A Case Study of The Elk Creek Landscape Restoration Project

By

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Title: A Case Study of The Elk Creek Landscape Restoration Project.

Abstract approved: ______David C. Shaw_____________________

Land management agencies are faced with decreasing budgets and staff, even as acres in need of restoration treatment are increasing. Rural communities in the West are still suffering from sharp declines in timber harvests since the 1990s and are now contending with wildfires that are increasing in size and severity. Landscape-level, partner-based collaborative projects have the potential to help with many of these issues. This report details a case study of the Elk Creek Landscape Restoration project implemented in southern Oregon from 2017 to 2022 by the U.S. Forest Service and the Natural Resources Conservation Service. The project sought to mitigate risk from wildfire, restore watersheds, and put money and jobs back into the local and regional communities. Treatments included commercial timber harvest, vegetative thinning, hazardous tree removal, and underburning. In total, over 3500 acres were treated and $13 million dollars invested in the community. The Elk Creek Landscape Restoration Project is an example of a successful collaborative and multi-ownership project that can restore forest resiliency. There are lessons to be learned from both successes and obstacles encountered during the project that can be incorporated into future projects of this type. Primary among them, future efforts
should seek to build collaborative relationships early, ensure adequate capacity within involved agencies, and plan around implementation constraints.

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1. Introduction

Wildfires are increasing in size and severity across the western United States (Westerling, et al., 2006; Westerling, 2016). In 2020, wildfires consumed over 10 million acres in the U.S. (NIFC, 2020). Federal land management agencies have recognized that cross-boundary treatment must be done to reduce fuel loadings and increase forest resiliency. The task is daunting: studies have shown that over 11 million acres of dry forested lands on federal, state, and private properties in Oregon and Washington need ecological restoration (Huago et al., 2015). To accomplish this immense workload, accelerating the pace of work using landscape-level project areas is essential.

Partnerships with other agencies, such as the Natural Resources Conservation Service, tribes, and state fire organizations, and NGOs are becoming increasingly important as budgets tighten, and the amount of restoration needed grows (Ingalsbee et al., 2008). The Joint Chiefs project was designed as a partnership between the U.S. Forest Service (USFS) and the Natural Resources Conservation Service (NRCS) to achieve landscape-scale restoration on public and private lands. Projects are chosen that mitigate wildfire risk, improve water quality, and restore ecosystems, while providing support to rural communities. The Elk Creek Landscape Restoration Project in southwest Oregon was chosen for the program in 2018 and has since funded $13 million of cross-boundary treatments.

The Elk Creek project centered on fuels reduction treatments for wildfire resistance and resiliency and provided funding for treatment on National Forest System lands as well as private property. This paper will focus on the work that the
USFS has planned and implemented in the footprint of the Elk Creek Landscape Restoration Project and what was learned in the process.

2. Site Information

The Elk Creek watershed is a 54,365-acre watershed located in southwestern Oregon. The drainage is south of the small, unincorporated town of Tiller and surrounds the community of Drew (Figure 1.) Elk Creek flows into the south stem of the Umpqua River. The watershed falls within the Tiller District of the Umpqua National Forest in Douglas County. The nearest cities are Roseburg to the west and Medford to the southeast. Nearly 38% of the lands within the watershed are private. This is split between industrial timberlands (23%) and residential or other (14%). There is a very small amount (0.3%) of land managed by the Bureau of Land Management (BLM) within the project area.
The Elk Creek watershed is divided into two distinct physiographical ecological provinces: the Klamath Mountain and Western Cascades ecoregions. The Klamath Mountain ecoregion covers the eastern half of the watershed. This ecological province is characterized by hot, dry summers, and wet winters (USGS, 2012). The Western Cascades ecoregion covers the western half of the project area. This ecoregion receives greater amounts of precipitation and is dominated by Douglas-fir forests at elevations below 4,000 (USGS, 2012).

The project area is characterized by dry-mixed conifer forests and oak woodlands. Much of the private industrial timber lands within the project are comprised of single-age Douglas-fir (*Psuedotsuga menziesii*) or ponderosa pine (*Pinus ponderosa*) stands managed for timber harvest. On National Forest System lands (NFS), there is a mix of natural stands and managed, single-species tree
plantations. Tree species include Douglas-fir, ponderosa pine, and white fir (*Abies concolor*), with California black oak (*Quercus kelloggii*) and Oregon white oak (*Quercus garryana*) in the lower, dryer sites. Shrubs species consist of vine maple (*Acer circinatum*), tall Oregon grape (*Mahonia aquifolium*), ocean spray (*Holodiscus discolor*), and California black hazel (*Corylus cornuta*).

The waterways in the Elk Creek watershed support numerous aquatic species. Chinook salmon (*Oncorhynchus tshawytscha*), Coho salmon (*Oncorhynchus kisutch*), steelhead (*Oncorhynchus mykiss*), and cutthroat trout (*Oncorhynchus clarkia*) use Elk Creek and its tributaries as spawning and rearing habitat. Other native species include Umpqua-chub (*Oregonichthys kalawatseti*), Pacific lamprey (*Lampetra tridentata*), western brook lamprey (*Lampetra richardsonii*), and numerous other non-anadromous fish species. Nonnative smallmouth bass (*Micropterus dolomieu*) have a sizeable presence in the South Umpqua River and its tributaries and have caused declines in native fish populations (Amos, n.d.).

A wildlife species of note within the project area is the northern spotted owl (*Strix occidentalis caurina*). The USFS surveyed this species between 2012-2015 within the project area. Two northern spotted owl pairs were discovered, one pair of which successfully raised young, and seven single birds (USDA Forest Service, 2017). Barred owls (*Strix varia*) are common in the project area, and often compete with northern spotted owls for resources such as nesting and feeding territory (Wiens et al., 2014).

