United States Department of Agriculture
Forest Service

Fire Ecology Report

Colville National Forest Plan Revision
Draft Environmental Impact Statement

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Table of Contents

Fire Ecology Report ... 1
Introduction ... 1
Revision Topics Addressed in this Analysis ... 1
Relevant Laws, Regulations and Policy that Apply ... 1
Affected Environment ... 2
Fire Regime Condition Class ... 10
Need for Change ... 13
Old Forest Management and Timber Production ... 13
Access ... 13
Recommended Wilderness Areas ... 14
Environmental Consequences ... 14
Methodology ... 14
Assumptions ... 16
Spatial and Temporal Context for Effects Analysis ... 16
Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis ... 16
Summary of Effects ... 17
Alternative 1 – No Action ... 18
Summary of Effects ... 19
Monitoring Recommendations ... 20
Alternative 2 – Proposed Action ... 21
Summary of Effects ... 21
Alternative B ... 23
Summary of Effects ... 23
Monitoring Recommendations ... 25
Alternative O ... 26
Summary of Effects ... 26
Monitoring Recommendations ... 27
Alternative P ... 28
Summary of Effects ... 28
Monitoring Recommendations ... 30
Alternative R ... 30
Summary of Effects ... 30
Monitoring Recommendations ... 32
Acronyms ... 32
Glossary ... 32
References ... 33

List of Tables

Table 1. Historic vs. Current Fire Return Interval ... 6
Table 2: Fire regime groups by vegetation type for the Colville National Forest ... 11
Table 3. Current Conditions by Vegetation Type ... 12
Table 4. Twenty-year predicted average fire regime condition class percent departure by forest type and alternative ... 17
Table 5. Acres Unsuitable for Mechanical Treatment within the WUI, by Alternative ... 18
Table 6. No Action Alternative Predicted Departure by Vegetation Type ... 19
Table 7. Proposed Action Alternative Predicted Departure by Vegetation Type ... 21

DRAFT

Table 8. Alternative B Predicted Departure by Vegetation Type..... 23
Table 9. Alternative O Predicted Departure by Vegetation Type 26
Table 10. Alternative P Predicted Departure by Vegetation Type 28
Table 11. Alternative R Predicted Departure by Vegetation Type..... 30

List of Figures

Figure 1. Communities within Vicinity of Federal Lands That Are at a High Risk from Wildfire and Areas currently covered by Community Wildfire Protection Plan..... 4
Figure 2 Contemporary fire history for the Colville National Forest..... 6
Figure 3: Natural range of variation for vegetation structure states in the Douglas-fir dry type..... 7
Figure 4: Natural range of variation for vegetation structure states in the subalpine fir/lodgepole pine type 8
Figure 5: Natural range of variation for vegetation structure states in the northern rocky mountain mixed conifer type..... 9
Figure 6: Natural range of variation for vegetation structure states in the western redcedar/western hemlock type 9
Figure 7: Natural range of variation for vegetation structure states in the spruce / subalpine fir type 10

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Introduction

This report evaluates and discloses the potential environmental consequences related to the disturbance process of fire that may result with the adoption of a revised land management plan. It examines, in detail, six alternatives for revising the 1988 Colville National Forest land management plan.

Revision Topics Addressed in this Analysis

The indicators listed for each revision topic are to be used to evaluate each management issue and to display the variations between the alternatives.

Relevant Laws, Regulations and Policy that Apply

Clean Air Act (USC 7401) of 1970, as amended: Forms a basis for the US air pollution control effort.

Clean air act of Washington (RCW 70.94) Mandates the Washington Department of Environmental Quality to protect Washington citizens from Air Pollution and gives state regulations for prescribed burning and smoke.

Healthy Forest Restoration Act of 2003: Aimed at expediting the preparation and implementation of hazardous fuels reduction projects on federal land; encouraging collaboration between federal agencies and local communities; requiring courts to balance effects of action versus no-action prior to halting implementation; and requires federal agencies to retain large trees under certain conditions.

"Urban Wildland Interface Communities within the Vicinity of Federal Lands That Are at High Risk From Wildfire" Federal Register Vol. 66, No. 3, 2001: List of communities in the vicinity of federal lands that are at high risk from wildfire.

Forest Service Manual 5142: Provides direction on using fire to accomplish land and natural resource objectives.

Forest Service Handbook 5109: Provides direction for fire managers.

National Fire Plan, August 2000: Outlines a plan of action for federal agencies in order to protect wildland-urban interface and be prepared for extreme fire conditions.

Federal Wildland Fire Management Policy of 1995 (updated January 2001): Guides the philosophy, direction, and implementation of fire management on federal lands.

2002 President's Healthy Forest Initiative: Emphasizes administrative and legislative reforms to expedite fuels treatments and post-fire rehabilitation actions.

Healthy Forests Restoration Act of 2003: Contains provisions aimed at expediting the preparation and implementation of hazardous fuels reduction projects on federal land.

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Interagency Prescribed Fire Planning and Implementation Procedures Guide, November 2013: Provides standardized procedures, specifically associated with the planning and implementation of prescribed fire.

Guidance for Implementation of Federal Wildland Fire Management Policy, February 13, 2009: Guidance for consistent implementation of the 1995/2001 Federal Fire Policy. This guidance includes the following:

- Planned ignitions – the intentional initiation of a wildland fire by hand-held, mechanical, or aerial device where the distance and timing between ignition lines or points and sequence of igniting them is determined by environmental conditions (weather, fuel, topography), firing technique, and other factors which influence fire behavior and fire effects (also known as prescribed fire).
- Unplanned ignitions – the initiation of a wildland fire by lightning, volcanoes, unauthorized and accidental human-caused fires (also known as wildfire).
- A wildland fire may be concurrently managed for one or more objectives and objectives can change as the fire spreads across the landscape. Objectives are affected by changes in fuels, weather, topography; varying social understanding and tolerance; and involvement of other governmental jurisdictions having different missions and objectives.
- Managers will use a decision support process to guide and document wildfire management decisions. The process will provide situational assessment, analyze hazards and risk, define implementation actions, and document decisions and rationale for those decisions.

Interagency Standards for Fire and Fire Aviation Operations (Red Book): USDA Forest Service Wildland Fire and Aviation Program Organization and Responsibilities: A reference guide that documents the standards for operational procedures and practices for the Forest Service fire and aviation management program.

Colville National Forest Fire Management Plan, 2014: Provides information concerning the fire process for the Colville National Forest and complies guidance from existing sources such as, but not limited to, the Colville National Forest Land and Resource Management Plan, national policy, and national and regional directives.

Smoke Management Guide for Prescribed and Wildland Fire, 2001: Provides guidance on understanding and application of smoke management.

Affected Environment

National Fire Policy and Wildland Urban Interface

Fire managers have been faced with increasing costs, urban development, and unprecedented fire behavior. Decades of government policy directed at extinguishing every fire on public lands have contributed to the disruption of natural fire processes. In response to these issues, several changes in national fire policy have emerged over the past two decades.

The current Federal Wildland Fire Management Policy was signed in 1995 and updated in 2001. The Federal Wildland Fire Management Policy guides the philosophy, direction, and implementation of fire management planning, activities, and projects on federal lands. The policy helps ensure consistency, coordination, and integration of wildland fire management programs and related activities throughout the federal government.

On August 8th, 2000, the President directed the Secretaries of the Department of Agriculture and the Department of the Interior to prepare a report recommending how best to respond to that year's severe fires, reduce the impacts of those fires on rural communities, and ensure sufficient fire management resources in the future. On September 8th, 2000, the President accepted their report, "Managing the Impacts of Wildfires on Communities and the Environment," which provided an overall framework for fire management and forest health programs (66 FR 751-777).

These recommendations initiated a number of policies including the National Fire Plan, the Healthy Forests Initiative (HFI), long-term stewardship contracting authority, and the Healthy Forests Restoration Act (HFRA). These policies led to the preparation of Community Wildfire Protection Plans (CWPPs) to define the wildland-urban interface (WUI) and to establish priorities for wildfire preparedness and hazardous fuels reduction work in these areas.

The wildland-urban interface, commonly referred to as WUI, exists where humans and infrastructure intermix with wildland fuels. There are 17 communities within 10 miles of the Colville National Forest boundary that have been identified both as communities at risk by County CWPPs and identified as "Urban Wildland Interface Communities with the Vicinity of Federal Lands That Are at High Risk from Wildfire" (Federal Register Vol. 66 No. 160). They include: Addy, Chewelah, Colville, Curlew, Cusick, Danville, Ione, Kettle Falls, Laurier, Malo, Marcus, Metaline, Metaline Falls, Newport, Orient, Republic, and Usk. In addition, the County CWPPs also list communities at risk that are not included on the Federal Register. They include: Alladin, Arden, Barstow, Bluecreek, Boyds, Clayton, Daisy, Dalkena, Diamond Lake, Echo, Evans, Furport, Loon Lake, Marble, Northport, Onion Creek, Orin, Toroda, Valley, and Waitts. While the CWPP listed communities that are not included on the Federal Register list will not have treatments reported in the Forest Service Activity Tracking System (FACTS), projects on the forest would continue to benefit these communities by reducing wildfire risk along the forest boundary near these communities. The entirety of Ferry, Stevens, and Pend Oreille counties were analyzed and included in each county's CWPP. See Figure 1 below.

