United States Department of Agriculture
Forest Service

Limestone/Silver Vegetation Management Project

Newport-Sullivan Lake Ranger Districts

Colville National Forest

Fire/Fuels Resource Report

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Relevant Laws, Regulations, and Policy

Farm Bill – Healthy Forests Restoration Act (16 U.S.C. 6591)

Section 8204 of the Agriculture Act of 2014 ("Farm Bill", Public Law 113-79) amended Title VI of the Healthy Forests Restoration Act of 2003 (HFRA). This amendment added Sections 602 and 603, which describe treatment area designations and the administrative review process. This amendment to the Healthy Forests Restoration Act requires the landscape-scale area to be experiencing declining forest health and be at risk substantially increased tree mortality during the next 15 years from insect or disease infestation.

Section 603 establishes a categorical exclusion for qualifying insect and disease projects in designated areas on National Forest System lands. Such projects under this exclusion must be limited to areas within the wildland-urban interface, or if outside the wildland-urban interface, be classified in condition classes 2 or 3 in fire regime groups I, II, or III (defined later in this report).

FSM 5141.1 Hazardous Fuels Management and Prescribed Fire Planning

Overall direction for hazardous fuels management and prescribed fire is provided within the Forest Service Manual (chapter 5100, Fire Management). The directives within the manual provide the basis for implementing hazardous fuels management and prescribed fire projects to meet resource management objectives.

We will meet the direction in FSM 5141.1 by adhering to the resource management objectives during the implementation of any hazardous fuels or prescribed fire project

FSM 5142.8 Smoke Management

In addition to following directives within the Forest Service Manual, we will coordinate prescribed fire program activities with the Forest Service's Pacific Northwest regional air quality specialists and with Federal, State, and Tribal air pollution authorities to ensure compliance with local regulations, as well as those established by the Clean Air Act.

We will meet the direction of FSM 5142.8 by coordinating with Washington State Smoke Management to get clearance for any days we decide to burn.

Colville National Forest Land and Resource Plan

Alternate methods of treatment for activity residues (logging slash) and natural fuels (hazardous fuels) will be addressed in project-level planning and will be commensurate with resource management objectives.

We will meet Colville Nation Forest Land and Resource Plan, Fuel Treatments (page 4-59), by adhering to resource management objectives, national and regional guidelines.

Pend Oreille County and Stevens County Community Wildfire Protection Plans

This project is consistent with the direction of the Pend Oreille County Wildfire Protection Plan and the Stevens County Community Wildfire Protection Plan. All Limestone/Silver treatment units fall within rural wildland-urban interface designations as described in the Pend Oreille County and Stevens County Wildfire Protection Plans. The counties developed the wildland-urban interface boundaries by calculating population densities and the presence of buildings and other structures with the proximity to undeveloped natural areas.

Information Sources

- Multiple peer-reviewed journals, professional publications, management guidebooks, and professional literature were referenced.
- Fire modeling/Fire Regime Condition Class classification was completed by the Colville National Forest and is based on a combination of Landfire data, LiDAR, local experience, and ground-truthing of data.
- A meeting was held Nov. 17, 2016 to begin the collaboration process with interested and affected parties, including local elected officials, landowners with property in or adjacent to the project area, interested private groups, and state and federal agencies. A follow-up meeting was held Dec. 5, 2016.

Fire Regime and Fire Regime Condition Class

Fire regime is the general role wildfire would play across a landscape in the absence of modern human intervention (Agee 1993). Fire regimes have been defined in terms of fire frequency, severity, stand effects, landscape spatial patterns, and season of occurrence. However, fire frequency and severity are the most common traits studied by ecologists and used by land managers.

Fire behavior and vegetation response is classified into three broad categories based on the severity of the fires characteristic to that regime. These categories are *low*, *mixed* (or moderate), and *high severity* fire regimes. Site productivity and fire frequency, or the amount of time between fire events, also plays an important role in the fire regime. In essence, higher site productivities and longer fire frequencies generally allow for more closed canopy conditions because the infrequency of fire allows for more uninterrupted vegetative growth. In contrast, marginal growth sites with shorter fire frequencies contribute to open forest canopy conditions as repeated fires further regulate the amount of vegetation in an already limited growth environment.

High frequency, low severity fire regimes (Fire Regime 1) are those with a relatively short fire return interval (less than 35 years) and low fireline intensity. These fires have little effect on soil heating or overstory vegetation. Typically, 90 percent or more of overstory vegetation survives this kind of fire (Morgan et al. 1996). In this regime, surface fuels typically carry fire and only litter, herbaceous material, foliage and woody undergrowth (i.e., “fine fuels”) are consumed. Examples in the Limestone/Silver analysis area include south- and west-facing slopes with an overstory of fire-tolerant ponderosa pine and Douglas-fir, and an understory dominated by low brush, bunchgrasses, and/or rhizomatous graminoids.