The Umpqua National Forest is the traditional land of the Yoncalla Kalapuyan, the Southern Molalla, the Upper Umpqua, and the Cow Creek Umpqua
peoples. Today descendants of these tribes belong to three federally recognized tribes: The Cow Creek Band of Umpqua Tribe of Indians, The Confederated Tribes of the Grande Ronde, and The Confederated Tribe of Silitz Indians (Guggemos, 2021). These tribes still use their ancestral land use to collect resources such as huckleberries, bear grass, and salmon, and for ceremonies and other events.

The first Euro-Americans who arrived in the Umpqua basin were drawn in by fur-trading in 1971 (OSU, 2021). The fur trade continued to lure people in until the mid-1800s. Around the same time, the discovery of gold in a tributary of the South Umpqua River brought permanent settlers. During World War II, the rich timber resources of the Umpqua area drew in many people and populations grew. Settlers used the area for farming and grazing in addition to timber harvest and mining. The legacy of many of these practices is still seen on the landscape today.

This landscape has evolved with many disturbance regimes. Through history, glaciation, fire, flooding, wind events, insects, disease, and more recent management activities such as timber harvest, livestock grazing, and road building, have all shaped the current landscape. Fire suppression began in the late 1800s and persists today, with minimal prescribed or managed fire. Timber harvest continues, though far less timber is moved off of the Umpqua National Forest than earlier in its history. Fire history information gathered from nearby watersheds show a fire return interval of around 15 years (USDA, 2017). The majority (81%) of the project area is classified as Fire Regime I, which is a high frequency, low severity regime (USDA, 2017). A fire history study conducted in a similar adjacent drainage showed lower elevation southern slopes to have a mean fire return interval of 23 years. Higher
elevation northern slopes had less frequent, higher severity fires (USDA, 1996). In this landscape, natural ignitions were caused by lightning storms.

Prior to European settlement, the area was managed for multiple reasons by indigenous people. Local tribes used fire to clear brush, improve forage for deer and elk, and to maintain plants for food or fiber (Adlam & Berger, 2022). This early system of land management endured for hundreds and perhaps thousands of years, influencing ecosystems and fire regimes. As European settlers moved in, patterns of fire on the landscape changed. Earlier settlers used fire to clear land and dispose of slash, but indigenous burning died out as local people were relocated to reservations in northern Oregon.

Particularly destructive fires across the West in the early 1900’s spurred the newly formed USFS to hire a large number of wildland firefighters. Aggressive new firefighting policies eventually led to a suppression rate of 97-99% of all ignitions during the initial attack phase by the 1950’s (Dennison et al., 2014). Fire suppression and a lack of prescribed fire have led to changing conditions across much of the Umpqua National Forest and surrounding lands. The Umpqua National Forest has experienced a dramatic increase in fire size in the last 20 years. Some fires of note are the Tiller Complex (2002; 68,862 acres), Timbered Rock Fire (2002; 27,118 acres), Boze and Rainbow Fires (2009; 16,461 acres), Whiskey Complex (2013; 17,878 acres), Stouts Creek Fire (2015; 26,452 acres), Falcon Complex (2017; 20,950 acres), South Umpqua Complex (2018; 50,115 acres) and the Devils Knob Complex (2020; 70,053 acres).
3. Current Conditions

The land in the Elk Creek project area is still used primarily for timber production. A small number of ranches raise cattle and other livestock. Several (noncommercial) mine claims exist, though activity is minimal. There is an active grazing allotment covering much of the area and cattle are turned out from May to October each year. Within the project footprint are several blocks of industrial timber land owned and managed by the Cow Creek Band of Umpqua Tribe of Indians. On NFS lands, timber harvest is the major driver of most activities.

Like many low-elevation sites in southern Oregon, the project area is experiencing widespread tree mortality (Bennet et al., 2023). A decline of Douglas-fir, the dominant tree species in the area, has been noted since at least 2017 (USDA, 2017). Fire exclusion has led to conifer encroachment in historically open oak meadows. Recent drought has further stressed trees in the area. In these sites, and other marginal Douglas-fir habitat, tree die-off is especially prevalent. Stressed trees provide a perfect host for many types of insects. An insect of particular note is the flat-headed fir borer (*Phaenops drummondi*). This beetle tunnels under the bark of “weakened, dying, and recently cut or killed trees” and damages the tree, often leading to mortality (USDA, 2011). This large-scale tree mortality has led to increased fuel loading and decreased economic value across many of the stands within the project area.

Heavy fuel loading and a departure from historic conditions in the area was the major driver for restoration plans in this area. Fire suppression and management
actions have led to increased stand densities and high fuel loading. Figure 2 below shows changes in conditions from 1954 to 2014, as documented by aerial photography.

![Aerial Photography of Project Area Showing Conifer Encroachment in Open Meadow Areas. (USDA, 2017)](image)

There were 201 documented structures on both private and publicly managed lands within the project area (USDA, 2017). Some fuels reduction immediately adjacent to structures on private property had been completed through a state Firewise program managed by Douglas County Forest Protection agency. However, larger blocks of private property needed treatments and finding funding opportunities was challenging outside of landowners performing the work out-of-pocket.

In 2020, the Devils Knob Complex of fires started as the result of lightning strikes July 29th and August 1st. The 40-plus fires burned 70,053 acres across the Umpqua National Forest. One of the fires in this complex, the Big Hamlin Fire,
burned 9,383 acres within the Elk Creek Restoration project area. On July 15th, 2018, dry lightning coupled with gusty winds and low relative humidity resulted in numerous wildfires. The Miles Fire, one of five in the South Umpqua Complex, burned nearly 3000 acres in the Elk Project area. In 2015, the Stouts Creek Fire ignited as the result of sparks generated by a lawn mower on private lands (Gajanan, 2016). This fire burned 11,563 acres within the project area. Each of these fires burned through planned treatment areas. Some of the areas that burned at higher severities were dropped from treatment due to changed conditions. Figure 3 below shows a fire history for the area.
4. Elk Creek Project Overview

This project was first proposed in 2016 and an Environmental Analysis (EA) was prepared in 2017. The EA built upon an earlier watershed analysis conducted in 1996 and a Watershed Restoration Action Plan drafted with the help of the South Umpqua Rural Communities Partnership (SURCP), a local nonprofit. The purpose as listed in the EA was shown in these four bullet points:

- Restore fire-dependent habitats.
- Improve fire resiliency, renew the role of fire and create opportunities to manage wildfires threatening values at risk.
- Improve watershed function.
- Improve wildlife habitat, forest composition and structure.