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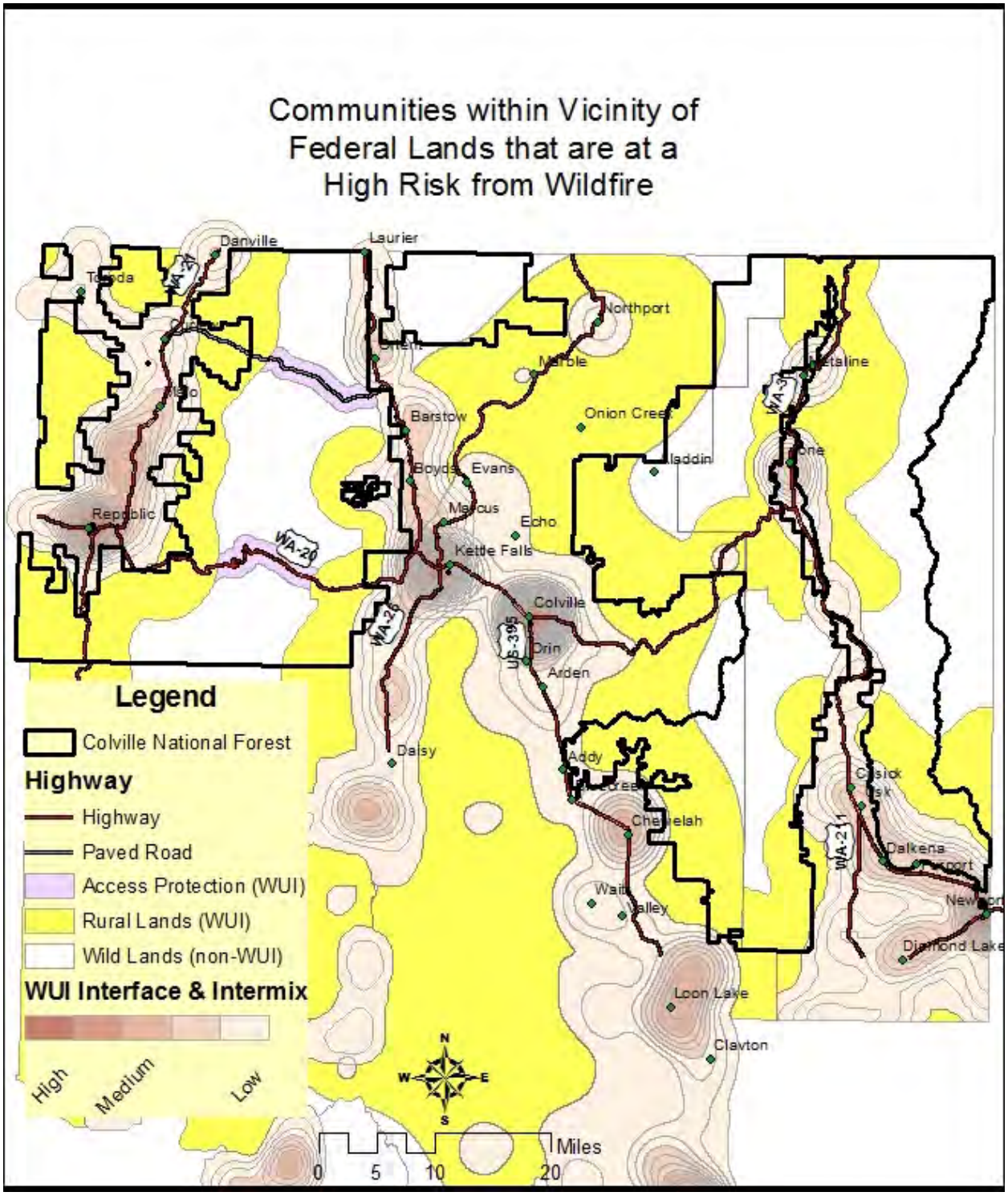

Figure 1. Communities within Vicinity of Federal Lands That Are at a High Risk from Wildfire and Areas currently covered by Community Wildfire Protection Plan

Fire History and Behavior

For the purposes of this planning effort, the Colville NF is grouped into five broad forest types. These groupings are based on potential vegetation and response to disturbance, particularly fire. All five types can be categorized as forested conifer systems, with elevation, aspect, and moisture determining the species.

Disturbance in general and fire in particular plays a critical role in shaping and maintaining forested ecosystems. The manner in which fire behaves in a system both historically and contemporarily can be described in terms of two key metrics: frequency and severity. Fire frequency is measured and reported here as mean fire return interval (MFRI). Both historic and current mean fire return intervals are noted in each description below. Historic, or natural fire return intervals and severity are used as a point of comparison as they represent the levels with which natural, functioning ecosystems develop and persist. For the purpose of this analysis, mean fire return interval refers to the how often (on average) a given vegetation type would have fire move across its entirety. For example, historically, fire burned across all dry Douglas Fir stands approximately every 40 years, therefore this vegetation type is noted as having a historic mean fire return interval of 40 years. Given current fire suppression and the rate of prescribed fire being used, it would take 188 years for fire to burn across all dry Douglas Fir stands on the Colville National Forest, and is noted as having a current fire return interval of 188 years. It is important to note that the natural fire return interval and associated severity is quite different for each vegetation type. Table 1 summarizes current and historic fire return intervals for each vegetation type. A description of how current fire return intervals were determined can be found in the Environmental Consequences section. Figure 2shows total acres burned for each forest type on the Colville National Forest for contemporary period.

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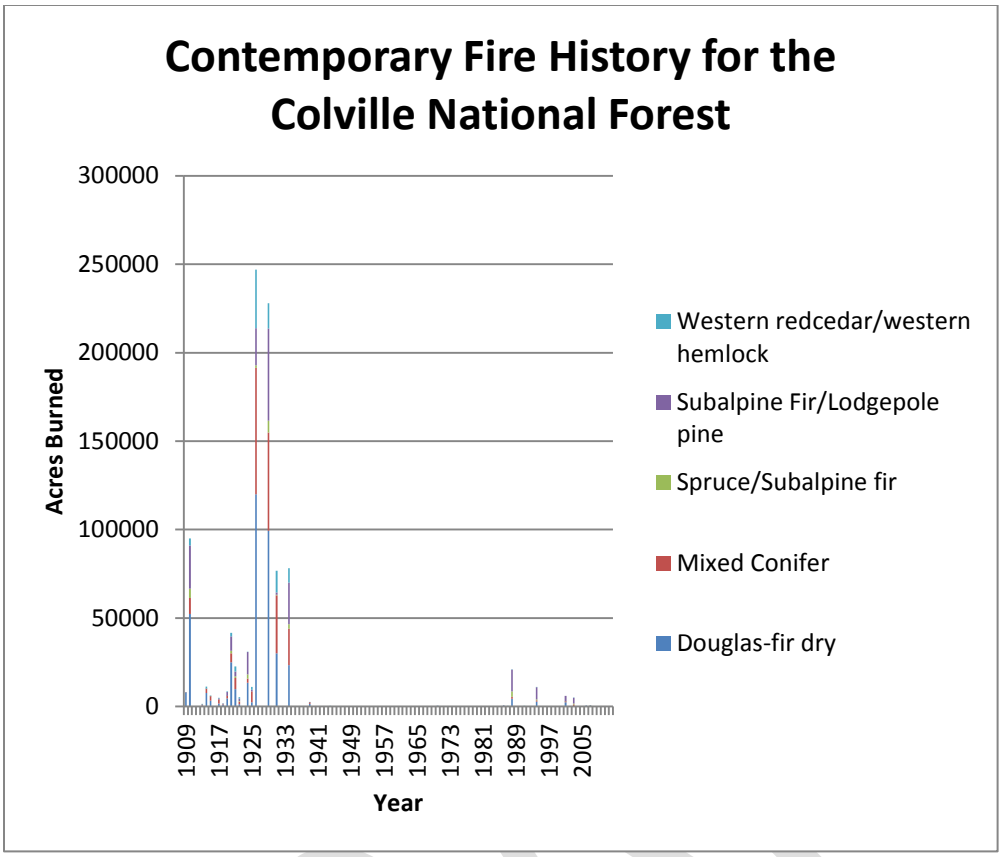

Figure 2 Contemporary fire history for the Colville National Forest.

Table 1. Historic vs. Current Fire Return Interval

Vegetation Type	Historic Fire Return Interval	Current Fire Return Interval
Dry Douglas Fir	40	188
Subalpine Fir/Lodgepole	225	225
Mesic Mixed Conifer	50-150	233
Western Red Cedar/Western Hemlock	200	200
Spruce/Subalpine Fir	150	218

The vegetation type's historic fire return interval is largely driven by the same environmental factors that determine dominant vegetation, namely climate, elevation, and soil type.

Across much of the lower elevations of the forest, sites are occupied by dry Douglas Fir stands which were historically characterized by frequent, low intensity fires. Within these stands, late forest structure was historically represented by both open canopy (<40% canopy cover) and closed canopy (>40% canopy cover) large and very large trees. Historically the dry Douglas Fir vegetation type would have supported 38-78% of the stands were classified as Late Development Open, with 1-32% classified as late development closed. Mid development open stands occurred across 2-8% of this vegetation type, and 4-13% was classified as mid development closed. These stand characteristics were developed and maintained by frequent surface fires in the mid-open and late-open structures that kill seedlings/saplings and prevented widespread closed canopy

conditions. Surface fires in the limited mid development closed stands were historically rare, and given the surface fuel build up most fire in the closed stands burned with mixed severity, which would transition the stands to mid-development open. With regular fire return intervals, mid-open stands would transition to late-open stands. Late-open conditions would continue while frequent fire intervals persisted. Missing fire returns would allow for establishment of younger cohorts of understory trees and transition stands to a late-closed condition. Late-closed conditions in the dry Douglas Fir type are important features on the landscape, however widespread closed canopy systems are prone to large scale stand replacing fire events that were not historically widespread in this system and are detrimental to ecosystem health and integrity. The historic mean fire return interval in this forest type was approximately 40 years and in the northern ranges younger age/size classes may be more extensive owing to larger and more frequent mixed or stand replacement fires. This type is extensive on the Colville National Forest, but has not been captured adequately in previous mapping projects (LANDFIRE Biophysical Setting Model Descriptions). Figure 3 displays the natural range of variation for stand structure that historically persisted in the Douglas-fir dry type. This forest type has a current mean fire return interval of 188 years, meaning that fire is not currently playing its natural role in this system. This increase in fire return interval has led to unnatural amounts of mid-development closed stands across the vegetation type putting the system at risk for uncharacteristically severe fire events.

