Chapter 8 Appendices

Appendix A

Botanical Resource Report

Kahler Dry Forest Restoration Project

Botanical Resource Report

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for:
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Introduction

This report serves to document existing known rare plant populations and special habitats in the Kahler Dry Forest Restoration Project area (KDFRPA). Starting with data collected over the last 30 years of extensive botanical surveys on the Umatilla National Forest in the Kahler project area and surrounding NFS lands housed in the Natural Resource Manager Threatened Endangered Sensitive Plants/Invasive Species (NRM TESP/IS) database, additional surveys were implemented as needed during the 2012 and 2013 field seasons.
Special habitats addressed include the proposed Henry Creek Botanical Area discovered during Kahler project field surveys and the Kahler Creek Butte proposed Research Natural Area included in the Umatilla National Forest Land and Resource Management Plan (1990).

In addition, this report will serve as the Biological Evaluation (BE), analyzing effects or impacts from the proposed action and alternatives to plants listed as federally Threatened or Endangered (TE), or proposed for listing, and Forest Service Sensitive (S) plant species. Sensitive plants are listed on the R6 Regional Forester's Special Status Species List (RFSSSL), updated in December 2011 (http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/).

The BE is the means of conducting the review and documenting the findings (FSM 2672.4). The objectives of the BE are to

1) ensure that Forest Service actions do not contribute to the loss of viability of any native or desired non-native plant species or contribute to trends toward Federal listing of any species;
2) comply with the requirements of the Endangered Species Act that actions of Federal agencies not jeopardize or adversely modify critical habitat of Federally listed species; and
3) provide a process and standard by which to ensure that threatened, endangered, proposed, and sensitive species receive full consideration in the decision making process

Resource Indicators and Measures

Table 65: Resource indicators and measures for assessing effects

Resource Element	Measure	Source
special habitats	Presence of a special habitat including: unique botanical areas, proposed Research Natural Area (pRNA), meadows, fens, seeps, ecologically intact scablands etc.	National Forest Management Act (1976) (NFMA) and Forest Plan (1990) as amended
sensitive vascular / non-vascular plant species	Presence of vascular and non-vascular plant species that are within potential project footprint and which are presently listed 'senstive' on the RFSSSL	NFMA (1976) and Forest Plan (1990) as amended
rare vascular / non-vascular plant species	Presence of unusual vegetation / species that do not have sensitive status on the RFSSSL, but which are perceived by the botanist to be rare with high probability of sensitive status in the near future.	NFMA (1976) and Forest Plan (1990) as amended

Methodology

Botanical resources refer to those vascular or non-vascular taxa that have been assigned special status as either Threatened or Endangered via federal Endangered Species Act (ESA) designation, as sensitive on the RFSSSL, or perceived as rare by the botanical specialist. This third category based on perception of rarity is supported by providing current status with the Oregon Biodiversity Information Center (ORBIC),

a part of the Institute for Natural Resources located at Portland State University. ORBIC maintains extensive databases of Oregon biodiversity, concentrating on rare and endangered plants, animals and ecosystems.

The primary survey methodology employed in conducting botanical surveys in the field is to use the standard intuitively-guided protocol. Utilizing this method the botanist(s) traverse through strategically chosen areas of the project footprint (e.g. designated treatment units) and immediately peripheral elements of the landscape that may have bearing upon the proposed action(s) – for example areas that have possible source populations of noxious weeds that may result in the establishment of these undesirable species post-project treatment. A list of all identifiable species is compiled as the traverse(s) represents an attempt to comprehensively sample the species richness and botanical character of all unique habitat elements within the chosen survey area. Utilizing the local taxonomic and ecological experience base of the botanist(s) this approach provides the best method for accurately assembling a "snapshot" of species richness and, to a lesser extent, distribution on the landscape.

Pre-Field Review

Prior to implementing field surveys, an assessment of rare plant species with the greatest probability of occurrence in the project area is conducted in order to provide search image focus for on-the-ground efforts. Table 2, below, provides a listing of those rare species which were thought likely to be encountered within the KDFRPA.

Table 2: Rare Species Considered Likely to occur within the KDFRPA

Species	Habitat	Comments
Astragalus misellus var. *misellus*	dry rocky hillsides	Potential habitat present in the project area / Oregon Biodiversity Information Center (ORBIC) List 1 – not on RFSSSL at present time
Botrychium sp.	moist locales on meadow peripheries / mesic forested sites with members of *Rosaceae*	several sensitive species of *Botrychium* with potential habitat in the project area: *Botrychium crenulatum*, *Botrychium hesperium*, and *Botrychium paradoxum*
Carex cordillerana	riparian sites / moist woods with good available light	known from occurrences proximal to the project area
Castilleja oresbia	high quality scabland sites with *Artemisia rigida*	known from a single locality on the Umatilla N.F. / ORBIC list 3
Cryptantha grandiflora	dry hillsides on crumbling strongly crystalline Columbia River Basalt flows	likely habitat in the project area / ORBIC List 2 – not on RFSSSL at present time
Eleocharis bolanderi	ephemeral typically HUC6 stream margins and streambeds	known from occurrences proximal to the project area
Eriogonum thymoides	high quality scabland sites	Potential habitat in and peripheral to the project area / ORBIC List 3
Lomatium packardiae	rocky sites, typically with clay soil matrix	known to occur proximal to project area / ORBIC List 3
Phacelia minutissima	moist meadow edges and under light coniferous canopy where moist early in the season	Potential habitat in project area
Streptanthus cordatus	rocky hillsides with deeper soil	known historically from the general

	pockets	area / ORBIC List 3
Thelypodium eucosmuum	moist to dry areas under western juniper / stream beds / seeps / riparian areas	Oregon Endangered Species Act (OEDA) Status: Threatened / RFSSSL sensitive / one population known from nearby on the Umatilla N.F. above Bologna Basin

Information Sources

Sources of information utilized to evaluate botanical resources on the ground rely upon the breadth of accumulated on-the-ground knowledge of the botany of the region developed by the Umatilla National Forest botany program over the nearly 30-years of botanical survey work conducted in the area. This survey work and sensitive plant documentation is housed in the NRM TESP/IS national database. Other seminal resources include the various technical botanical references available for the region including Hitchcock and Cronquist (1973), the Flora of North America (1993+) the Intermountain Flora, ORBIC 2013 RTE Guide (2013) and the Consortium of Pacific Northwest Herbaria website (2013).