Fire exclusion has resulted in increased fuel loads in these stands. With historical fire-return intervals of 5 to 35 years, up to 10 fire cycles may have been eliminated from this ecosystem. Site visits indicate about 75 percent of these stands are currently in a departure from their historical range of variability. Because the biota is adapted to frequent fires, this exclusion has important influences on biodiversity as well as fuel buildups and wildland fire hazards. Fire Regime 1 (high frequency, low severity) occupies a minority of the Limestone/Silver analysis area.

Mixed, or moderate, severity fire regimes (Fire Regime 3) are the most complex fire regimes to categorize, as the fire frequency and fire effects are variable across the landscape. Mixed severity fires are those with an intermediate return interval (35 to 75 years) and have a variable fire severity. Typically, this fire regime produces irregular stand patches and clumps resulting from different fire severities (Agee 1993). At local and landscape scales, mixed severity fire regimes produce spatially uneven mosaics of even-aged stands, where stand replacement severity occurs frequently in small patches (1 to 5 acres) or infrequently in larger patches (5 to 15 acres).

Warm-dry Douglas-fir/ninebark shrub communities have a more frequent, lower severity fire regime with some stand-replacement activity, while cool-moist Douglas-fir/grand fir communities have a less frequent, higher severity fire regime that may have larger patches of stand replacement severity (5 to 15 acres).

Moderate-severity fires kill lodgepole pine, Engelmann spruce, grand fir, western hemlock, young Douglas-fir and western redcedar. Western larch, ponderosa pine, large-diameter Douglas-fir, western white pine, and occasionally western redcedar may tolerate low intensity fires. These micro-sites can serve as refugia for shade-tolerant/fire-intolerant species and are important locales for their establishment and encroachment into drier, upland environments when fire cycles are missed.

Fire Regime 3 (mixed, or moderate, severity) occupies the majority of the Limestone/Silver analysis area. In these areas, we are experiencing a moderate to sometimes dramatic departure (Condition Class 2 and 3) from the historical range of variability. Fire exclusion has resulted in an increase in ladder fuel abundance and continuity. Current conditions indicate an increased vulnerability to uncharacteristic disturbances, such as high severity wildfire.

Mixed to high severity fire regimes (Fire Regime 4) are typically positioned on the landscape where the opportunity for ignition is limited. In the analysis area, shade-tolerant plant communities in moist or wet zones characterize these fire regimes. Western hemlock, western redcedar, and grand fir are common late-successional species in this fire regime and project area. High severity fire regimes often have understories of large down woody material and mesic shrub and herbaceous species. The combined features of the understory generally favor a moist environment for most of the year. Wildfire intervals are infrequent (100 years or more), usually only occuring during droughts. The fires can burn with high intensity because of the high accumulation of unburned fuels. For early spring prescribed burning, these stands can serve as natural firebreaks as fuel moistures tend to stay high even late into the summer. Fire Regime 4 (mixed to high severity) occupies very little of the Limestone/Silver analysis area.

Fire Regime Condition Class (FRCC).

The FRCC is used to describe the degree of departure from historical fire regimes that results from alterations of key ecosystem components, such as composition, structural stage, stand age, and canopy closure. One or more of the following activities may have caused this departure: fire exclusion, high-grade timber harvesting, grazing, introduction and establishment of non-native plant species, insects or disease outbreaks, or other past management activities. Table 3 describes the attributes of each FRCC. The FRCC was determined using stand exam data, Colville National Forest Plant Association Groups imagery, and local historical fire history records. It is important to note that FRCC Landfire data is intended for use as a large-scale planning tool and isn't intended to analyze finite areas within analysis areas; as with vegetation structure and composition, minor changes in slope, aspect, or topographic position can have dramatic effects on the vegetation potential of the landscape.

Table 1. Fire Regime Condition Class Attributes

Condition Class	Attributes
Condition Class 1	Fire regimes are within or near their historical range. The risk of losing key ecosystem components is low. Fire frequencies have departed from historical frequencies (either increased or decreased) by no more than one return interval. Vegetation attributes (species composition and structure) are intact and functioning within their historical range. Small areas of the analysis area are in FRCC 1.
Condition Class 2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components has increased to moderate. Fire frequencies have departed from historical frequencies by more than one return interval, resulting in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape pattern. Vegetation attributes have been moderately altered from their historical ranges. The majority of the Limestone/Silver analysis area is in FRCC 2.
Condition Class 3	Fire regimes have been substantially altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed by multiple return intervals, resulting in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape pattern. Small areas of the analysis area are in FRCC 3.