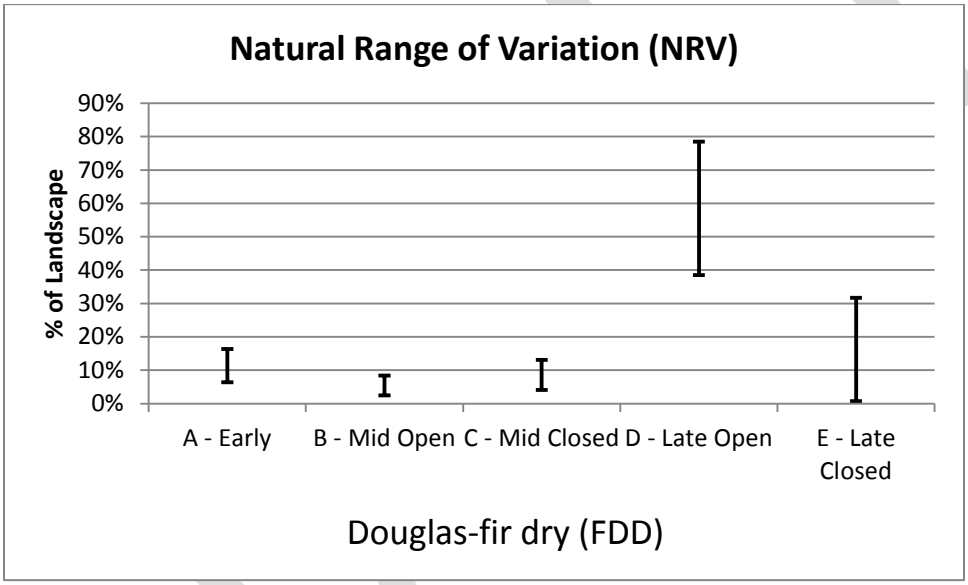

Figure 3: Natural range of variation for vegetation structure states in the Douglas-fir dry type

At higher elevations along the Kettle Crest, subalpine fir/lodgepole pine stands are the dominant vegetation. These subalpine fir/lodgepole stands were historically characterized by a long fire return interval (>225 years) and historically supported primarily stand replacing fire events. Within subalpine fir/lodgepole pine stands, historic conditions had only 2% of this vegetation type in late development closed canopy conditions, and typically did not support late development open canopy stands, due to high severity fire being the dominant disturbance regime. Historically, 33-53% of the stands would have been in mid development closed canopy conditions, with 45-65% in early development. Mid and late forest structure in this vegetation type would persist until fire occurrence (naturally stand replacing), and would revert to early development. Figure 4 displays the natural range of variation for stand structure that historically persisted in the subalpine fir/lodgepole type. The current mean fire return interval in this vegetation type is 225 years indicating that fire is currently occurring at natural levels.

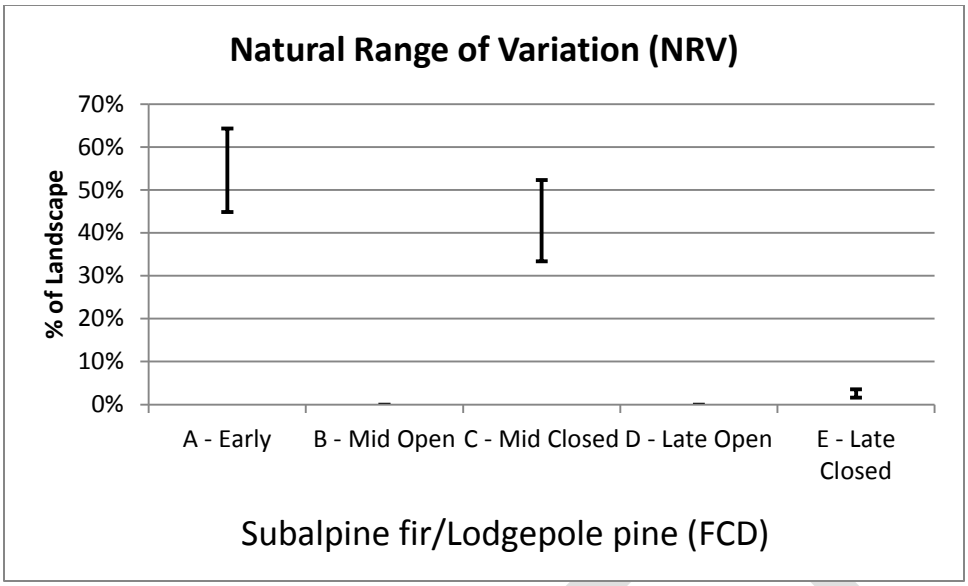

Figure 4: Natural range of variation for vegetation structure states in the subalpine fir/lodgepole pine type

East of the Columbia River at mid-elevation and higher, northern rocky mountain (mesic) mixed conifer stands dominated the landscape. This vegetation type naturally supported primarily mixed severity fire with a 50-150 year return interval creating a mosaic of mid and late development closed canopy stands and small, patchy open canopied stands. Open canopied stands would historically regrow into closed stands quickly (<30years) due to recruitment and canopy infill therefore the location of open canopy conditions shifted across the landscape through time. Within these mixed conifer stands late development open stands historically occurred across only 4-6% of this vegetation type, while 44-60% of the stands would have represented late development closed conditions. Mid development open was considered to be 1-3%, and 18-30% was classified as mid development closed. Early development stands accounted for 9-25% of the vegetation type. Figure 5 displays the natural range of variation for stand structure that historically persisted in the northern rocky mountain mixed conifer type. Fires were mostly mixed severity with a 50-150 year frequency. Current mean fire return interval is 233 years indicating that fire levels are less frequent than historic levels and fire is not currently playing its natural role in shaping the landscape.

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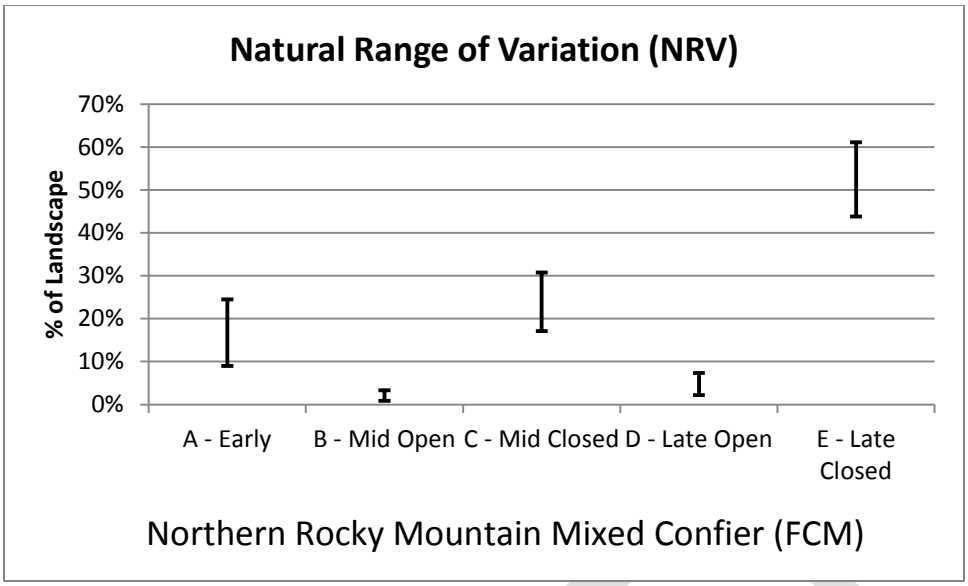

Figure 5: Natural range of variation for vegetation structure states in the northern rocky mountain mixed conifer type

Scattered through drainages east of the Kettle Crest, western red cedar/western hemlock stands were the dominant vegetation. Within western red cedar/western hemlock stands, historically 55-83% of stands were in late development closed conditions, with no late development open stands. High severity fire occurred approximately every 200 years, reverting late development stands to early development, which occupied 4-24% of vegetation type. Mid development closed stands occurred on 7-27% of the landscape. There was historically no mid development open stands. Figure 6 displays the natural range of variation for stand structure that historically persisted in the western redcedar/western hemlock type. This forest type had longer fire return intervals, approximately 200 years, with high severity fire. This forest type is still within range of its historic mean fire return interval indicating that fire is playing its natural role in shaping and maintaining this system.