Incomplete and Unavailable Information

By the very nature of botanical surveys, no one survey nor set of surveys is likely to capture the full range of diversity that a large complex area has to offer. Plant phenology, time constraints, staff knowledge limitations and chance limit full understanding of the botanical resources of an area as large as the Kahler Dry Forest Restoration Project area (KDFRPA)

Affected Environment

Existing Conditions

The KDFRP area encompasses a broad area of the Heppner Ranger District of the Umatilla National Forest comprising in total approximately 14,000 acres. This dry forest area is comprised predominately of coniferous forest characterized by plant associations in the Douglas fir, ponderosa pine and western juniper plant association groups with some subordinate xeric to mesic-moist members of the grand fir plant association group. Some occurrences of xeric shrubland/grassland plant associations are also present. Table 3 below presents the plant associations that were identified within the KDFRPA while conducting on-the-ground surveys during the 2012 and 2013 field seasons.

The area encompassed by the KDFRP has departed significantly relative to historical conditions in the pre-settlement era. As indicated by early photographs and records from the general region in similar settings most of the general area was open ponderosa pine woodland with old-growth early seral species the dominant coniferous presence. The advent of aggressive fire suppression policies, late 19th and early 20th century unregulated grazing practices, and vegetation changes associated with trophic cascade effects (e.g. increases in ungulate populations and attendant browsing) related to the loss of top predator species much/most of the KDFRPA has been strongly modified, and non-native vascular plant taxa are common to ecologically dominant in some settings – particularly in shrubland and grasslands.

Historically, frequent low intensity fires kept understory vegetation composition dominated by grasses and forbs with lesser shrub and conifer regeneration components. Conversely, at the present time much of the KFRPA is comprised of significantly overstocked forested areas (Figure 1). While it is not sufficiently documented owing to a paucity of botanical collections and community composition records from the 19th and early 20th century, it can be inferred that overall vascular plant species richness within the KDFRPA is at present reduced relative to historical levels. Conversely, a subset of native taxa with low occurrence

levels historically may now enjoy a higher frequency/abundance. Amongst these taxa are species that are highly shade tolerant such as members of the genus *Pyrola*, three species of orchids in the genus *Coralorhiza*, the showy orchid *Cypripedium montanum* (mountain lady's slipper), *Viola orbiculata* (darkwoods violet), *Bromus vulgaris* (Columbia brome), and *Chimaphila menziesii* (little prince's pine).

Figure 1. Typical overstocked forested area in the KDFRPA

Figure 2. *Pseudotsuga menziesii / Calamagrostis rubescens* plant association at or near desired condition within the KDFRPA

Table 3: Plant associations documented by field surveys in the KDFRPA during the 2012 and 2013 field seasons.

Plant association	*General Abundance In KDFRPA*	*Comments*
Abies grandis/Arnica cordifolia	uncommon	none
Abies grandis Bromus vulgaris	rare	none
Abies grandis/Carex geyeri	uncommon	none
Abies grandis/Linnaea borealis	rare	one wet slope above a meadow in north portion of KDFRP
Artemisia rigida/Poa secunda	common	primarily flat scabland sites – particularly in southern portions of the KDFRP
Juniperus occidentalis/Cercocarpus ledifolius/Festuca idahoensis-Pseudoroegneria spicata	uncommon	shoulders of basalt cliff bands
Juniperus occidentalis/Festuca idahoensis-Pseudoroegneria spicata	uncommon	most xeric south-aspect sites
Pinus ponderosa/Carex geyeri	common	particularly common in south portions of KDFRP
Pinus ponderosa/Festuca idahoensis	common	particularly common in south portions of KDFRP
Poa secunda-Danthonia unispicata	common	may be ecologically modified from pre-existing ARRI2/POSE
Pseudotsuga menziesii/Calamagrostis rubescens	common	often ecotonal with *Pseudotsuga menziesii/Symphoricarpos albus*
Pseudotsuga menziesii/Carex geyeri	common	none
Pseudotsuga menziesii/Symphoricarpos albus	abundant	none
Pseudoroegneria spicata/Poa secunda	common	south aspect slopes in southern portions of the KDFRP

Botanical Surveys

Botanical surveys of areas within the KDFRPA in support of the project were conducted on the dates in table 4 below. Figure 3 provides the locations of survey tracks on the ground within and peripheral to the project area.

Table 4: Botanical Surveys Conducted Within The KDFRPA – 2012 and 2013

Dates	Personnel	Comments
24 May 2012	Mark Darrach / Joan Frazee	none
30 May 2012	Mark Darrach / Joan Frazee	none
31 May 2012	Mark Darrach / Joan Frazee	none
4 June 2013	Mark Darrach / Tom Brumbelow	none
5 June 2013	Mark Darrach / Tom Brumbelow	none
6 June 2013	Mark Darrach / Joan Frazee / Tom Brumbelow	*Pyrola dentata* and *Cryptantha rostellata* populations discovered
11 June 2013	Mark Darrach / Tom Brumbelow	
12 June 2013	Mark Darrach / Tom Brumbelow	*Cryptantha grandiflora* population discovered
1 July 2013	Mark Darrach / Tom Brumbelow	none
25 July 2013	Mark Darrach	*Erigeron instillauratus* population discovered

Table 5: Historical Botanical Surveys Within and Peripheral To The KDFRPA.