Anthropogenic Disturbances and Fire History

Major anthropogenic, or human-caused, disturbances within the analysis area include homesteading (land clearing), timber harvesting, mining, and the introduction of noxious weeds. Logging and land clearing has been occurring in the Lost Creek subwatershed since the early 1900s when ranchers and homesteaders cleared tracts of land to raise cattle and crops. Much of the homesteading land was transferred to the Forest Service in the 1930s, where it has since been logged on multiple occasions.

As was the case elsewhere in the Intermountain West, human settlement (mostly of Euro-American descent) often altered the historic fire regime. Natural and human disturbances are important processes that have shaped both forest structure and composition within the Limestone/Silver analysis area. Natural disturbances include fire, insects and diseases, wind, snow, and ice storm events. At the landscape scale, natural disturbances occurred at both regular and irregular intervals with varying degrees of intensity. High severity, low frequency fire regimes favor shade-tolerant and fire-intolerant tree species, such as western redcedar and western hemlock. These species are generally found growing within the more protected draws and cooler, north-facing aspects. Low severity, high frequency fire regimes favor shade-intolerant and fire-tolerant species, such as western larch and ponderosa pine. These species are generally found on the more open ridges and dryer, south-facing aspects.

Harvest methods and removal of timber products from the national forest has changed substantially over time. Early harvest methods (1950s, '60s, and '70s) generally occurred in locations with the highest volume and most easily accessible stands. Harvest prescriptions were primarily designed to produce healthy young stands with shorter rotation ages. As these stands become mature and overmature they become susceptible to blowdown, disease, and overcrowding unless treated.

Fire Exclusion

Although few fires were suppressed at the turn of the 19th century, successful fire suppression began to increase following the Second World War, and since that time, few fires (from natural or anthropogenic sources) have been allowed to burn in or around the analysis area. The majority (more than 75 percent) of the Limestone/Silver analysis area burned in the 1930s.

Since 1931, two significant fires have occurred in this area: the Windy Ridge Fire and the Pend Oreille Fire. Historical research of the area surrounding this watershed indicates large fires were likely a natural occurrence every 15 to 20 years prior to settlement in the early 1900s. Because of fire suppression, fires in this area have been limited to relatively small events. According to our records, 40 fires have started within the project area. With so little acreage burning since 1931, fuel accumulation within the project area is now higher than it would have been had the fires not been suppressed. Given that the fuel loading is higher across the landscape than historical levels, the risk of a larger, more ecologically damaging and costly fire has also increased.

Aerial photographs from the 1930s to 2009 show a trend toward "afforestation," or the establishment of forest cover in areas not previously forested prior to European settlement. This phenomenon is largely from the removal of fire as a recurring disturbance on the landscape (i.e., fire exclusion). Fire exclusion has allowed fuels to accumulate on the forest floor – the duff is thicker and the amount of down wood is probably greater (Smith and Fisher 1997; DeLuca and Sala 2006).

The second major observed effect of fire exclusion is the shift in species composition away from predominantly fire-tolerant species, such as ponderosa pine and western larch, to a substantial increase and co-dominance of fire-intolerant species, primarily western redcedar and grand fir. Many of the high elevation stands are dominated by lodgepole pine and subalpine fir that had colonized after the large fire events in early half of the 20th century and have received little disturbance since.

Wildland-Urban Interface

All lands adjacent to and included in the project area are designated as "Rural Wildland-Urban Interface" within the Pend Oreille and Stevens County Community Wildfire Protection Plans.

Project Design Criteria and Mitigation Measures

The removal of post-harvest fuels by jackpot, pile, and/or underburning are proposed for up to 2,995 acres of post-harvest activity acres. The treatment of these fuels post-harvest will help move Fire Regime Condition Classes away from their current departed condition of Classes 2 and 3 toward a more historical Class 1 condition. This would result in stands becoming more fire-tolerant and resilient to wildfire.

In the case of a large, stand-replacing wildfire in or near the analysis area, it may become necessary to establish a primary or secondary holding feature along previously treated harvest units, fuel treatment areas, roads, or geographic features. If this were to happen, it would most likely be necessary to treat the fuels right up to the road edge before they could be effective as a holding and/or ignition point.