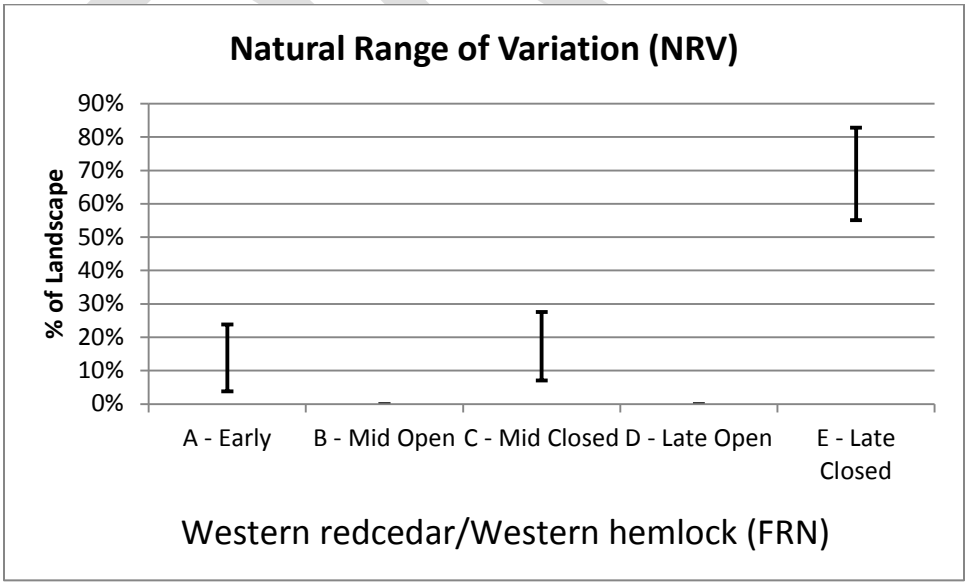

Figure 6: Natural range of variation for vegetation structure states in the western redcedar/western hemlock type

Spruce/subalpine fir stands occupied drainages at higher elevations along the Kettle Crest, and in some limited areas of the Kaniksu Mountains. Spruce/subalpine fire stands historically had 29-57% of stands in the late development closed condition, with no late development open stands. 13-41% of the vegetation type was in mid development closed canopy conditions, and 14-46% in early development. Figure 7 displays the natural range of variation for stand structure that historically persisted in the spruce/subalpine fir type. Replacement fire historically occurred every 150 years. The current mean fire return interval in this forest type is 218 years indicating that fire is occurring less frequently than necessary to shape and maintain this system.

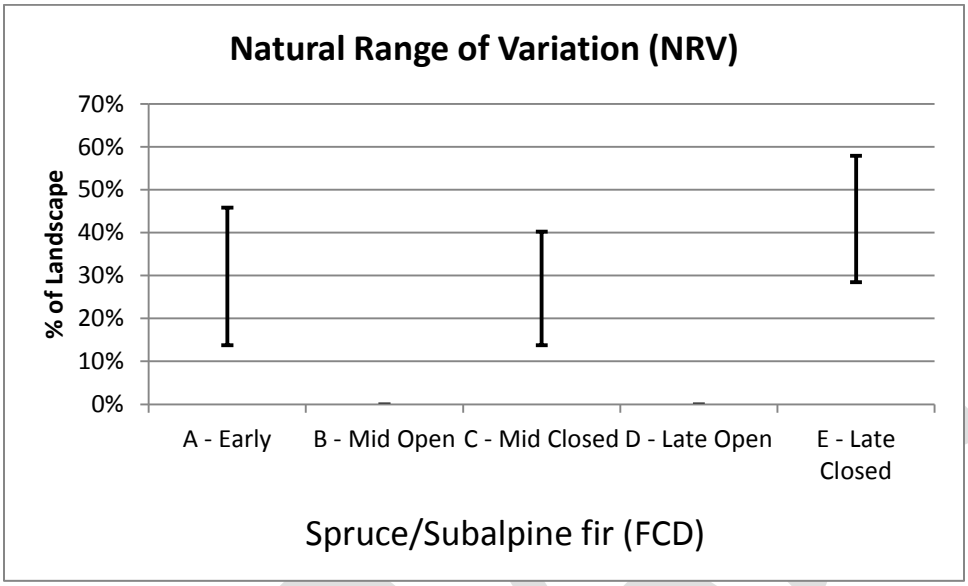

Figure 7: Natural range of variation for vegetation structure states in the spruce / subalpine fir type

Prior to euro-American settlement, fires would burn naturally until they were extinguished by precipitation, ran out of fuel, or reached a previously burned area. Over a century of fire suppression practices have impacted the ability of fire to play its natural role across the Colville NF. Fire frequency and severity has been altered from historic condition in most vegetation types contributing to shifts in vegetative conditions outside the natural range of variation and in places creating conditions susceptible to uncharacteristic fire events.

On the Colville NF, fire season is generally June 1 to October 1. The potential for lightning is most likely during this period as temperatures begin to climb and relative humidity values are low. From 2000 to 2014 the majority (85%) of fire starts on the Colville NF were caused by lightning, with an average of 20 fires starts per year. The remaining fires (15%) were caused by equipment, smoking, campfires, arson, or miscellaneous causes. All fires on Colville NF land during this timeframe took place between the months of April and October. During this time over 47,000 acres have burned on the Colville NF with 30% of the burned area coming from unplanned ignitions.

Fire Regime Condition Class

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but it includes the influence of aboriginal burning (Agee 1993). Fire regimes are described in terms of fire frequency and severity. Coarse-scale definitions for natural fire regimes have been developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001) and Hann et al. (2008). The five natural fire regime groups are classified based on average number of years

between fires (fire frequency) combined with the severity of the fire on the dominant overstory vegetation. These five regimes are:

Fire Regime Group I – 0-35 year frequency and low (surface fires most common) to mixed severity (less than 75 percent of the dominant overstory vegetation replaced);

Fire Regime Group II – 0-35 year frequency and high (stand replacement) severity (greater than 75 percent of the dominant overstory vegetation replaced);

Fire Regime Group III – 35-100+ year frequency and mixed severity (less than 75 percent of the dominant overstory vegetation replaced);

Fire Regime Group IV – 35-100+ year frequency and high (stand replacement) severity (greater than 75 percent of the dominant overstory vegetation replaced;

Fire Regime Group V – 200+ year frequency and high (stand replacement) severity.

All fire regimes are represented across the forest, though Fire Regime V is present only in isolated patches. Table 2 shows the fire regime groups for each vegetation type on the Colville National Forest.

Table 2: Fire regime groups by vegetation type for the Colville National Forest

Vegetation Type	Fire Regime Group	Historic Frequency	Historic Severity
Douglas-fir dry	**Fire Regime Group I**	40 years	Surface
Subalpine fir / Lodgepole pine	**Fire Regime Group IV**	>225 years	Replacement
Northern Rocky Mountain Mixed Conifer	**Fire Regime Group III**	50-150 years	Mixed-Severity
Western Redcedar / Western Hemlock	**Fire Regime Group V**	>200 years	Replacement
Spruce / Subalpine fir	**Fire Regime Group IV**	150 years	Replacement

Fire Regime Condition Class (FRCC) is a metric that quantifies how departed a system is from historical conditions in relation to fire, the role fire historically played in that system, and vegetative structure (Hann and Bunnell 2001, Hardy et al. 2001, Hann et al. 2008). FRCC is an estimate of the departure from the natural fire regime. FRCC assessments measure departure in two main components of ecosystems: 1) fire regime (fire frequency and severity) and 2) by comparing the abundances of each seral stage (by potential vegetation type) to historical amounts. There are three classes of FRCC, based on low (FRCC 1), moderate (FRCC 2), and high (FRCC3) departure from the central tendency of the natural fire regime structure (Hann and Bunnell 2001, Hardy et al. 2001, Barrett et al. 2010). FRCC 1 is considered to be within the historic range of fire regimes, while FRCC 2 and FRCC 3 are outside the range. While fire rates and severity play a role in determining FRCC, vegetation structure plays an equal role. Changes and manipulation of structural stages on the landscape through means other than fire (e.g. commercial harvest, mechanical fuels reduction, insect and disease outbreaks, etc.) play an equal role in determining FRCC.

In FRCC 1(<33% departure), there is little to no departure from the historic range. Vegetation composition, structure, and fuels are similar to those of the historic regime and do not pre-dispose

the system to risk of loss of key ecosystem components. Wildland fires are characteristic of the historical fire regime behavior, severity, and patterns, being departed from historical frequencies by no more than one return interval.

In FRCC 2(33-66% departure) vegetation composition, structure, and fuels have moderate departure from the historic regime and pre-dispose the system to risk of loss of key ecosystem components. Wildland fires are moderately uncharacteristic compared to the historical fire regime behaviors, severity, and patterns, being departed (either increased or decreased) from historical frequencies by more than one return interval. This results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns (Hardy et al, 2001).

In FRCC 3(>66% departure) vegetation composition, structure, and fuels have high departure from the historic regime and predispose the system to high risk of loss of key ecosystem components. Wildland fires are highly uncharacteristic compared to the historical fire regime behaviors, severity, and patterns. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns (Hann and Bunnell 2001, Hardy et al. 2001).

A Fire Regime Condition Class analysis of Forest lands was completed using the Fire Regime Condition Class Software Application. See Methodology under Environmental Consequences for a full description of model inputs, assumptions, and limitations.

Currently, much of the Colville National Forest has some degree of departure from historic conditions as a result of past fire and timber management. Because of these departed conditions, fire does not currently play its historic role across much of the landscape, and as a result, the Colville is at risk of losing key ecosystem components such as soil quality, large trees, and habitat.

Table 3. Current Conditions by Vegetation Type

Vegetation Type	*Landfire Biophysical Setting*	*Acres*	*Avg Departure*	*FRCC*	*VCC*	*Frequency Departure*	*Severity Departure*
Douglas-fir dry	1010451 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Ponderosa Pine – Douglas-fir	486045	71	3	2	89%	87%
Subalpine fir / Lodgepole pine	1010452 – Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Larch	173699	35	1	1	6%	47%
Northern Rocky Mountain Mixed Conifer	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	308365	51	2	2	66%	45%
Western Redcedar / Western Hemlock	1010471 - Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (95%) / 1010472 - Northern Rocky Mountain Mesic Montane Mixed Conifer Forest -	95820	53	2	2	66%	45%

Vegetation Type	*Landfire Biophysical Setting*	*Acres*	*Avg Departure*	*FRCC*	*VCC*	*Frequency Departure*	*Severity Departure*
	Cedar Groves (5%)						
Spruce / Subalpine fir	1010560 - Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (90%) / 1011610 - Northern Rocky Mountain Conifer Swamp (10%)	20240	26	1	1	1%	44%

Need for Change

Old Forest Management and Timber Production

In the revision of the Forest Plan, three broad-scale concerns drove the need to consider how we address old forest management, especially the current reserve system approach at the landscape scale. These are:

- Contemporary fire rates and severity are not in line with historic ranges for many vegetation types. In the Douglas-fir dry type, a lack of frequent, low severity fire and contemporary/historic vegetation management has led to fuel accumulation and stand structure that is conducive to large, stand replacing fire events that were not historically common. Likewise, a lack of mixed severity and stand replacing fire in systems that were historically maintained by them along with contemporary forest management practices has led to an imbalance of structure states. Projected impacts from climate change have the potential to interact with and increase uncharacteristic levels of disturbance. This elevates the importance of restoring landscape resiliency.