Year	Project	Comments
1988	Tamarack-Mahogany P.A.	synoptic survey
1990	Dixon Basin Juniper Burn	synoptic survey
1991	Flatiron P.A.	synoptic survey
1991	Porter P.C.T.	synoptic survey
1991	West End Seed Tree	synoptic survey
1991	Wheeler P.C.T.	synoptic survey
1991	Whitetail P.A.	synoptic survey
1992	Coffee Pot	synoptic survey
1992	Slice	synoptic survey
1992	Wheeler Sub Soil	synoptic survey
1992	Wheeler	synoptic survey
1993	Bologna Basin	synoptic survey
1993	Chunk	synoptic survey
1993	Tamarack-Mahogany 2	synoptic survey
1997	21B Lower Kahler	synoptic survey
1998	Tamarack-Mahogany	synoptic survey
1999	Rimrock Carex Blitz	targeted survey for Carex backii
2002	Tamarack-Monument Allotment	synoptic survey
2006	Collins Butte ELBO Blitz	targeted survey for Eleocharis bolanderi
2006	Yellowjacket ELBO Blitz	year not certain, but within +/- 2 years / targeted survey for Eleocharis bolanderi
2007	West End OHV ELBO Blitz	targeted survey for Eleocharis bolanderi

2008	Winlock Allotment East	synoptic survey
2010	Tamarack Mtn.	synoptic survey

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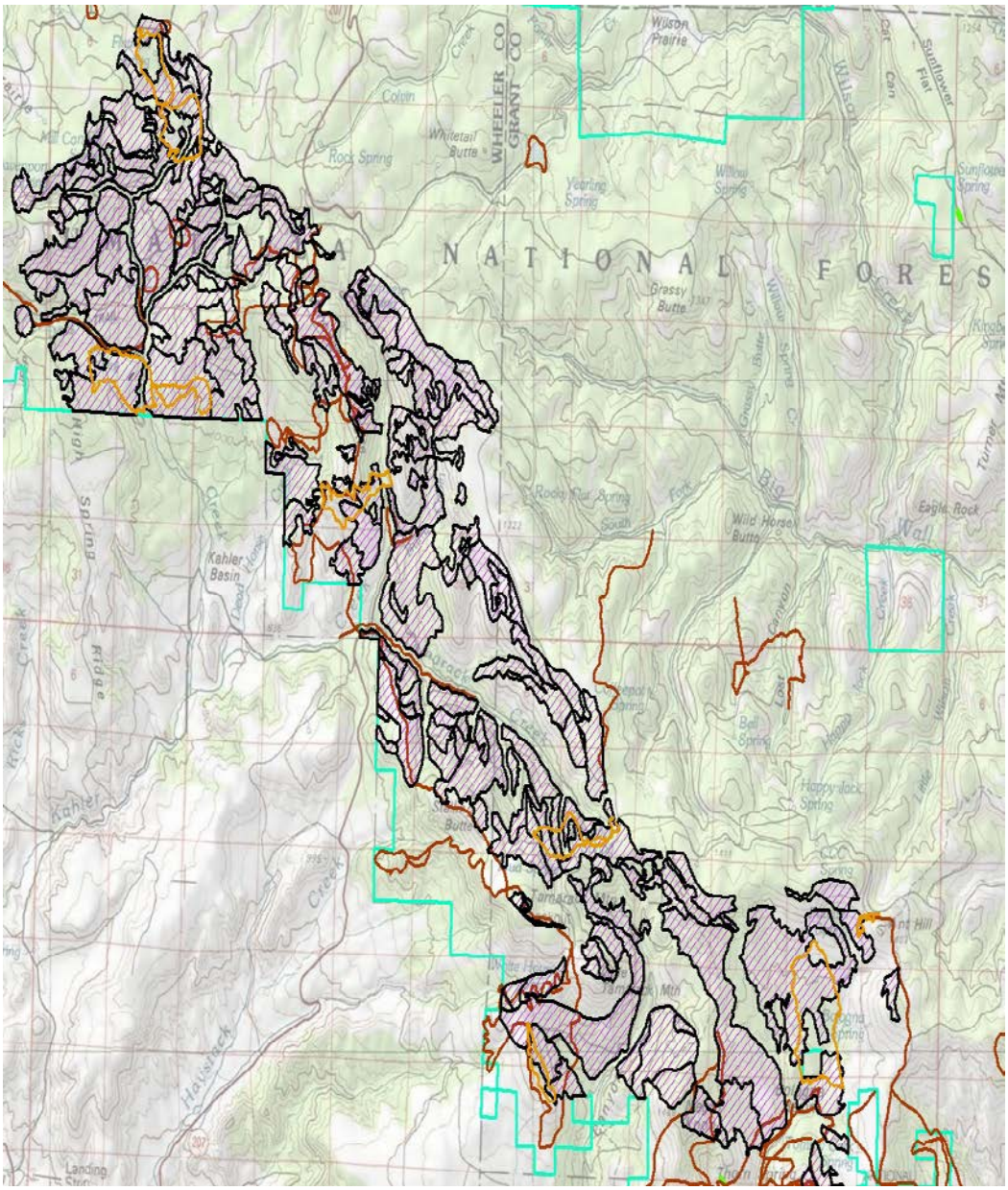

Figure 3. Botanical survey tracks within the KDFRPA. Tracks in orange represent surveys conducted in 2012 and 2013. Survey tracks in brown represent historical surveys conducted within the last 25 years

Rare Plant Populations

The botanical surveys conducted during 2012, and again in 2013, resulted in the discovery of 3 populations of rare plants. At the present time none of these 3 taxa are listed ‘sensitive’ on the RFSSSL.

Discussion of each of these species and populations includes their respective status with ORBIC. ORBIC List 1 contains taxa that are threatened with extinction or presumed to be extinct throughout their range. ORBIC List 2 contains taxa that are threatened with extirpation or presumed to be extirpated from the state of Oregon. These are often peripheral or disjunct species which are of concern when considering species diversity within Oregon's borders. List 3 contains taxa for which more information is needed before status can be determined.