In late 2018, Joint Chiefs funding was awarded for activities within the project area. The Joint Chiefs Landscape Restoration Project is a program that allows the NRCS to partner with the USFS to invest in landscape-scale cross boundary projects aimed at reducing wildfire threats to communities, improving wildlife habitat, and protecting water supplies. The NRCS works with agricultural producers, private timberland owners, and other private property owners to design and fund treatments adjacent to NFS lands. Once awarded, funding continues for three years.

In addition to the USFS and NRCS, SURCP worked to secure further funding and to make contacts with local landowners to explain the program and the process involved. Additional partners included the Cow Creek Band of Umpqua Tribe of Indians, the Douglas Forest Protection Agency, and the Douglas County Soil and
Water Conservation District. Several small reforestation crews were identified and trained to provide local workforce capacity and spent several years performing restoration work for landowners.

There were many types of treatments proposed for the project area, which were selected by an interdisciplinary team of specialists at the U.S. Forest Service, local landowners, and a local community group. Non-fuels related treatments included instream restoration, culvert replacement, fence construction, storm proofing of roads, meadow restoration, and quarry expansion. The planned fuels treatments with descriptions and acres are listed in Table 1 below. Figure 4 at the end of this section shows locations of the various treatments in the project area.

Table 1. Fuels Treatments Proposed in the Elk Creek Watershed Landscape Restoration Project.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Description</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber Harvest</td>
<td>Commercial harvest of timber for fuels reduction. Revenue generated from timber sales helps fund restoration work.</td>
<td>3,600</td>
</tr>
<tr>
<td>Activity Fuels Treatment</td>
<td>Fuels generated during commercial harvest activities.</td>
<td>4,305</td>
</tr>
<tr>
<td>• Hand Pile &amp; Burn</td>
<td>Manually create small (6x4x4 ft) piles from smaller-diameter fuels generated from mechanical tree harvest. Piles are burned after curing. This treatment may be used in areas where terrain limits equipment access.</td>
<td>1,646</td>
</tr>
<tr>
<td>• Grapple Pile &amp; Burn</td>
<td>Uses heavy equipment to create medium sized (10x6x6 ft) piles from smaller-diameter fuels generated from mechanical tree harvest. Piles are burned after curing.</td>
<td>839</td>
</tr>
<tr>
<td>• Underburning</td>
<td>Uses prescribed fire to remove fuels generated by commercial harvest. Often this treatment follows grapple or hand pile and burn.</td>
<td>1,387</td>
</tr>
<tr>
<td>Shaded Fuel Breaks</td>
<td>Manually remove excess trees and brush while maintaining canopy cover in linear units along roads. This treatment creates safer egress routes for public and areas of lighter fuels for firefighters to suppress a wildfire. Fuels are piled and burned.</td>
<td>513</td>
</tr>
<tr>
<td>Noncommercial Thinning</td>
<td>Manually thin and remove excess small trees and brush in natural stands. Leave trees are pruned and all cut vegetation is piled. Piles are burned after curing.</td>
<td>153</td>
</tr>
<tr>
<td>Precommercial Thinning</td>
<td>Manually thin and remove excess trees in young timber plantations. Leave trees are pruned and all cut vegetation is piled. Piles are burned after curing.</td>
<td>280</td>
</tr>
<tr>
<td>Firewise Ignition Zone Thinning</td>
<td>Thinning near private property and within 200 feet of a structure. Several FS managed structures were also treated.</td>
<td>12</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>----</td>
</tr>
<tr>
<td>Pruning</td>
<td>Reduce ladder fuels by pruning trees in young timber plantations. Pile cut limbs for burning.</td>
<td>50</td>
</tr>
<tr>
<td>Natural Fuels Underburning</td>
<td>Uses prescribed fire to reduce surface and ladder fuels. Can help to restore historic fire regimes.</td>
<td>3,176</td>
</tr>
<tr>
<td>Handline Construction</td>
<td>Handline is used as a containment feature on underburns and other prescribed fires.</td>
<td>29.5 (miles)</td>
</tr>
</tbody>
</table>

Timber harvest- There were many sale units spanning the project area. In each unit trees were selectively cut, leaving behind some trees but increasing spacing and reducing overall fuel loading. All mechanical harvest adds to surface fuel loadings by displacing some of the biomass that is in the canopy of trees onto the forest floor.

While underburning is the preferred method of removing activity generated slash, fuel loadings are often high enough that a series of treatment must be performed before underburning. Steep terrain may require timber harvest to be completed with helicopters or through cable-yarding due to erosion concerns and inaccessibility for ground-based logging equipment. After harvest, smaller diameter activity-generated slash is usually gathered manually and piled into hand piles. These piles are burned after the slash has cured, generally 1-2 years. Ground based logging systems are used in flatter terrain and activity generated slash can be piled with equipment. Piling with equipment is more cost effective and less time-consuming for the purchaser. Once piling and pile burning is complete, an underburn may be used to further reduce fuel.