There is an additional concern for at risk stands that contribute to late forest structure because these stands typically have heavy fuel accumulation and dense canopies, both of which increase potential for fire transmission and spread. While stand replacing fire is not uncharacteristic in many of the vegetation types on the Colville, the potential for high severity fire in late forest structure is particularly concerning because the forest has considerably less old forest and associated habitat on the landscape than would have historically occurred. This lack of landscape redundancy in late forest structures means that even moderate acreage of loss due to fire events would further exacerbate the imbalance of forest structures.

Access

Three broad concerns drove the need to address road density:

1) current funding is not sufficient to properly maintain the existing road system at current operational maintenance levels,
2) the current road system is not aligned with current and future resource management objectives, and

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3) the existing road management direction is confusing and difficult to follow because it is scattered throughout current Forest Plan (Colville National Forest Land and Resource Management Plan), Forest Plan amendments (East-side Screens, Interim Inland Native Fish Strategy for the Intermountain, Northern, and Pacific Northwest Regions [INFISH, USDA Forest Service 1994c and 1995]), national-level decisions (the Roadless Rule), and interim policy (e.g., Grizzly Bear No-Net-Loss, Lynx Agreement, the Interior Columbia Basin Strategy).

In addition, access to wildfires and fuel treatment locations continues to be a concern. As road density increases or decreases, response time to wildfires would change accordingly. Costs for fuel treatments would also change depending on the level of access.

Recommended Wilderness Areas

By law, all National Forest System lands must be evaluated for possible wilderness recommendation during the plan revision process. The result of that evaluation shows whether a need exists for additional wilderness and what trade-offs may exist if the area is eventually designated part of the National Wilderness Preservation System.

Currently, the Salmo-Priest Wilderness covers about 3 percent of the Colville National Forest and evaluation showed a need for additional wilderness opportunities on the Forest. A review of possible areas showed some are available to fill this need.

Environmental Consequences

Methodology

This analysis examines how the plan alternatives address the risk of uncharacteristic wildfire and how well they contribute to returning wildfire to a more natural role. This is done by comparing the existing Fire Regime Condition Class (FRCC) with the projected FRCC for each alternative to determine the percent of how well each alternative contributes to moving the forest that would move towards desired conditions. Analysis results are shown by Average Departure presented as expected FRCC by alternative with a percentage change (increase or decrease in departure from historic conditions) noted for each alternative. , which is the amount of departure in percent from historic conditions. FRCC 1 is less than 33% departed, FRCC 2 is 33-66% departed, and FRCC 3 is greater than 66% departed from historic conditions.

All alternatives use mechanical and fire treatments to reduce fuel loads and tree densities, thus reducing the risk of uncharacteristic wildfires which pose threats to ecosystems and communities. However, some alternatives have more of a management emphasis on the restoration of and development of healthy, resilient ecosystems. As a result, some alternatives are expected to be more effective in changing the risk of uncharacteristic fire than others. These treatments assist in moving forested systems into more natural landscape conditions thereby allowing fire to play a more natural role. FRCC is a tool used to determine if a landscape is moving towards desired conditions natural ecosystem structure and function. It measures how close or far much a system has departed from its natural fire regime.

All of the alternatives contain objectives for treating (mechanical and burning) vegetation to improve structure and composition, including reducing surface/ladder fuels and canopy density. However, some alternatives focus these efforts only in certain areas while managing for other objectives (including timber production) elsewhere. This The expected FRCC outcome was

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compared by alternative at 20 years of implementation , the expected length of the plan, plus time allotted to develop the a new forest plan. At 20 years in the future, some movement toward desired conditions would be seen, but effecting change in natural processes at current and expected levels as prescribed by these alternatives would likely take much longer than 20 years.

The Fire Regime Condition Class Software Application (FRCCsa) was used to analyze the vegetation and fire regime departure for the Colville National Forest lands. The FRCCsa uses biophysical settings (BpS) and their associated succession classes (S-Class) as the baseline for pre-European settlement disturbance processes. A crosswalk between biophysical settings and the vegetation groupings used in this analysis is provided in table XX . A description of the biophysical settings and associated S-Classes can be found at www.landfire.gov. The FRCCsa quantifies the departure of current vegetation structure and composition, fire severity, and fire frequency from a set of reference conditions representing the historical range of variation. The tool derives several metrics of departure at the S-Class, BpS, and landscape levels .

Fire Frequency and Severity need to be calculated to use the tool, and are utilized to determine the amount of departure from reference frequencies and severities. To estimate current fire frequency, an analysis of historic and current fires was conducted. Following the methods contained in the Fire Regime Condition Class Guidebook, a Fire Atlas mapping both planned and unplanned ignitions was created with data from 1909-2014. Local knowledge and expert opinion determined that an average of 75% of the acres within burn perimeters were actually burned during the fires, and this average was used to determine actual acres burned within each biophysical setting . The total area burned was divided by Fire Atlas time period to estimate current mean annual burned acres. The total acres of each BpS were divided by the reference fire return interval to determine historic mean annual burned acres. The reduction factor (historic/current) was multiplied by the reference return interval to determine current mean fire return interval. Reference fire return intervals were used for Fire Regime IV areas as the reference return interval was longer than the fire atlas data years.

Current Potential fire severity was calculated by running the Flammap fire behavior model using a landscape file from Landfire (www.landfire.gov). Fuel model, canopy bulk density, canopy cover, canopy base height, canopy height, aspect, slope, and elevation layers comprise the landscape file. Using 90th percentile weather conditions derived from analyzing local weather stations , a Flammap run with flame length and crown fire activity outputs was created. For the purpose of the analysis, surface fire was considered Low Severity (0-25% tree mortality), passive crown fire was considered Mixed Severity (26-75% tree mortality), and active crown fire was considered High Severity (76-100% tree mortality). A value for each severity was assigned (Low, 15%; Mixed, 50%, High 90%), then the mid-point severity was multiplied by percentage of each BpS it was present on. The results were added together to calculate the current severity for each BpS.

For each alternative, S-class layers were modified to match vegetation modelling results. The fire atlas data were updated to add new fires, including both planned and unplanned ignitions. The amount of planned ignitions in each BpS was determined by analyzing historic planned ignition acres completed, and averaging the acres completed each year. To determine the amount of unplanned ignitions that could be used to meet resource objectives, historic lightning data was analyzed in the areas where fire could be managed in this manner during periods when fire effects would produce low-mixed severity fire. Using the Fire Spread Probability (FSPro) tool, the ignitions were run using moderate fire conditions typically experienced in the last 30-60 days of the typical fire season. Using these conditions meets the intent of using fire to meet resource objectives with low and mixed severity effects. Fire frequency was then updated and entered

into the FRCCsa. Fire severity was calculated by taking the amount of acres treated per alternative (commercial thinning, prescribed fire, and mechanical fuels reduction) in each BpS and then reducing the amount of high and mixed severity fire based on the assumption that 50% of treatments would focus on moving high severity areas to mixed severity, 40% of treatments would focus on moving mixed severity to low severity, and that 10% of treatments would focus on maintaining low fire severity conditions.

Assumptions

- Modelled treatments, fire severity, and fire return intervals would closely match actual conditions in the future
- Budget would allow for implementation of all mechanical and prescribed fire treatments

Spatial and Temporal Context for Effects Analysis

The administrative boundary of the Colville National Forest is the spatial extent of this analysis. The temporal context for the affected environment is 105 years, which the oldest data for wildfires in the Colville's corporate GIS database. For the effects analysis, the temporal context looks forward 20 years in regards to Fire Regime Condition Class.

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Of all the ongoing and foreseeable future actions that have the potential to affect fire, especially unwanted wildfire, climate change is likely to be the single most important factor. The effects of climate change would likely combine with some of the effects that result from implementing the alternatives. In general, the fire seasons are expected to become longer, large wildfires are expected to occur more often, and total area burned is expected to increase. By increasing the amount of prescribed fire use, as well as the amount of natural, unplanned ignitions that are used to meet resource objectives, the action alternatives would be expected to partially offset predicted effects from the climate change. The more fire use (and mechanical treatments) that occurs as a result of the action alternatives, the greater the fuels would be reduced and the forest vegetation restored to more resistant and resilient conditions, which would mitigate climate change effects.

Through CWPPs there has been an emphasis to treat Forest Service land as well as state lands and private property within the WUI. The efforts identified in all alternatives, in combination with past, current, and future treatments on private and state lands would help to reduce the risk of uncharacteristic wildfire impacts to communities and the national forest. Treatments carried out on the majority of private lands bordering the Colville NF are done with grants from the WA-DNR. WA-DNR Landowner Assistance Foresters assist with planning those treatments with the intent of reducing fire hazards, which reduces the risk to both the private lands being treated and the potential of fire moving off private land onto Forest Service land. Treatments on NFS land would also serve to reduce the potential of fire moving off of Forest Service land onto private land.

Neighboring land managers (Colville Confederated Tribes, BLM, Okanogan/Wenatchee National Forest, Idaho Panhandle National Forest) are also implementing projects that produce emissions (smoke). There may be additional impacts to Colville NF forest lands in terms of air quality,

visibility, and human health. Tribal participation in the Washington Smoke Implementation Plan is voluntary, though the other agencies follow guidance from the state.