Cryptantha rostellata

Cryptantha rostellata was encountered at a single location on the KDFRPA on 6 June 2013 (Figure 4) in proposed Kahler unit 22. This occurrence marked the first time that the species has ever been documented and collected on the Umatilla N.F. Indeed it is the first time that the species has been found in all of northeast Oregon in many decades. A review of state collection records indicates that this species has been overlooked and is a candidate for rare status by ORBIC. It is already listed as rare in Washington, and it appears to be rare throughout its range (California, Idaho and Nevada).

Cryptantha rostellata is a small annual species with minute white flowers (Figure 5). It is found in very xeric sites on rocky substrates that may or may not include a significant component of western juniper.

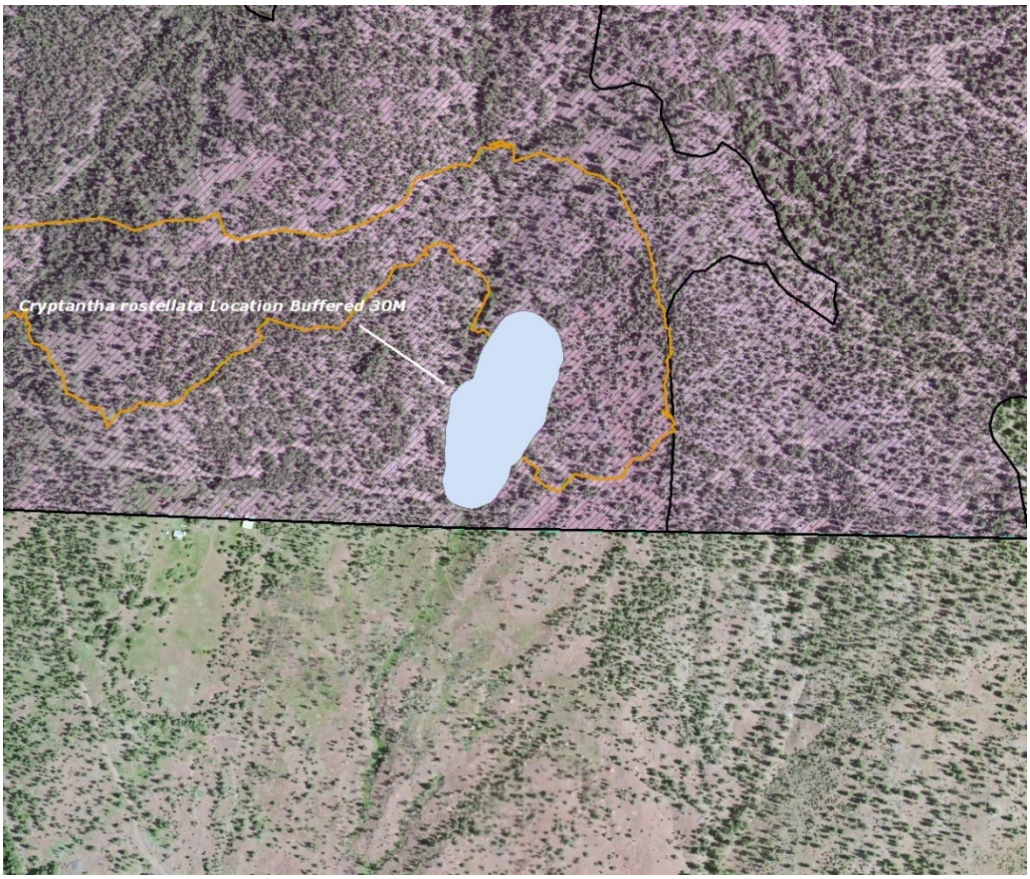

Figure 4. Location of *Cryptantha rostellata* population within the KDFRPA. Track in orange represents survey conducted on 12 June 2013.

Figure 5. Photo of *Cryptantha rostellata*

Erigeron instillauratus

Erigeron instillauratus was discovered on 25 July 2013 as a population of perhaps a few dozen genets (Figure 6) in proposed Kahler unit 14. The species is strongly rhizomatous, so the true number of individuals is not easy to assess. The plants are on the crest of a moderate rocky slope under a canopy of ponderosa pine and subordinate Douglas fir. It was a surprise to discover this species on the project as the other two known locations of the species on the Umatilla National Forest are far to the north on the Walla Walla ranger district – although an apparent occurrence of this species is now also known from far to the south on the Malheur National Forest (Paula Brooks pers. comm. 2013).

While it is very similar morphologically to the more widespread *Erigeron inornatus* (particularly common in California where nearly 600 collections have been made over the years), this plant species was discovered on the Walla Walla Ranger District in 2012 and recognized as being distinctly different in several respects (Figure 7). Confirmation of these plants in northeast Oregon as an entirely new species was provided by the expert in the genus, Dr. Guy Nesom. The species has yet to be published, and it may be a few years before the species is formally recognized as a valid taxonomic entity.