In general, units prescribed for jackpot burning and underburning contain a high percentage of fire-tolerant residual trees, such as western larch, ponderosa pine and Douglas-fir, while units prescribed for mechanical slash treatments contain a high percentage of residual fire-intolerant species, such as lodgepole pine, western redcedar, western hemlock, and grand fir. Prescribed fire might not be used in harvest units that consist of predominantly shade-tolerant trees, where overstory tree morality would be expected to exceed 10 percent.

Fire and Fuels managers would coordinate with Forest and District specialists prior to fuel treatments and fire line placements in order to minimize impacts or completely avoid sensitive areas.

Direct and Indirect Effects

Effect on Fire Regime Condition Class (FRCC)

The removal of post-harvest fuels by jackpot, pile, and/or underburning are proposed for up to 2,995 acres. The direct effects of these treatments will be the reduction of post-harvest fuels, moving Fire Regime Condition Classes away from their elevated conditions toward milder, more historical levels. Potential adverse effects of the proposed action would be the escape of a controlled fire, which would then become an uncontrolled wildfire. To mitigate or reduce this likelihood, the type of burning treatment would be tailored to the appropriate landscape. For example, in units containing a majority of fire-intolerant trees, pile-burning would be done to isolate flames and heat (as opposed to underburning, which would give fire more breadth to travel).

Any and all prescribed fires would adhere to agency standards set forth in Forest Service Manual chapter 5100 (fire management). These directives present protocols for assessing factors such as weather, topography, and fuel type to determine when it is reasonably safe to burn.

Another indirect effect of the proposed actions would be the creation of smoke and the potential adverse effects to air quality and human health. Proper planning and timing, though, can greatly minimize the concentration of smoke and its effects on human health (Long et al 2017). Forest Service Manual chapter 5142.8 specifically addresses ways to manage smoke from prescribed fires. These methods include but are not limited to: increasing combustion efficiency, burning when smoke dispersal is favorable, and reduction of fuels pre-burn. Fuel treatments might have a long-term positive effects on air quality by reducing the amount of smoke potentially generated during a severe wildfire (Long et al 2017).

Effects of Fuels Treatments on the Residual Overstory

Fuels reduction through burning should result in a more open overstory and subsequent understory composed of a greater diversity of hardwoods, shrubs, forbs and grasses. Overall, this treatment would be beneficial because it would minimize encroachment and accumulation of shade-tolerant species, while promoting a more fire-tolerant overstory. Historically, wildfires burned on the drier sites every 15 to 20 years, in patches ranging from 200 to 500 acres (Shellhaas 2000). With 70 to 80 years of fire exclusion, it may require several mechanical and/or prescribed fire treatments to successfully restore this project area to its historical Fire Regime Condition Class.

It is anticipated the cutting treatment would provide a moderate modification by introducing gaps or openings into the overstory canopy. Grapple piling and subsequent pile burning also would result in a substantial reduction in surface fuels and ladder fuels. Shelterwood with reserves, accompanied by mechanical fuel piling and burning treatments, would remove about half of the canopy cover, thereby

affectively reducing crown fire potential in the project area. Non-merchantable trees would be cut/slashed by hand, and these residual fuels would likely be piled and burned.

The intent of proposed activities is not to eliminate the disturbances caused by insects, disease, or fire on the landscape, but to reduce high severity attacks. Treatments have the potential to help prevent fires from either growing to catastrophic levels or from spreading onto adjacent landowners' property, threatening lives and structures.

Compliance with LRMP and Other Relevant Laws, Regulations, Policies, and Plans

FSM 5140.2; Hazardous Fuels Management and Prescribed Fire

Objective 1 in FSM 5104.2: Understand the role of fire on the landscape in order to integrate fire as a critical natural process into land and resource management plans. Develop achievable and sustainable…fuel projects in order integrate fire, as a critical natural process, into Land and Management Plan (LRMP) objectives that provide for landscapes which are resilient to fire related disturbances and climate change.

We are meeting objective 1 in Limestone/Silver by planning and implementing up to 2,995 acres of fuel projects that will introduce fire back into the landscape and reduce fuels associated with post-harvest activities.

Objective 2 in the FSM5104.2, In cooperation with partners, strategically plan and implement a landscape-scale, risk-informed, and cost-effective hazardous fuel modification and vegetation management treatment (wildland and prescribed fire, mechanical manipulation, biological and chemical) to attain management objectives identified in the Land and Resource Management Plans, to protect, sustain, and enhance resources, and where appropriate, emulate the ecological role of natural fire.

We are meeting objective 2 in the FSM 5104.2 by strategically planning and implementing 2,883 acres of hazardous fuels treatments that protect, sustain, and enhance resources. The hazardous fuels units are strategically located in areas that could aid in the support of wildfire suppression and protection of public and private resources.

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