Summary of Effects

Fire Regime Condition Class

Mean fire return intervals decrease with the use of prescribed fire and allowing unplanned ignitions to be managed for resource benefit. Mean fire return interval only considers prescribed fire and wildfire on the landscape. Fire severity is generally reduced across the landscape in areas where any type of treatment (mechanical and/or fire) is implemented.

The following table shows the change in percent of landscape in each Fire Regime Condition class by alternative:

Table 4 shows average fire regime condition class percent departure by forest type after 20 years. This is a relatively short time for management to affect changes at the forest scale, so only a 2-3% decrease is seen in the Douglas-fir dry forest type under the action alternatives. Mechanical and prescribed fire treatments in the Douglas-fir dry forest type would focus on reducing fire severity, but due to the stands missing multiple fire returns, the relatively high mean fire return interval continues to keep this vegetation type severely departed from historic conditions.

The most notable changes occur in Western Red Cedar/Western Hemlock stands. These stands have a longer mean fire return interval and are still within range of historic fire returns. In all alternatives, these stands would continue to move toward more late development closed conditions that more closely match historic conditions.

Table 4. Twenty-year predicted average fire regime condition class percent departure by forest type and alternative

Vegetation Type	Current	No Action	Proposed Action	B	O	P	R
Douglas-fir dry	71	69	67	68	67	67	67
Subalpine fir / Lodgepole pine	35	29	23	21	22	24	23
Northern Rocky Mountain Mixed Conifer	51	53	49	48	48	49	48
Western Redcedar / Western Hemlock	53	52	50	48	49	49	50
Spruce / Subalpine fir	26	33	33	32	32	31	32

Overall, the differences in management prescribed are not sufficient to change FRCC in the 20 year time period, though some vegetation types do begin trending towards a change in FRCC.

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Access

As road densities decrease, or roads are closed to allow for new roads, fire response times would likely increase, though there is "no evidence for an effect of linear feature presence or densities" (roads, powerlines, pipelines) on fires escaping during initial attack (Arienti et al. 2006). Therefore, changes in road densities between alternatives are not expected to impact fire impacts. In addition, although fire boundaries are influenced by multiple topographic and vegetation constraints, roads tend to have the largest influence of any single variable, particularly in lower elevation landscapes with relatively high road densities (Narayanaraj, 2011).

Wilderness

Current management of the Salmo-Priest Wilderness would remain largely unchanged across all alternatives.

Recommended Wilderness areas are discussed in each alternative.

Wildland Urban Interface

All alternatives would restrict treatment in portions of the Wildland Urban Interface (WUI), as it is mapped in the county CWPPs. In all alternatives, except the No Action, Recommended Wilderness, current Wilderness, and Research Natural Areas would not allow timber harvest to be used as a tool. Recommended Wilderness is the most restrictive management allocation in all alternatives that drives the differences in acres unsuitable for mechanical treatment. In the No Action Alternative, Management Areas 1, 3b, 3c, 4, 9, 10, and 11 do not allow timber harvest. The following table shows by alternative how many acres within the WUI would not allow timber harvest as a tool:

Table 5. Acres Unsuitable for Mechanical Treatment within the WUI, by Alternative

ALTERNATIVE	ACRES UNSUITABLE FOR MECHANICAL TREATMENT
No Action	62,709
Proposed Action	30,451
Alternative B	92,787
Alternative O	13,889
Alternative P	35,966
Alternative R	83,730

Alternative 1 – No Action

This is the current Colville Forest Plan as amended. No action means the current management direction would continue.

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Summary of Effects

Overall, the forest would remain moderately departed from historic fire return intervals and severities. Stand departures would change from current conditions as follows:

Table 6. No Action Alternative Predicted Departure by Vegetation Type

Vegetation Type	*Landfire Biophysical Setting*	*Acres**	*Avg Departure*	*Departure Compared to Current Conditions*	*VCC*	*Frequency Departure*	*Severity Departure*
Douglas-fir dry	1010451 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Ponderosa Pine – Douglas-fir	486045	69%	Down 2%	2	87%	86%
Subalpine fir / Lodgepole pine	1010452 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Larch	173699	29%	Down 6%	1	6%	47%
Northern Rocky Mountain Mixed Conifer	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	308365	53%	Up 2%	2	66%	38%
Western Redcedar / Western Hemlock	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (95%) / 1010472 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest – Cedar Groves (5%)	95820	52%	Down 1%	2	66%	38%
Spruce / Subalpine fir	1010560 - Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (90%) / 1011610 - Northern Rocky Mountain Conifer Swamp (10%)	20240	33%	Up 7%	2	1%	44%

*Acres are approximate and vary due to GIS methodology

Vegetation departures would generally continue to increase in most vegetation types. Mechanical treatments would account for the lower departure value in Western Redcedar/Western Hemlock stands, as these stands typically would not experience enough wildfire or prescribed fire to account for the change in departure. The landscape would be 57% departed from historic conditions with a landscape FRCC of 2.

Old Forest Management and Timber Production

Mechanical fuels reduction and prescribed fire treatments could occur as scheduled treatments across 82% of the landscape. Treatments would be planned following direction from the 1988

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Forest Plan as amended. A fixed reserve approach would be used to manage late forest structure, where no scheduled timber harvest is permitted.

Within dry Douglas Fir stands, modeling 20 years in the future predicts, 15% of the stands would be classified as late development open, and 19% of the stands as late development closed. The largest amount of stands (53%) would be classified as mid development closed. Closed canopied stands, especially those in the mid development stage are particularly susceptible to stand replacing fire events due to dense canopies and abundant ladder fuels Once late development open structure was reached, regular fire treatments would be needed to maintain this condition.

Within subalpine fir/lodgepole pine stands modeling 20 years in the future predicts, 2% of stands would be classified as late development closed, with no stands classified as late development open. Late forest structure in this vegetation type would persist until fire occurrence, and would revert to early development.

Within mixed conifer stands, modeling20 years in the future predicts, 22% of the stands within this vegetation type would be considered late development closed, with 0% late development open.

Within western red cedar/western hemlock stands, modeling 20 years in the future predicts 34% of the stands would be classified as late development closed. These stands would continue to experience natural stand replacement fire if left to natural disturbances.

Within spruce/subalpine fire stands, modeling 20 years into the future predicts, 16% of the vegetation type would be classified as late development closed. Replacement fire historically occurred every 150 years, with that fire return interval and severity expected to persist without management intervention.

Fire would play its natural role across 23% of the landscape, supporting the retention of late forest structure in the Douglas-fir dry type as low severity fire moves through those areas that typically experienced low severity fire. Mixed and high severity fire would also be expected if fire plays its natural role in all other vegetation types. 77% of the landscape exhibits a departure from natural fire process and would remain predisposed to losing key ecosystem components, which could threaten late forest structure and timber production.

Wilderness

There would be no RW areas in the no action alternative. Management of the Salmo-Priest Wilderness would not change.

Stands would remain in their current Fire Regime Condition Class, but would continue to miss fire cycles which would lead to progression to FRCC 2 and 3, leaving them at risk of losing key ecosystem components.

Monitoring Recommendations

Use FRCC assessment to track changes in landscape departure over time.

Use FLAMMAP and FSPro to track predicted changes in fire behavior over time.

Collect field fuels data on a limited basis, where doing so would improve modelling or applications of future treatments.

Report monitoring results to the public on a timely basis.

Alternative 2 – Proposed Action

This is the June 30, 2012, proposed action released to the public with the Lewisia draft plan revision document providing supporting information.

Summary of Effects

Stand departures relating to fire frequency and severity would change from current conditions as follows:

Table 7. Proposed Action Alternative Predicted Departure by Vegetation Type

Vegetation Type	*Landfire Biophysical Setting*	*Acres**	*Avg Departure*	*Departure Compared to Current Conditions*	*VCC*	*Frequency Departure*	*Severity Departure*
Douglas-fir dry	1010451 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Ponderosa Pine – Douglas-fir	486045	67	Down 4%	2	89%	86%
Subalpine fir / Lodgepole pine	1010452 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Larch	173699	23	Down 12%	1	6%	47%
Northern Rocky Mountain Mixed Conifer	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	308365	49	Down 2%	2	66%	38%
Western Redcedar / Western Hemlock	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (95%) / 1010472 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest – Cedar Groves (5%)	95820	50	Down 3%	2	66%	38%

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Vegetation Type	*Landfire Biophysical Setting*	*Acres**	*Avg Departure*	*Departure Compared to Current Conditions*	*VCC*	*Frequency Departure*	*Severity Departure*
Spruce / Subalpine fir	1010560 - Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (90%) / 1011610 - Northern Rocky Mountain Conifer Swamp (10%)	20240	33	Up 7%	2	1%	44%

*Acres are approximate and vary due to GIS methodology

The use of prescribed fire and allowing for unplanned ignitions to be used to meet resource benefits would work toward lowering the mean fire return interval slightly. Fire severity would be moderated through the use of mechanical treatments and prescribed fire. The landscape overall is 54% departed from historic conditions, resulting in a landscape FRCC of 2.

Old Forest Management and Timber Production

Mechanical fuels reduction and prescribed fire treatments could occur as scheduled treatments across 71% of the landscape. Treatments would be planned using a “whole landscape” approach which would promote late forest structure in shifting locations across the forest over broad time horizons as treatments work to enhance and maintain old forest conditions. Rather than designating specific geographic locations where old forest would be managed for, this alternative seeks to develop and maintain overall landscape proportions of old forest while recognizing that specific locations change through time due to natural and anthropogenic disturbance. This approach closely mimics historic landscape patterns represented by a mosaic of forest structure shaped by fire of differing severities. The whole landscape approach aims to promote fire resilient species composition and structure at the landscape scale, specifically in vegetation types that would historically have fire resilient species such as Ponderosa Pine, Douglas Fir, and Western Larch.