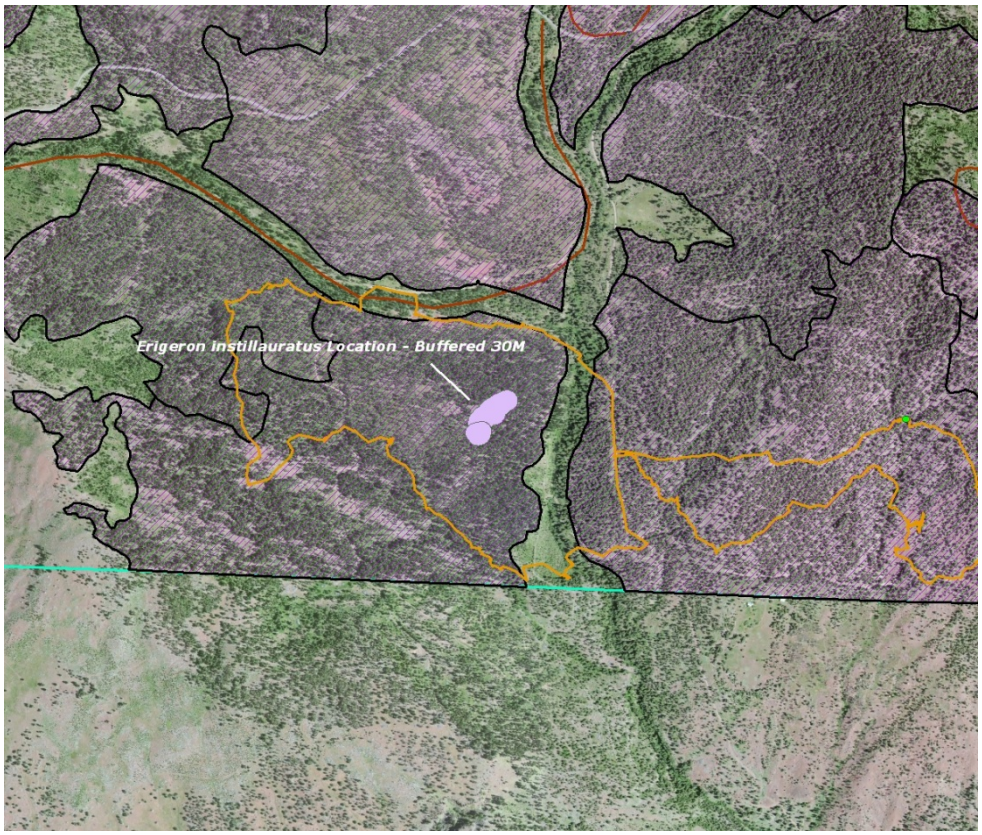

Figure 6. Location of *Erigeron instillauratus* population within the KDFRPA. Tracks in orange represent survey conducted on 6 June 2013 (east) and 11 June 2013 (west).

Figure 7. Photo of *Erigeron instillauratus*

Pyrola dentata

Pyrola dentata was found as a population of a single plant on 6 June 2013 (Figures 8, 9) in proposed treatment unit 22 in the KDFRPA. At present this species is recognized by ORBIC as a List 3 review species with a questionable S2 ranking status. On molecular genetic grounds, the species has recently been resurrected as a separate species. It is recognized as perhaps the rarest of all members of the genus in North America (Jolles pers. comm. 2011).

While the species is most typically found on serpentine substrates, it is also known to occur sporadically under canopy of xeric coniferous forest (Jolles pers. comm. 2011). As is the case with the KDFRPA occurrence, it is commonly found in small populations – often only a few individuals.

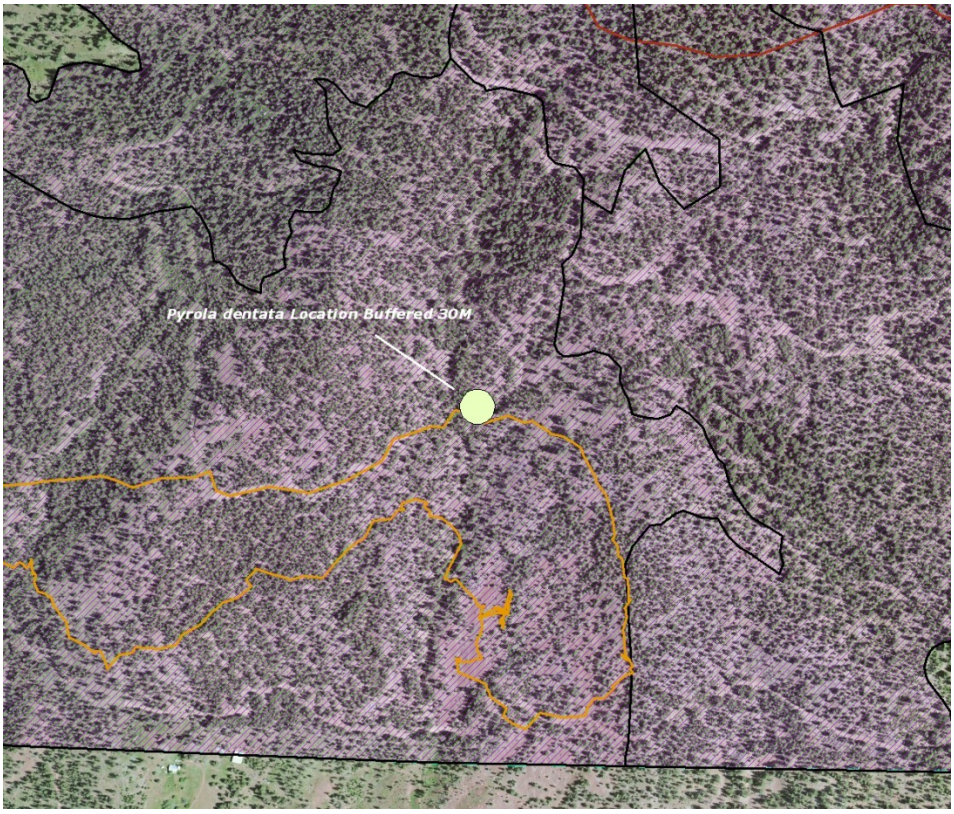

Figure 8. Location of *Pyrola dentata* on the KDFRPA in unit 22.

Figure 9. Photo of *Pyrola dentata* on the KDFRPA in unit 22.

Henry Creek Proposed Botanical Area

During the course of conducting surveys on the 11th of June 2013 on the KDFRPA an unusual botanical area was encountered. A large display of the species *Wyethia amplexicaulis* (mule's ears) was discovered under a canopy of ponderosa pine, Douglas fir, and sparse western juniper. This appears to be a unique botanical setting for the plant in Region 6.