In units using whole tree yarding methods, piling before underburning may not be necessary. In all units, large piles of slash are created where trees are processed. These are referred to as landing piles and are burned after curing.
Shaded fuel breaks- Units were laid out 150 feet on either side of strategic roadways. In these units, excess trees and surface and ladder fuels are manually removed and piled into hand piles. These piles are later burned after fuels are cured. Roads were selected based on public ingress and egress routes. Roads were also chosen if locations and conditions could provide a strategic fire control line. These units were selected before the Potential Operational Delineations (PODs) concept was widely used as a framework for prioritizing treatments, but many of the same concepts were used to select roads for treatments. PODs are spatial units or containers defined by potential control features, such as roads and ridge tops, within which relevant information on forest conditions, ecology, and fire potential can be summarized” (PODs, 2023). Shaded fuel breaks are typically easy to implement but are time-consuming and expensive on federal lands due to the manual nature of these treatments. Costs for this treatment were around $1,400 an acre. Pictures of shaded fuel break treatments are shown in Appendix B.

Noncommercial and Precommercial Thinning. Smaller trees and brush are thinned using a chainsaw. The resulting slash and some surface and ladder fuels are piled into small piles. Piles are later burned. Noncommercial refers to thinning in natural stands of trees, and precommercial refers to thinning in plantations. In plantations, thinning may be performed several times before trees reach commercial size. All plantations within the planning area were analyzed for thinning needs. In forested areas that were not planned for other types of treatments, noncommercial thinning was planned as
needed. This treatment is expensive, with total costs reaching $1,400 an acre depending on density of trees and piles.

Firewise Ignition Zone Thinning- Similar to other types of thinning, this treatment is concentrated around neighboring private structures. Treatment specifications were often unique to each site, and most units were only a few acres in size. Costs are similar to other types of thinning/piling/pile burning work.

Pruning- Pruning was used in young timber plantations that did not need thinning but where raising the canopy base height was viewed as effective in reducing torching/crowning potential. Lower limbs of trees are cut with a chainsaw, piled, and burned. Cost for this treatment on federal lands was around $750 an acre.

Natural fuels underburning- These are prescribed fire underburn units in areas outside of plantations or other stands managed for timber harvest purposes. Underburning reduces fuel loading and returns fire as a natural disturbance mechanism. Some of the underburn units were planned in meadows suffering from conifer encroachment, and some were in forested areas with high fuel loading. Underburn units are prepped for implementation by constructing containment lines, falling snags near those containment lines, and removing some of the fuel buildup near legacy trees or large hardwoods to enhance their survival through an underburn. Units were chosen in natural stands and meadows that would benefit from fire. Underburning is usually more cost-effective and mimics a natural ecological process in these ecosystems.
However, prescribed burning on federal lands is heavily regulated, can require significant logistical support, and can be challenging to implement making it prohibitively expensive. Clearance for smoke emissions can be difficult to attain depending on proximity to population centers or sensitive areas. Some units have short burn windows or complex logistical needs, such as aviation or heavy equipment support. Federal regulations require teams of federally qualified personnel, which can also be a limitation. Typical costs for underburning in these fuel types ranges from $500-$1000 an acre.

Handline construction- Handline is often used as a containment feature on prescribed fires. To construct handline, a strip of vegetation is cleared using chainsaws and handtools. The width of this strip will vary based on fuel type, terrain, and other features, but is generally 1.5-3 feet wide. Handline typically costs $1/foot. Roads, dozer line, or natural features such as bodies of water may also be used as containment features.
5. Fuels Treatment Effectiveness Monitoring

Monitoring the impact of wildfires burning through recent fuels reduction treatments can provide important data for future treatments and projects. Fuels Treatment Effectiveness Monitoring (FTEM) is a system of documenting “the effectiveness of fuels treatments on wildfire behavior when a wildland fire intersects with a previously applied hazardous fuels reduction treatment” (USDA, n.d.). The Big Hamlin was the only large fire that burned through the treatment during the Joint Chiefs funding period, but still required a substantial monitoring effort. The FTEM
application is hosted on the Interagency Fuels Treatment Decision Support System (IFTDSS) site. Fuels reduction treatments are entered into an Interagency Fuels Data Service, which may be the Forest Activity Tracking System (FACTS) for the USFS or the National Fire Plan Operations & Reporting System (NFPORS) for Department of Interior (DOI) agencies. All fuels treatments completed after 2005 for the USFS and all fuels reduction treatments completed after 2008 for the DOI are entered into these databases. The National Incident Feature Service (NIFS) is an ArcGIS Online hosted feature service in which all wildfires perimeters in the U.S. are entered (NWCG, 2021). Data from NIFS is uploaded to IFTDSS daily. Whenever a wildfire perimeter interacts with a fuels reduction treatment polygon, FTEM reporting is required. Each step in a fuels reduction treatment is recorded. For example, treatment that involves thinning, piling, and pile burning will have three records. FTEM data collection is usually carried out by local fuels technicians in the fall months after fire season. In the case of a very heavy wildfire season, teams of firefighters are deployed to Forests needing help with data collection. A FTEM survey form is included in Appendix D.

The Devils Knob Complex wildfires had 110 interactions with fuels reduction treatments. Four of these were of interactions between fuels treatments in the Elk Creek project area and fires occurring during the 2021 fire season. One treatment unit interacted with a very small (≤0.10 ac) fire, the Wolf incident. This fire was a single burning tree struck by lightning. The FTEM data collection for this interaction was completed remotely. The fuels treatment likely had no effect on the outcome of fire suppression. One treatment unit interacted with a fire included in the Devils Knob
Complex, the Big Hamlin incident. This FTEM data collection was performed by a team of firefighters with help from the local fuels technician. A summary of these interactions is shown in Table 2 below. A photo point from the FTEM monitoring for the Elk 79 Unit is show in Appendix B.

Table 2. FTEM Data for Fuels Reduction Treatments Interacting with Wildfires in the Project Area.