Prescribed fire use would slightly decrease the mean fire return interval, though the landscape would still remain severely departed from historic return intervals. Treatments are expected to shift some high fire severity areas to moderate severity, and some moderate severity areas to low severity as overall fuel loading and canopy closure is reduced. Overall the landscape FRCC remains moderately departed with an FRCC 2. Fire is able to play its natural role across 27% of the forest, maintaining resilient stands in those areas. These areas would include both low and mixed severity fire regimes. However, 73% of the forest is at risk of losing key ecosystem components, which could threaten both timber production and late forest structure.

Within dry Douglas Fir stands modeling 20 years in the future predicts 17% of the stands would be classified as late development open, and 17% of the stands as late development closed. The largest amount of stands (50%) would be classified as mid development closed. Closed canopied stands, especially those in the mid development stage are particularly susceptible to stand replacing fire events due to dense canopies and abundant ladder fuels. Once late development open structure was reached, regular fire treatments would be needed to maintain this condition.

Within subalpine fir/lodgepole pine stands, modeling 20 years into the future predicts 12% of stands would be classified as late development closed, with no stands classified as late

development open. Late forest structure in this vegetation type would persist until fire occurrence, and would revert to early development.

Within mixed conifer stands, modeling 20 years into the future predicts, 20% of the stands within this vegetation type would be considered late development closed, with 2% late development open.

Within western red cedar/western hemlock stands, ,modeling 20 years into the future predicts 18% of the stands would be classified as late development closed and would continue to experience natural stand replacement fire if left to natural disturbances.

Within Spruce/subalpine fire stands, 20 years into the future predicts 16% of the vegetation type would be classified as late development closed. Replacement fire historically occurred every 150 years, with that fire return interval and severity persisting without management intervention.

Fire would play its natural role across 27% of the landscape, supporting the retention of late forest structure in the Douglas-fir dry type as low severity fire moves through those areas that typically experienced low severity fire. Mixed and high severity fire would also be expected if fire plays its natural role in all other vegetation types. 73% of the landscape exhibits a departure from natural fire process and would remain predisposed to losing key ecosystem components, which could threaten late forest structure and timber production. Losing key ecosystem components in late forest structure would impact dependent surrogate wildlife species habitat (Gaines, 2015).

Recommended Wilderness Areas

101,390 acres are recommended for Wilderness. Tools for fire management would remain unchanged until Congress acts to designate the areas as wilderness. If areas are designated by Congress, the use of some tools for fire management (i.e. chainsaws, helispots, etc.) would require approval prior to their use.

Alternative B

Summary of Effects

Stand departures relating to fire frequency and severity would change from current conditions as follows:

Table 8. Alternative B Predicted Departure by Vegetation Type

Vegetation Type	*Landfire Biophysical Setting*	*Acres**	*Avg Departure*	*Departure Compared to Current Conditions*	*VCC*	*Frequency Departure*	*Severity Departure*
Douglas-fir dry	1010451 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Ponderosa Pine – Douglas-fir	486045	68	Down 3%	2	89%	86%

Vegetation Type	*Landfire Biophysical Setting*	*Acres**	*Avg Departure*	*Departure Compared to Current Conditions*	*VCC*	*Frequency Departure*	*Severity Departure*
Subalpine fir / Lodgepole pine	1010452 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Larch	173699	21	Down 14%	1	6%	47%
Northern Rocky Mountain Mixed Conifer	1010471 - Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	308365	48	Down 3%	2	66%	38%
Western Redcedar / Western Hemlock	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (95%) / 1010472 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest – Cedar Groves (5%)	95820	48	Down 5%	2	66%	38%
Spruce / Subalpine fir	1010560 - Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (90%) / 1011610 - Northern Rocky Mountain Conifer Swamp (10%)	20240	32	Up 6%	2	1%	44%

*Acres are approximate and vary due to GIS methodology

Stand departure is lowered in all vegetation types except Spruce/Subalpine Fir. Overall, mean fire return intervals decrease slightly, and severity is changed through the use of mechanical and prescribed fire treatments. Overall the landscape is 51% departed from historic conditions, and has a landscape FRCC of 2.

Old Forest Management and Timber Production

Late forest structure restoration is the highest priority within the Restoration Zone management area of Alternative B, which encompasses 31% of the forest. Restoring late forest structure in dry forest types would allow fire to resume its natural role in those areas, as species composition and structure would support resiliency to low severity fire in the Douglas-fir dry type. Some restoration activities (timber harvest for example) would not occur in moist mixed conifer forests, meaning that mixed and high severity fire would continue to be expected in those areas. Because mixed and high severity fire serves critical natural processes in the moist mixed conifer type, this is expected to enhance and improve fire regime condition class within the restoration zone management area.

The Active Management area includes 43% of the forest. All activities (timber harvest, thinning, prescribed fire) are available for use as treatments focus on a stable flow of forest products in all vegetation types. The vegetation treatments prescribed in the active management area are primarily designed to promote production of wood products. These treatments have limited value in restoring natural disturbance and fire process into these forested ecosystems.

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Within dry Douglas Fir stands, modeling 20 years in the future predicts 15% of the stands would be classified as late development open, and 19% of the stands as late development closed. The largest proportion of stands (49%) would be classified as mid development closed. Closed canopied stands, especially those in the mid development stage are particularly susceptible to stand replacing fire events due to dense canopies and abundant ladder fuels. Once late development open structure was reached, regular fire treatments would be needed to maintain this condition.

Within subalpine fir/lodgepole pine stands, modeling 20 years into the future predicts 12% of stands would be classified as late development closed, with no stands classified as late development open. Late forest structure in this vegetation type would persist until fire occurrence, and would revert to early development.

Within mixed conifer stands, modeling 20 years into the future predicts 21% of the stands within this vegetation type would be considered late development closed, with 1% late development open.

Within western red cedar/western hemlock stands, modeling 20 years into the future predicts 35% of the stands would be classified as late development closed and would continue to experience natural stand replacement fire if left to natural disturbances.

Within spruce/subalpine fire stands, modeling 20 years into the future predicts 16% of the vegetation type would be classified as late development closed. Replacement fire historically occurred every 150 years, with that fire return interval and severity persisting without management intervention.

Fire would play its natural role across 38% of the landscape, supporting the retention of late forest structure in the Douglas-fir dry type as low severity fire moves through those areas that typically experienced low severity fire. Mixed and high severity fire would also be expected if fire plays its natural role in all other vegetation types. 62% of the landscape exhibits a departure from natural fire process and would remain predisposed to losing key ecosystem components, which could threaten late forest structure and timber production. Losing key ecosystem components in late forest structure would impact dependent surrogate wildlife species habitat (Gaines, 2015).

Recommended Wilderness Areas

220,330 acres would be recommended as wilderness under Alternative B. Mechanized uses would not be allowed prior to Congress acting to designate the areas as Wilderness. Some fire management tools (chainsaws, helispots, etc.) would require approval prior to their use in the RW's.

Monitoring Recommendations

Use FRCC assessment to track changes in landscape departure over time.

Use FLAMMAP and FSPro to track predicted changes in fire behavior over time.

Collect field fuels data on a limited basis, where doing so would improve modelling or applications of future treatments.

Report monitoring results to the public on a timely basis.

Alternative O

Summary of Effects

Alternative O would change stand departure of vegetation types as follows:

Table 9. Alternative O Predicted Departure by Vegetation Type

Vegetation Type	*Landfire Biophysical Setting*	*Acres**	*Avg Departure*	*Departure Compared to Current Conditions*	*VCC*	*Frequency Departure*	*Severity Departure*
Douglas-fir dry	1010451 – Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Ponderosa Pine – Douglas-fir	486045	67	Down 4%	2	87%	84%
Subalpine fir / Lodgepole pine	1010452 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Larch	173699	22	Down 13%	1	6%	47%
Northern Rocky Mountain Mixed Conifer	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	308365	48	Down 3%	2	66%	38%
Western Redcedar / Western Hemlock	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (95%) / 1010472 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest – Cedar Groves (5%)	95820	49	Down 4%	2	66%	38%
Spruce / Subalpine fir	1010560 - Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (90%) / 1011610 - Northern Rocky Mountain Conifer Swamp (10%)	20240	32	Up 6%	2	1%	44%

*Acres are approximate and vary due to GIS methodology

Departure would decrease across all vegetation types except Spruce/Subalpine fir. Mean fire return intervals would decrease slightly with the use of prescribed fire and the use of unplanned ignitions. Fire severity would be reduced through the use of mechanical treatments and

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prescribed fire. Overall, the landscape would be 52% departed from historic conditions, with a landscape FRCC of 2.

Old Forest Management and Timber Production

Within dry Douglas Fir stands, modeling 20 years in the future predicts 15% of the stands would be classified as late development open, and 19% of the stands as late development closed. The largest proportion of stands (50%) would be classified as mid development closed. Closed canopied stands, especially those in the mid development stage are particularly susceptible to stand replacing fire events due to dense canopies and abundant ladder fuels. Once late development open structure was reached, regular fire treatments would be needed to maintain this condition.

Within subalpine fir/lodgepole pine stands, modeling 20 years into the future predicts 12% of stands would be classified as late development closed, with no of stands classified as late development open. Late forest structure in this vegetation type would persist until fire occurrence, and would revert to early development.

Within mixed conifer stands, modeling 20 years into the future predicts 21% of the stands within this vegetation type would be considered late development closed, with 1% late development open.

Within western red cedar/western hemlock stands modeling 20 years into the future predicts 34% of the stands would be classified as late development closed.

Within spruce/subalpine fire stands, modeling 20 years into the future predicts 18% of the vegetation type would be classified as late development closed. Replacement fire historically occurred every 150 years, with that fire return interval and severity persisting without management intervention.