In the Blue Mountains region *Wyethia amplexicaulis* (mule's ears) occurs almost exclusively in open sunny rocky soil sites – it does particularly well on substrates that include some component of clay. In the Blue Mountain the species is rarely to be found in abundance under a sparse canopy of ponderosa pine. The species is well-known for being an aggressive and persistent increaser under heavy grazing pressure.

In this small portion of the Henry Creek area (Figure 10), *Wyethia amplexicaulis* is found coincident with a soil type that includes a well-developed clay horizon. The plants occur in great abundance under a moderate canopy of ponderosa pine, Douglas fir and western juniper (Figure 11). Plant associations within this area range from ponderosa pine / elk sedge to the more mesic Douglas fir / common snowberry. This particular setting appears to be unique for the Blue Mountains region although some similar occurrences may occur well to the east on the Bridger-Teton and Targhee national forests in Wyoming and Idaho.

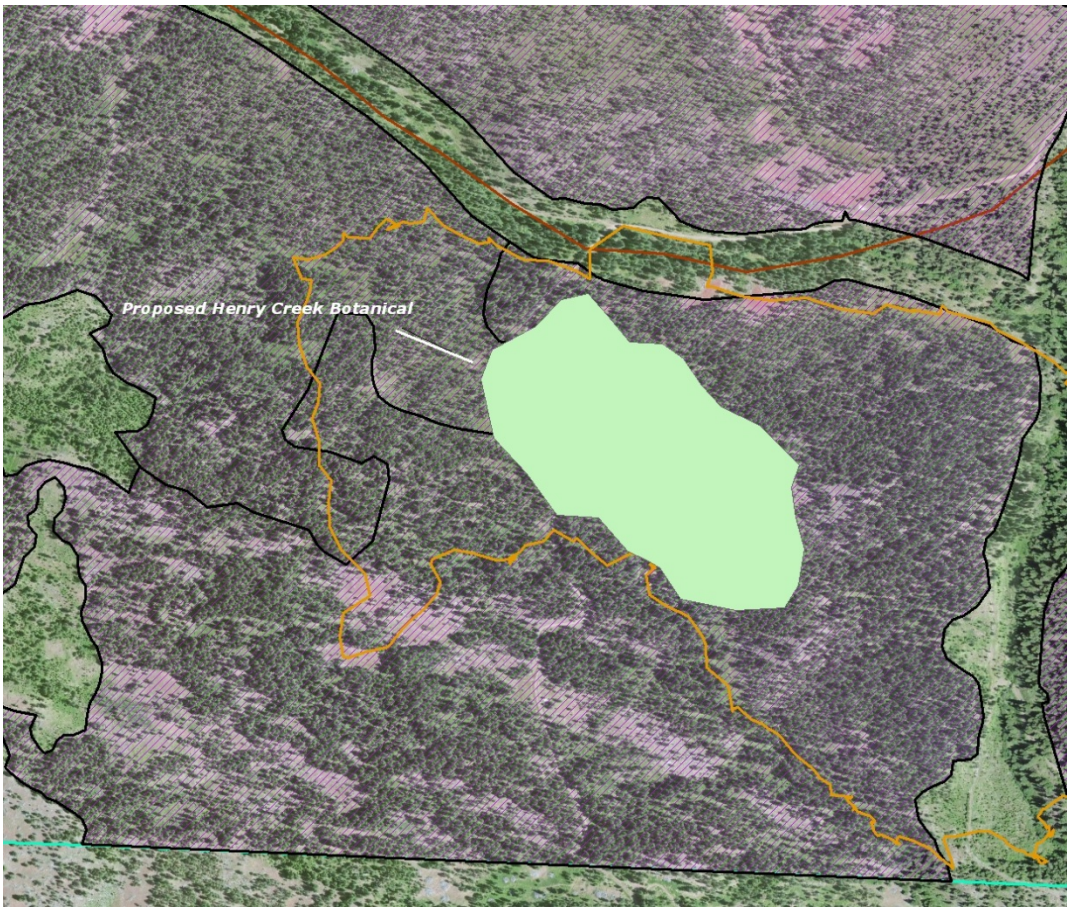

Figure 10. Location of proposed Henry Creek Botanical Area in KDFRPA Unit 14.

Figure 11. *Wyethia amplexicaulis* in the proposed Henry Creek Botanical Area.

The proposed Henry Creek Botanical Area does not show any evidence of having been subjected to grazing activity at any point in the past; the setting is apparently an entirely naturally-occurring ecological entity. In support of this conjecture a hitherto unmapped spring-fed small perennial stream immediately adjacent to the proposed area has banks that are fully intact. This stream course is so narrowly incised and overgrown by native vegetation that it is not readily visible until one is directly on top of it. A stock pond has been constructed along this stream at some point in the past, but it clearly receives light usage.

This proposed Henry Creek Botanical Area will be incorporated into the Forest Plan Revision process between draft and final. It will be preserved for its unique botanical and soil characteristics.

Kahler Creek Butte proposed Research Natural Area (pRNA)

The Kahler Creek Butte pRNA is located on a high elevation plateau characterized by shallow soils and areas of exposed gravels interspersed with areas of mounded soils. The natural area cell represented in this RNA is the rigid sagebrush shrubland vegetation as identified by the Oregon Natural Heritage Advisory Council (2003). Timber harvest is not allowed in RNAs and there is no proposed logging in the pRNA. Three commercial thinning units (49 and 49b skyline/helicopter and 49a ground-based) are located adjacent to the pRNA to the north.

Observations of field going botany personnel on the Umatilla National Forest and neighboring forests in the Blue Mountains are mounting evidence for concern over declining rigid sagebrush communities and the increasing presence of invasive annual grasses such as ventenata grass. Shallow scabland communities typically did not burn very often due to the general absence of fuel and rigid sagebrush is poorly adapted to fire. A field visit in October 2013 by area ecologist Sabine Mellmann-Brown confirmed an abundance of ventenata grass in the pRNA. There is concern that with this invasion of non-native annuals, the fuel conditions could be changed and the introduction of fire may threaten the integrity of the rigid sage community the RNA is proposed for. Prescribed fire can be used to enhance the cell characteristics of RNAs but in this case, design criteria will be developed to keep fire out of this vulnerable plant community.