<table>
<thead>
<tr>
<th>Treatment Name</th>
<th>Treatment Type</th>
<th>Treatment Completion Acres</th>
<th>Wildfire Name</th>
<th>Wildfire Acres</th>
<th>Treatment and Wildfire Interaction Details (Picklist)</th>
<th>Treatment Acres Burned By Wildfire</th>
<th>Fire Behavior Change? (Picklist)</th>
<th>Treatment Contribute to Control and/or Management? (Picklist)</th>
<th>Strategically Located? (Picklist)</th>
<th>Comments</th>
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<tbody>
<tr>
<td>TL ELK JOINT CHIEFS 19</td>
<td>Hand Pile</td>
<td>69.60</td>
<td>Wolf</td>
<td>0.10</td>
<td>Other</td>
<td>0.10</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No survey</td>
</tr>
<tr>
<td>TL ELK JOINT CHIEFS 19</td>
<td>Hand Pile Burn</td>
<td>69.60</td>
<td>Wolf</td>
<td>0.10</td>
<td>Other</td>
<td>0.10</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No survey</td>
</tr>
<tr>
<td>ELK 79 1</td>
<td>Hand Pile</td>
<td>79.00</td>
<td>Big Hamlin</td>
<td>19377</td>
<td>Wildfire burned through some acres treated</td>
<td>2.01</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Fuels treatment prevented fire from reaching crown. The majority of ground and ladder fuels were removed during the previous fuels treatment. Fire was held along treatment perimeter.</td>
</tr>
<tr>
<td>ELK 79 1</td>
<td>Thinning</td>
<td>79.00</td>
<td>Big Hamlin</td>
<td>19377</td>
<td>Wildfire burned through some acres treated</td>
<td>2.01</td>
<td>Yes</td>
<td>Yes</td>
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<td>Fuels treatment prevented fire from reaching crown. The majority of ground and ladder fuels were removed during the previous fuels treatment. Fire was held along treatment perimeter.</td>
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</tbody>
</table>

There are several obvious issues with this FTEM data. The treatment ‘TL ELK JOINT CHIEFS FUELS 19’ is missing an entry for the thinning portion of this treatment. This error likely has to do with the way the fuels treatment data was entered into FACTS. This entry is either missing or not yet “accomplished” in the database, which is to be done no more than 30 days after a treatment is completed on the ground.

Only two acres of the ‘ELK 79 UNIT 1’ fuels reduction treatment were burned during the Big Hamlin incident. This may mean that fire behavior was moderated enough by the fuels treatment that the fire did not progress farther into the unit. This is certainly indicated by the comments in this entry; however, two data
points are not enough to draw any significant conclusions. FTEM data is collected based on observations of fire behavior long after a fire has passed through an area and often without any direct observations of fire behavior.

6. Accomplishments

In all, about 72% of the original (non-harvest related) fuels treatments were implemented or treated. Table 3 below shows accomplished treatments and acres. None of the natural fuels underburns were implemented due to wildfires, tree mortality, lack of agency staff, and burning restrictions. However, fuels reduction objectives were met across two of these units due to the fires burning through. The USFS staff does have plans to burn portions of the remaining units, and to use prescribed fire to maintain conditions created by wildfires.

Table 3. Accomplished Fuels Reduction Treatments as of 2022.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Acres Planned</th>
<th>Acres accomplished</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber harvest</td>
<td>3,600</td>
<td>1,057</td>
</tr>
<tr>
<td>Activity Fuels Treatment</td>
<td>4,305</td>
<td>744</td>
</tr>
<tr>
<td>• Hand Pile &amp; Burn</td>
<td>1,646</td>
<td>493</td>
</tr>
<tr>
<td>• Grapple Pile &amp; Burn</td>
<td>839</td>
<td>251</td>
</tr>
<tr>
<td>• Underburning</td>
<td>1,387</td>
<td>0</td>
</tr>
<tr>
<td>Shaded Fuel Breaks</td>
<td>513</td>
<td>513</td>
</tr>
<tr>
<td>Noncommercial Thinning</td>
<td>153</td>
<td>149</td>
</tr>
<tr>
<td>Precommercial Thinning</td>
<td>280</td>
<td>273</td>
</tr>
<tr>
<td>Firewise Ignition Zone Thinning</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Pruning</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Natural Fuels Underburning</td>
<td>3,176</td>
<td>0</td>
</tr>
<tr>
<td>Handline Construction</td>
<td>29.5 (miles)</td>
<td>29.5 (miles)</td>
</tr>
<tr>
<td>Hazardous Tree Felling</td>
<td>NA</td>
<td>249</td>
</tr>
</tbody>
</table>
Due to fluctuating timber markets and tree mortality in the units, some commercial timber sales were dropped or delayed. Additionally, some of the planned slash disposal treatments, such as underburning, were dropped or minimized to keep costs to the purchaser low. Moving towards whole tree logging styles changed how slash was distributed in units after harvest, which allowed treatments such as piling to be dropped.

One additional treatment was the removal of hazard trees along major roadways in the project area. Many areas are experiencing high tree mortality. This was especially prevalent in fire scars or along exposed southern slopes. Dead standing trees along roadways present a major safety concern to the public, crews performing restoration work, and firefighters. Considerable time each year was devoted to cutting downed logs out of roadways after storms or wind events. To mitigate this hazard, dead trees within one tree length of the road prism were fell by professional falling teams. Some of these logs were repurposed as firewood, some were directly fell into waterways for fish habitat, and many were left in place.

The treatments that were easiest to implement were those that could easily be contracted out. Smaller units or those requiring specific, delicate treatment, like those near structures were best suited for agency personnel. The large underburn units were the most difficult to complete. Large underburn units in steep, difficult terrain with timber fuel types requires substantial preparation, ideal weather conditions, and a large team of firefighters to safety accomplish. COVID related burning restrictions and an agency-wide pause on burning further hampered efforts.
A major accomplishment through the project was the collaboration between the USFS, NRCS, private landowners, and the other involved groups. Many landowners were able to have their lands treated through a cost-share program. Specifications for those treatments were similar to those on NFS lands, providing a continuous, large-scale reduction in fire hazard. Developing relationships with landowners made things easier during the extended attack suppression efforts that occurred during the Miles and Big Hamlin fires.