Fire would play its natural role across 35% of the landscape, supporting the retention of late forest structure in the Douglas-fir dry type as low severity fire moves through those areas that typically experienced low severity fire. Mixed and high severity fire would also be expected if fire plays its natural role in all other vegetation types 65% of the landscape exhibits a departure from natural fire process and would remain predisposed to losing key ecosystem components, which could threaten late forest structure and timber production. Losing key ecosystem components in late forest structure would impact dependent surrogate wildlife species habitat (Gaines, 2015).

Recommended Wilderness Areas

15,950 acres would be recommended as wilderness. Mechanized uses would be allowed to continue until Congress acts to designate the areas as wilderness. Once the areas are designated as wilderness, approval to use some tools (chainsaws, helispots, etc.) would need to be obtained prior to their use.

Monitoring Recommendations

Use FRCC assessment to track changes in landscape departure over time.

Use FLAMMAP and FSPro to track predicted changes in fire behavior over time.

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Collect field fuels data on a limited basis, where doing so would improve modelling or applications of future treatments.

Report monitoring results to the public on a timely basis.

Alternative P

Summary of Effects

Alternative P would change stand departure in each vegetation types as follows:

Table 10. Alternative P Predicted Departure by Vegetation Type

Vegetation Type	*Landfire Biophysical Setting*	*Acres**	*Avg Departure*	*Departure Compared to Current Conditions*	*VCC*	*Frequency Departure*	*Severity Departure*
Douglas-fir dry	1010451 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Ponderosa Pine – Douglas-fir	486045	67	Down 4%	2	89%	86%
Subalpine fir / Lodgepole pine	1010452 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Larch	173699	24	Down 11%	1	6%	47%
Northern Rocky Mountain Mixed Conifer	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	308365	49	Down 2%	2	66%	38%
Western Redcedar / Western Hemlock	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (95%) / 1010472 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest – Cedar Groves (5%)	95820	49	Down 4%	2	66%	38%
Spruce / Subalpine fir	1010560 - Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (90%) / 1011610 - Northern Rocky Mountain Conifer Swamp (10%)	20240	31	Up 5%	2	1%	44%

*Acres are approximate and vary due to GIS methodology

Stand departure would decrease in all vegetation types except Western Red Cedar/Western Hemlock and Spruce/Subalpine fir. This is due to no treatments being modeled in Western Red

Cedar/Western Hemlock stands, and limited treatments in Spruce/Subalpine Fir Stands. Mean fire return intervals would decrease slightly through the use of prescribed fire and the use of unplanned ignitions. Fire severity would be reduced through the use of mechanical treatments and prescribed fire. Overall, the landscape would be 55% departed from historic conditions, with a landscape FRCC of 2

Old Forest Management and Timber Production

Within dry Douglas Fir stands, modeling 20 years in the future predicts 18% of the stands would be classified as late development open, and 17% of the stands as late development closed. The largest amount of stands (45%) would be classified as mid development closed. Closed canopied stands, especially those in the mid development stage are particularly susceptible to stand replacing fire events due to dense canopies and abundant ladder fuels. Once late development open structure was reached, regular fire treatments would be needed to maintain this condition.

Within subalpine fir/lodgepole pine stands, modeling 20 years into the future predicts 12% of stands would be classified as late development closed, with no stands classified as late development open. Late forest structure in this vegetation type would persist until fire occurrence, and would revert to early development.

Within mixed conifer stands, modeling 20 years into the future predicts 21% of the stands within this vegetation type would be considered late development closed, with 1% late development open.

Within western red cedar/western hemlock stands, modeling 20 years into the future predicts 36% of the stands would be classified as late development closed and would continue to experience natural stand replacement fire if left to natural disturbances.

Within the spruce/subalpine fire stands, modeling 20 years into the future predicts, 20% of the vegetation type would be classified as late development closed. Replacement fire historically occurred every 150 years, with that fire return interval and severity persisting without management intervention.

Fire would play its natural role across 26% of the landscape, supporting the retention of late forest structure in the Douglas-fir dry type as low severity fire moves through those areas that typically experienced low severity fire. Mixed and high severity fire would also be expected if fire plays its natural role in all other vegetation types. 74% of the landscape exhibits a departure from natural fire process and would remain predisposed to losing key ecosystem components, which could threaten late forest structure and timber production. Losing key ecosystem components in late forest structure would impact dependent surrogate wildlife species habitat (Gaines, 2015).

Recommended Wilderness Areas

68,333 acres would be recommended as wilderness. Mechanized uses would be allowed to continue until Congress acts to designate the areas as wilderness. If the areas are designated as wilderness by Congress, approval to use some tools (chainsaws, helispots, etc.) would need to be obtained prior to their use.

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Monitoring Recommendations

Use FRCC assessment to track changes in landscape departure over time.

Use FLAMMAP and FSPro to track predicted changes in fire behavior over time.

Collect field fuels data on a limited basis, where doing so would improve modelling or applications of future treatments.

Report monitoring results to the public on a timely basis.

Alternative R

Summary of Effects

Stand departures of each vegetation type would change as follows:

Table 11. Alternative R Predicted Departure by Vegetation Type

Vegetation Type	*Landfire Biophysical Setting*	*Acres**	*Avg Departure*	*Departure Compared to Current Conditions*	*VCC*	*Frequency Departure*	*Severity Departure*
Douglas-fir dry	1010451 - Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Ponderosa Pine – Douglas-fir	486045	67	Down 4%	2	87%	86%
Subalpine fir / Lodgepole pine	1010452 – Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Larch	173699	23	Down 12%	1	6%	47%
Northern Rocky Mountain Mixed Conifer	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	308365	48	Down 3%	2	66%	38%
Western Redcedar / Western Hemlock	1010471 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (95%) / 1010472 – Northern Rocky Mountain Mesic Montane Mixed Conifer Forest – Cedar Groves (5%)	95820	50	Down 3%	2	66%	38%

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Vegetation Type	*Landfire Biophysical Setting*	*Acres**	*Avg Departure*	*Departure Compared to Current Conditions*	*VCC*	*Frequency Departure*	*Severity Departure*
Spruce / Subalpine fir	1010560 - Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (90%) / 1011610 - Northern Rocky Mountain Conifer Swamp (10%)	20240	32	Up 6%	2	1%	44%

*Acres are approximate and vary due to GIS methodology

Stand departure would be lower in all vegetation types except Spruce/Subalpine fir. Mean fire return intervals would decrease slightly through the use of prescribed fire and the use of unplanned ignitions. Fire severity would be reduced through the use of mechanical treatments and prescribed fire. Overall the landscape would be 53% departed from historic conditions with an FRCC of 2.

Old Forest Management and Timber Production

Within dry Douglas Fir stands, modeling 20 years into the future predicts 16% of the stands would be classified as late development open, and 18% of the stands as late development closed. The largest proportion of stands (52%) would be classified as mid development closed Closed canopied stands, especially those in the mid development stage are particularly susceptible to stand replacing fire events due to dense canopies and abundant ladder fuels. Once late development open structure was reached, regular fire treatments would be needed to maintain this condition.

Within subalpine fir/lodgepole pine stands, modeling 20 years into the future predict 12% of stands would be classified as late development closed, with no stands classified as late development open. Late forest structure in this vegetation type would persist until fire occurrence, and would revert to early development.

Within mixed conifer stands, modeling 20 years into the future predicts 22% of the stands within this vegetation type would be considered late development closed, with 1% late development open.

Within western red cedar/western hemlock stands, modeling 20 years into the future predicts 33% of the stands would be classified as late development closed and would continue to experience natural stand replacement fire if left to natural disturbances.

Within the spruce/subalpine fire stands, modeling 20 years into the future 17% of the vegetation type would be classified as late development closed. Replacement fire historically occurred every 150 years, with that fire return interval and severity persisting without management intervention.

Fire would play its natural role across 39% of the landscape, supporting the retention of late forest structure in the Douglas-fir dry type as low severity fire moves through those areas that typically experienced low severity fire. Mixed and high severity fire would also be expected if fire plays its natural role in all other vegetation types. 61% of the landscape exhibits a departure from natural fire process and would remain predisposed to losing key ecosystem components,

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which could threaten late forest structure and timber production. Losing key ecosystem components in late forest structure would impact dependent surrogate wildlife species habitat (Gaines, 2015).

Recommended Wilderness Areas

207,800 acres would be recommended as wilderness under Alternative R. Mechanized uses would not be allowed prior to Congress acting to designate the areas as Wilderness. Some fire management tools (chainsaws, helispots, etc.) would require approval prior to their use in the RW's.

Monitoring Recommendations

Use FRCC assessment to track changes in landscape departure over time.

Use FLAMMAP and FSPro to track predicted changes in fire behavior over time.

Collect field fuels data on a limited basis, where doing so would improve modelling or applications of future treatments.

Report monitoring results to the public on a timely basis.

Acronyms

FRCC: Fire Regime Condition Class

WUI: Wildland Urban Interface

Glossary

FRCC: Fire Regime Condition Class (FRCC) is a metric that quantifies how departed a system is from historical conditions in relation to fire, the role fire historically played in that system, and vegetative structure (Hann and Bunnell 2001, Hardy et al. 2001, Hann et al. 2008). FRCC is an estimate of the departure from the natural fire regime. FRCC assessments measure departure in two main components of ecosystems: 1) fire regime (fire frequency and severity) and 2) by comparing the abundances of each seral stage (by potential vegetation type) to historical amounts. There are three classes of FRCC, based on low (FRCC 1), moderate (FRCC 2), and high (FRCC3) departure from the central tendency of the natural fire regime structure (Hann and Bunnell 2001, Hardy et al. 2001, Barrett et al. 2010). FRCC 1 is considered to be within the historic range of fire regimes, while FRCC 2 and FRCC 3 are outside the range

WUI: A wildland–urban interface refers to the zone of transition between unoccupied land and human development.

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