Management Direction

Desired Condition

As stated in the Kahler EA, the purpose of the KDFRP is to restore dry forest conditions to a resilient, fire adapted landscape by moving the project area towards its range of variability in forest structure, tree density, species composition, and associated wildlife and aquatic habitat . Ultimately this management approach is intended to create conditions that enhance vascular – and non-vascular – plant diversity. This analysis however does not take into account the expected, but largely poorly defined, departures from Historic Range of Variability (HRV) that ongoing changes in climate are expected to illicit.

The vision of bringing botanical resources more into line with the HRV is in compliance with the intent of the present land and resource management planning rule for the Umatilla National Forest (1990). The forest plan includes the goal, ‘maintain or improve habitats for all threatened and endangered plant and animal species on the forest, and manage habitats for all sensitive species to prevent their becoming threatened or endangered.’ Under the National Forest Management Act, the population viability boundary stops at the forest boundary. The project, as discussed here, is consistent with both existing ESA regulations and the 1990 planning rule. Before implementation and during operations, if sensitive plant

populations are discovered in the project area, the Forest Botanist will be contacted immediately and appropriate actions will be taken to insure the plants are protected.

Environmental Consequences

Alternative 1 – No Action

Under Alternative 1, the Kahler project would not be implemented. There are no sensitive plant species listed on the RFSSSL known to occur in the project area and the three rare plant species described under 'existing conditions' above would likely continue to occupy their current niches but may not have been discovered and documented without the surveys associated with the proposed Kahler project. The fuels reduction associated with the logging units proximal to the Kahler Creek Butte pRNA would not occur which would increase the risk of wildfire burning the rigid sage plant community with the resultant risk of ventenata grass further degrading this already endangered plant community. The proposed Henry Creek Botanical Area would likely continue to thrive in its unique habitat under the 'no action' alternative.

Action Alternatives 2 (Proposed Action) and 3

Complete descriptions of the Proposed Action (Alternative 2) and Alternative 3 are located in Chapter 2 of the Environmental Assessment (EA) for the Kahler Dry Forest Restoration project. A brief overview of both action alternatives is included here.

The Kahler project proposes to use variable density thinning with skips and gaps to reduce tree density, shift species composition, and promote old forest structure across approximately 10,677 acres within the project area.

Western juniper and other conifer species (including ponderosa pine and Douglas-fir) have spread from historically occupied habitat into grassland and shrub-steppe habitats in the Kahler area, based on examination of 1939 aerial photographs. Grassland/shrub-steppe enhancement through conifer reduction would occur on approximately 333 acres in the project area.

Following mechanical treatment, approximately 27,422 acres of the project area will be treated using prescribed fire. This treatment would reintroduce fire to a fire-dependent ecosystem blackening about 50-75% of the area to lessen the impact of a future wildfire, improve forage quality for big game, and encourage ponderosa pine recruitment.

Noncommercial thinning would occur on approximately 6,135 acres; 1,077 acres outside harvest units and 5,058 acres within harvest units. The noncommercial thinning treatment will cut conifer seedlings, saplings, and small poles, generally up to 7 inches in diameter at breast height (dbh), and western juniper trees less than 12 inches diameter, to help meet forest vegetation needs identified in the Kahler project's purpose and need, including tree vigor improvement for insect and disease resistance, restoring and maintaining a sustainable species composition, increasing forage for native and domestic ungulates, and addressing fire hazard by reducing ladder fuels.

Approximately 800 acres of dry upland, high density forest stands are within intermittent stream riparian habitat conservation areas (category 4 RHCAs) in proposed units and would be treated to maintain or restore riparian habitat and upland vegetation including improvement of channel function and floodplain connectivity using a variable width no-mechanical zone adjacent to the stream channels.

For further proposed actions included in Alternative 2 such as Tamarack Fire Lookout thinning, danger tree removal, aspen restoration, reforestation, treatment of residual debris, road construction, and forest plan amendments, refer to Chapter 2 in the Kahler EA.

Alternative 3 was developed to address the key issues described in Chapter 1 of the Kahler EA. Acres of commercial thinning are reduced in order to retain cover for elk as well as to retain dense multi-strata ponderosa pine and mixed conifer stands distributed across the landscape to provide for the needs of associated wildlife species, including the pileated woodpecker. A reduction in the acres of commercial thinning would also reduce the miles of temporary road and closed roads required to access treatment units. For a complete description of Alternative 3 and comparison of acres and harvest systems between action alternatives, refer to Chapter 2 in the Kahler EA.

Project Design Features

'Areas to protect' (ATP) will be implemented at 3 rare plant population locations in units 14 and 22. Both of these units are proposed for ground-based commercial thinning in Alternatives 2 and 3. These 'areas to protect' are buffered (30 m) rare plant populations.

These 'areas to protect' shall be excluded from ground-disturbing treatments by implementing a no-ground-disturbance buffer around each site of a size adequate to provide protection from implementation impacts. All off-road vehicles, trucks, and equipment shall avoid operation and travel in these areas. Decking, yarding, and piling of slash shall not occur in these areas. Camps and staging areas shall not be allowed. Fire control lines shall not be constructed in these areas. Each buffer size will be determined based on the site-specific setting of the occurrence, although the customary minimum is 30 meters. If it is determined to be necessary for project implementation, these areas will be identified (flagged) on the ground. 'Areas to protect' will be specified in timber sale contract maps. Trees will be directionally felled away from these 'areas to protect.'

If any new rare plant populations are located before or during project implementation, a Forest Service Botanist will be notified. The population will be evaluated and design criteria shall be developed in consultation with the botanist.

The proposed Henry Creek Botanical Area is another designated 'area to protect' in unit 14 with a small portion in unit 12. Both units are proposed for ground-based commercial thinning and this 'ATP' includes the same design criteria as stated for 'areas to protect' in narrative above.