7. Limitations/Obstacles

While the project was successful overall, there were some obstacles and limitations that kept the project from being fully implemented. The first was how quickly conditions changed from the completion of the environmental analysis to implementation. Southern Oregon is experiencing an unprecedented Douglas-fir mortality event. Several timber sale units had to be remarked for sale or dropped entirely because of the mortality that happened between unit layout, cruising, and harvest. In two of the natural fuels underburn units, the number of snags presented such a safety hazard to firefighters, fire managers were hesitant to implement burning.

Another major issue that arose was wildfires burning through the project area. The 2015 Stouts Creek fire burned through the southern half of the project area during the EA period. Some of the proposed treatments were dropped, and much of the analysis had to be redone to include fire effects. Some of the low to moderate intensity burned areas that were not dropped from the project area later experienced significant tree mortality. Where tree mortality was very high, implementation of treatments was never carried out due to high fuel loading from snags and downed
logs, or danger from standing snags. The 2018 Miles Fire burned through a large, prescribed fire unit on the east side of the project area. However, the wildfire served as a natural treatment in reducing fuels and returning fire as a disturbance process. The 2021 Devil’s Knob Complex burned nearly 9,000 acres within the project area. Some of the planned treatments within the burned area were dropped from implementation, while others are currently undergoing re-evaluation. Large fires burning on the district also indirectly affect projects such as these by shifting priorities for local staff.

A further barrier to implementation of large-scale projects such as the Elk Creek project is lack of agency capacity and high turnover of employees. Although these problems exist at many agencies, it was especially noticeable on the Tiller Ranger District. During the years that fundings was provided through the Joint Chiefs Project, the fuels department at the local Forest Service district office was staffed with just half of the personnel normally present in the department. Many of the other departments faced similar staffing issues. On a larger scale, agencies often do not have the staff to complete the fuels reduction treatments in-house. Often larger projects are contracted to local companies. Contracting out work raises prices and requires specialized training for agency staff to carry out government contracts. Contracting regulations and short timelines to obligate funds add to the difficulties. Capacity for developing and overseeing contracts was extremely limited and was a major constraint during this project. Designing projects with these limitations in mind may help to speed up implementation of future projects.
A 2019 study found that these same obstacles and limitations are faced in many cross-boundary, landscape scale restoration projects like this one. The study looked at 17 Joint Chief projects across the nation that had been ongoing for at least two years. A major component contributing to either successes or limitations across many of the projects was “limited capacity, gaps in expertise, and frequent staff turnover” (Cyphers & Schultz, 2019). This study did find that programs such as Joint Chiefs which require collaboration across boundaries and guarantees multi-year funding led to larger, more impactful projects.

The FTEM collection did not contribute meaningful data towards an evaluation of the treatments in the project area, however, a review of this process and the data generated is still useful. There are changes that could be made to the monitoring protocol that could make it more useful. Perhaps observations in addition to fire severity data as a standard practice could enhance the usability of FTEM data.

The USFS does provide a national database of burn severity data for all large (≥ 100 acres) fires, called RAVG. This is described as ‘a rapid initial assessment of post-fire vegetation condition following large wildfires on National Forests’ (USDA, n.d.). Department of Interior lands are provided a similar dataset. RAVG data is often used in the absence of observational data for FTEM reporting. A standardized combination of these two methods, plus data collected in real time as fires burn could make FTEM data more useful. Doing quality control of the data entered into the FACTS database would also be helpful.
8. Recommendations

This project has many successful aspects that can provide learning opportunities for other projects. Building strong partnerships is very important for large collaborative projects such as this. This is a long process that takes dedication for all involved partners. Starting with smaller, simpler projects could build trust and relationships before undertaking a larger project.

Agencies could benefit from having some staff in key positions devoted solely to large projects. A similar project, the Rogue Basin Collaborative Forest Restoration Project, has a ‘special projects coordinator’ who manages the project, meets with partners, and tracks funding. Having a person in a similar role during the course of the Joint Chiefs would have relieved some of the workload on district staff.

Figure 5. View of the Big Hamlin Fire Burning through the Project Area (Negherbon, 2021).
9. References


10. Appendices

A. Specifications for Fuels Reduction Treatments

Hand thin and pile specifications

A. Treatment prescriptions for hand-severing and pile will be as follows:

- **Shaded fuel breaks** - Cut conifers up to 7” DBH on a variable spacing using 16’x16’ as a basis, but allowing for occasional leave clumps for wildlife cover and habitat. Conifers >10” dbh are not counted as leave trees and canopy closure should be no less than 60%. Avoid cutting hardwoods. Prune leave trees according to pruning specifications below. Units are generally 150’ along selected roadways and will be flagged.

- **Non-commercial or pre-commercial thinning** - Cut conifers up to 7” DBH on a variable spacing using 16’x16’ as a basis but allowing for occasional leave clumps for wildlife cover and habitat. Conifers >10” dbh are not counted as leave trees and canopy closure should be no less than 35%. Unit shapes and sizes are variable and will be flagged.

- **Pruning** - Leave trees will be pruned of all limbs and ladder fuels up to 8’ from ground level. Hardwood trees shall not be pruned. Unit will be flagged.

Specifications common to all hand thinning and pile treatments

- **Flush cut all stumps of cut material within 6 inches of the ground and ensure no live limbs remain on stumps.**

- **Leave tree preference is as follows:** Sugar Pine, Ponderosa Pine, Douglas-fir, Cedars and White-fir.

