,100	35.3
1	129,200	35.9
2	88,100	24.5
3	13,800	3.8
4	800	0.2
5	230	0.07
6	20	0.006

SOLAR RADIATION INTENSITY

Solar radiation intensity was analyzed for the analysis area and is shown on Map 11. A summary of the analysis with approximate acres in each category can be found in Table H4.

Table H4 Summary of Solar Radiation Intensity Analysis

Relative Amount of Solar Radiation	Estimated Solar Radiation (watts per m^2 per year)	Approximate Acres in HCFSC Planning Area	Percentage of HCFSC Planning Area
Very Low	203,689 – 844,425	35,288	9.8
Low	844,426 – 1,028,340	57,773	16.1
Moderate	1,028,341 – 1,194,457	80,608	22.4
High	1,194,458 – 1,360,574	105,575	29.3
Very High	1,360,575 – 1,716,539	80,023	22.2

As shown in Table H4, over half of the planning area is in areas with high or very high solar radiation intensity.

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