- **Cut dry site shrubs (Ocean Spray, Ceanothus, Manzanita) less than 8” in diameter at 12” from the ground on 20’x20’. Allow for leave clumps in continuous patches no more than 10% of the area (.1 acre/acre). Shrubs can count in leave tree spacing.**

- **Cut conifers, hardwoods, and shrubs up to 7” DBH growing within ditch of road.**

- **Unit Slash** - See attachment for specifications for slash and hand pile specs.

B. No treatment:

- **No treatment in any perennial shade zone (PSZ) or with 10’ of all intermittent/ephemeral streams. Use Table 1. Below to determine PSZ.**

- **Within Riparian Reserves (outside of primary shade zones), fuel break treatments would be limited to pruning of branches to a height of 8’ and slash**
will be treated by lop and scatter. Riparian Reserves extend to 170’ each side of non-fish streams, and 340’ each side of fish streams.

- Within Riparian Reserves (outside of primary shade zones), Do not cut: Pacific Yew, wet site shrubs (Dogwood, Vine Maple, Nine Bark), Western White Pine, Knob Cone Pine or any hardwoods.
- No treatment within 50’ of wetlands.

<table>
<thead>
<tr>
<th>Tree Height</th>
<th>Hill Slope</th>
<th>PSZ Distance (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;30%</td>
<td>30% - 60 %</td>
</tr>
<tr>
<td>&lt; 20’</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>20’ to 60’</td>
<td>28</td>
<td>33</td>
</tr>
<tr>
<td>60’ to 100’</td>
<td>50</td>
<td>55</td>
</tr>
<tr>
<td>100’ to 140’</td>
<td>70</td>
<td>75</td>
</tr>
</tbody>
</table>

Table 1. Use average tree height and average hill slope to determine distance of PSZ.

C. Debris:

- All slash generated from thinning and pruning operations will be hand-piled according to specifications below, except as noted in no treatment specifications.
- Materials resulting from the cutting operation in excess of 12 inches in length or 3 inches in diameter are not allowed to remain on roadway slopes within the treated area, in ditches, or within water courses.

D. Construction and size of handpiles

- All slash less than 8 inches in diameter and greater than 2 feet in length shall be piled. Slash less than 2 feet in length shall be left on the ground. Slash left on the ground shall not exceed 6 inches in depth.
- All piles shall be constructed by laying limbs, stems, cut boles, and other slash in the pile so as to be parallel with each other. Slash that causes large air spaces in piles shall be cut to eliminate air spaces.
- Pile size shall be a maximum of 8 feet in diameter by 8 feet in height, and minimum pile size shall be 6 feet in diameter by 5 feet in height at the time of final inspection by the Government. The Government may designate smaller maximum, minimum, or both when it determines this is required to meet resource or prescribed fire objectives.
• All piles shall be covered with 6-mil polyethylene plastic or alternate material approved by the COR to cover at least 90% of the surface of each pile, maximum plastic size of 10’ x 10’. All four corners and the middle of the plastic sheets shall be anchored with slash or other debris. Covering shall be done at the time of piling.

• Piles shall not be closer than 10 feet to leave or reserved vegetation or 25 feet to a unit boundary, unless approved by the COR. Slash shall not be piled or placed on logs or stumps, in roadways or drainage ditches, or within channel bottoms or streams unless designated otherwise by the COR.

• Piles shall not be within 50 feet of a stream or wetland.

Pruning specification:

A. Treatment prescriptions for pruning will be as follows:

• Cut all live and dead branches and limbs up to a height of 8 feet above ground. Limbs attached above the 8-foot mark but extending into the pruning height area shall be pruned so they do not extend below the designated height.

• Limbs shall be cut cleanly and to within ½ of the bole of the tree.

• Material shall be pulled back 4 feet away from the tree bole.

Fireline Construction specifications:

A. Treatment for handline construction will be as follows:

• The location of fireline will be flagged by COR.

• Handline shall be cleared of slash and litter to a width of 8 feet and a height of 8 feet. Limbs extending into the fireline shall be cut if possible. Limbs will be flush cut to bole whenever possible.

• The width of the handline shall be at least 1.5 feet to 3 feet and cleared to mineral soil. A strip less than 1.5 feet wide may be designated by the COR.

• Shrubs and other vegetation will be cut to within 18 inches of the ground. Live and dead trees shall be cut at ground level or as close as possible.

• No trees larger than 8 inches DBH shall be cut.

• A 3-foot section shall be removed from all logs located across the fireline.
B. Pictures of Several Treatments in the Project Area.

Figure 6. Shaded Fuel Break Treatment with Handpiles.

Figure 7. Hand Pile Burning in Shaded Fuel Break Treatment.
B. FTEM Report Photo Point

Figure 8. FTEM Report Photo Point for Elk 79 Unit.
C. FTEM Guide

Guidance for Treatment Monitoring

Select the FTEM field below for an explanation about each input.

Treatment and wildfire interaction details
Choose one of the options listed in the drop-down list (displayed in bullets below). If you choose "Other" or if there are multiple interactions choose the dominant one and use the "comments" field for further explanation.

- Wildfire started in the treatment
- Wildfire spotted into treatment
- Wildfire burned through all acres treated
- Wildfire burned through some acres treated
- Treatment was used primarily for suppression actions
- Other

Treatment acres burned by wildfire, date, and time.
Enter the treatment acres burned by wildfire and select the date and time the wildfire entered the treatment.

If both the wildfire and the treatment are polygons (indicated by the icon for fires and for treatments) the treatment acres field is populated automatically. You should verify the auto-populated value does not exceed the treatment size (either the "Accomplished Acres" value in the treatment list, or the "GIS Acres" value that appears in the right-hand panel when hovering over the treatment in full-screen view).

Entering acres manually will overwrite the automatically populated entry. To restore the auto-populated entry when in the FTEM monitoring interface, click the Calculate button next to the "Treatment acres burned by wildfire" field.

Did the fire behavior change as a result of the treatment? (as planned in the treatment objectives)
This question focuses on the expected changes in fire behavior (intensity, flame length, or rate of spread) when the fuel treatment is tested by a wildfire, that was described in the treatment objectives when the fuel treatment was planned, conducted, and/or completed. For example, in forest fuel types where the fire behavior went from a crown fire to a surface fire. Or, in shrub fuel types where the fire behavior decreased in flame length or intensity or rate of spread.

- Answer "Yes" when changes in fire behavior met the treatment objective.
- Answer "No" when changes in fire behavior did not meet the treatment objectives, then explain in the Comments field.
  - If the fire did not enter the treatment, answer "The fire did not enter the treatment."

Did the treatment contribute to control and/or management of the fire?
- Answer "Yes" when the treatment contributed to control/management of the fire. For example, if a treatment unit was used as a barrier in a burnout operation or
used to support field crews by providing an effective retardant dropped, or used to dig hand line, or used to catch the wildfire during initial attack (before it got big) then the answer would be "Yes." A treatment might also allow for the management of a multiple objective fire, allowing fire to burn through treatment with lower severity or decision maker to decide to manage an unplanned ignition for resource benefits.

▪ Answer “No” when the treatment did not contribute to control or management of the fire, for example the wildfire went through the unit because of extreme fire behavior or fire fighters would have been at risk to control the fire.

Was the treatment strategically located in order to facilitate control of the fire? Answer "Yes" or "No" based on your knowledge of the purpose of the project and layout of this treatment and other treatments designed as a part of this project.

Comment
Use this field for supporting information:

▪ When you choose "Other" or when there are multiple interactions in the "Treatment and wildfire interaction details."

▪ If you answered "No" describing whether the treatment contributes to control and/or management of the fire.

▪ This is also be the place to specify the RAWS name and number when used in the "Weather Conditions" section later.

How did the treatment contribute to the control of the fire? (Select all that apply)
Check all that apply, including:

▪ Able to do direct attack

▪ Used treatment for burn out operations

▪ Fire spread was arrested (stopped) in the treatment unit

▪ Fire spread was slowed as it moved through treatment (decreased R.O.S.)

▪ Other (If selected, fill in a description)

Other might include: “allowed for point protection,” “able to do indirect attack,” “able to use retardant for attack,” “was the treatment useable as a safety zone” and needs to be specified.

Dominant Type of Fire Spread - Outside and Inside the Treatment
Select the dominant types of fire spread outside and inside the treatment from the list:

▪ Active Crown Fire

▪ Passive Crown Fire (Group or single tree torching)

▪ Surface Fire

▪ Other (If selected, fill in a description)

Flame Length - Inside and Outside the Treatment
Select the estimated flame length, in feet, observed when the wildfire intersected the treatment outside of, and inside of, the treatment unit.
Fuel Moisture
Report all fuel moisture percentages and weather observations at the time the wildfire intersected the treatment area (or observation nearest to the time the fire intersected the treatment area).

Information should be either from the nearest weather station or from weather observations taken on site. If a weather station is used; indicate the name and RAWS station number used in the Comments section.

1-1000 Hour Fuel Moistures: Select the estimated fuels moistures for 1, 10, 100, and 1000 hour fuels, each has a drop-down list with the moisture depicted below. If no 10,100, or 1000 hour fuels exist in the treatment area, leave those fields blank.
- 1-5
- 6-10
- 11-15
- 16-20
- 20+

Live Fuel Moisture: Enter the Live fuel moisture percent (single value or range) when measurements/estimates are available from on-site or the local area that would be representative of woody/herbaceous fuels in the treatment/wildfire.

Sample Type: Select the live fuel moisture sample type used to determine live fuel moistures from the drop-down list (see below).
- Woody
- Herbaceous
- Conifer

Measured/Estimated: Select the measured or estimated used to determine the Live fuel moisture from the drop-down list (see below):
- Measured
- Estimated

Weather Conditions When Fire Entered Treatment
All fuel moisture and weather observations should be from the time the wildfire intersected the treatment area (or observations nearest to the time the fire intersected the treatment area).

Information should be either from the nearest weather station or from weather observations taken on site. If a weather station is used; indicate the name and RAWS station number used in the Comments section of Interaction Details.

Observation Source: Select the weather observation source from the drop-down list options below:
- On Site – Site observation when measured on wildfire
- Station Observation– RAWS or other official weather station
- Local - Offsite observation when measured away from wildfire

Observation Date: Input in mm/dd/yyyy format. Ideally this is the same date as when the fire entered the treatment.

ERC Percentile: Select the Energy Release Component (ERC) percentile from the drop-down menu (see below):
- Less than 90%
- 90 - 97%
- Greater than 97%

Wind Speed: Enter the wind speed (single value or range) in miles per hour. Use the midflame wind-speed (MFWS). If you need to convert 20 feet wind speeds to MFWS, visit the Windspeed Conversion topic.

Wind Direction: Select the wind direction from the drop-down list (see below):
- N
- NE
- NW
- S
- SE
- SW
- E
- W

Temperature: Select the air temperature in degrees Fahrenheit from the drop-down list (see below):
- < 60
- 60 – 69
- 70 – 79
- 80 – 89
- 90 - 99
- 100+

Relative Humidity: Enter the estimated relative humidity (0-100) in percent.

Fuel Model and Percent area - Inside and Outside the Treated Area
Choose the dominant top three Fire Behavior Fuel Model (FBFM) 13 or FBFM 40 Fuel Model(s) inside and outside the treated area and the approximate percent of the fuel treatment area they cover. These Percents do not need to add to 100 percent. See Scott and Burgan (2005) fuel model descriptions.

Attachments
You can include attachments during any phase of treatment monitoring. Files available for upload include:
- MS Word documents (.doc, .docx) up to 5 Mb.
- PDF documents (.pdf) up to 5 Mb.
Image files (.gif, .jpg, .png) up to 1.5 Mb.