Prescribed fire will be kept away from the Kahler Creek Butte proposed Research Natural Area by spring backburning in Idaho fescue plant communities bordering the RNA creating a black line where possible and practical.

Direct and Indirect Effects

There are no RFSSSL listed sensitive plant populations in the Kahler project area and as a result, the proposed project will have no effect/impact to any sensitive plants. The 3 rare plants in units 14 and 22 will be protected from direct disturbance associated with proposed treatment activities by being excluded from project activities as described in the design criteria above. There will be no direct effects to the proposed Henry Creek Botanical Area from logging activities. This special area is an 'area to protect' and will be excluded from all logging activities.

Prescribed fire will be implemented in the rare plant populations as well as in the proposed Henry Creek Botanical Area. Effects from fire are expected to be beneficial to these plant communities. An exception to this is the Kahler Creek Butte proposed RNA. The decline of rigid sagebrush and the invasion of this community by ventenata grass has resulted in the need to keep fire away. The design criteria described above in addition to the reduction in fuel load by logging activities in proximal units 49, 49a and 49b will reduce the likelihood of any direct effects from fire to the pRNA.

An indirect effect from proposed project activities is an increase in invasive plant spread with resulting habitat degradation. This risk of habitat degradation from increased invasive plant spread will be lessened by design criteria for noxious weeds found in Chapter 2. These design criteria include treatment of invasive plant infestations before and after project activities, equipment washing, revegetation standards with native plants, as well as timber sale contract maps including known weed infestations to avoid.

Cumulative Effects

Spatial and Temporal Context for Effects Analysis

The spatial boundaries for analyzing the cumulative effects to sensitive plants are the Kahler project boundary because that is where the proposed project treatment activities are located. The temporal boundaries begin with the first European settlers in the area in the 1800's and end approximately 10 years into the future or 2024, based on the knowledge of proposed projects in the Kahler project area.

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

All ground disturbing activities included in the list of past, present and reasonably foreseeable activities for the Kahler project in the EA (Chapter 3) are relevant to cumulative effects analysis for sensitive plants.

Given that no RFSSSL plants are known to occur in the Kahler project area, and there are no direct and/or indirect effects/impacts, there are no cumulative effects. The one potential indirect effect from proposed treatment activities of increasing invasive plants discussed above with regard to effects on rare plants is further exacerbated when considered as part of cumulative effects analysis. Certainly all past, present and reasonably foreseeable ground disturbing events have potential to exacerbate invasive plant spread leading to habitat degradation. Design criteria for invasive plants will lessen this risk of invasive plant spread.

Regulatory Framework

Land and Resource Management Plan

The proposed Kahler Dry Forest Restoration project is consistent with the following standards from the Umatilla National Forest Land and Resource Management Plan (1990):

- Legal and biological requirements for the conservation of endangered, threatened and sensitive plants and animals will be met. All proposed projects that involve ground disturbance or have the potential to alter habitat of endangered, threatened or sensitive plant and animal species will be evaluated to determine if any of these species are present.
- When sensitive species are present, a biological evaluation will be prepared. There must be no impacts to sensitive species without analysis of the significance of adverse effects on its population, habitat, and on the viability of the species as a whole.

Management Areas

The proposed Kahler Dry Forest Restoration project is consistent with the following standards for Botanical Areas (Special Interest Areas) and proposed Research Natural Areas (RNAs) from the Umatilla National Forest Land and Resource Management Plan (1990):

- Timber harvest will not be scheduled or programmed in botanical areas (special interest area, A9). Tree cutting and vegetation management may be permitted in order to maintain or enhance the special features of the interest area, to provide for public safety, to construct or maintain improvements, or in a catastrophic situation. Fuel treatments should emphasize maintenance of the natural character of the area.
- Timber management use and practices are excluded from proposed and established RNAs. Cutting and removal of vegetation is prohibited except as part of an approved scientific investigation. If authorized in a management plan, low intensity unplanned fire or prescribed burns may be used as a tool to mimic a natural fire to 1) perpetuate the sere and thus the cells the RNA represents; 2) return fire to its natural role in the area; and 3) return plant communities to a condition similar to that existing prior to active fire suppression.

Summary

In summary, there are no impacts/effects to any RFSSSL sensitive plant species since there are none documented in the Kahler project area. The 3 rare plant populations documented during project surveys will be protected by buffering these plant populations as described in the design criteria. These 'areas to protect' will be avoided during project implementation.

Two management areas within the Kahler project area are excluded from logging activities. The proposed Henry Creek Botanical Area is an 'area to protect' in Units 12 and 14 as described in the design criteria. The proposed Kahler Creek Butte RNA is outside of any proposed treatment units and will be protected from fire to the extent practical as described in the design criteria.

References Cited

Brooks, Paula. 2013. Malheur National Forest. Personal Telephone Communication.

Consortium of Pacific Northwest Herbaria. 2007-2013. University of Washington Herbarium, Burke Museum of Natural History and Culture, University of Washington, Seattle. View online at various dates <http://www.pnwherbaria.org/data/search.php>.

Cronquist, A., A. H. Holmgren, N. H. Holmgren, & J. L. Reveal. 1972 – 2011. Intermountain Flora. Vascular Plants of the Intermountain West, U.S.A. Vols. 1-6. New York: Hafner Publ. Co., Inc.

Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 16+ vols. New York and Oxford.

Hitchcock, C.L., and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, WA.

Jolles, Diana. 2011. Rancho Santa Ana Botanical Garden. Personal Telephone Communication.

Oregon Biodiversity Information Center. 2013. Rare, Threatened and Endangered Species of Oregon. Institute for Natural Resources, Portland State University, Portland, Oregon. 111 pp.

Oregon Natural Heritage Advisory Council. 2003. Oregon Natural Heritage Plan. Division of State Lands, State of Oregon, Salem, OR. 167 pp.

Appendix A. List of Plant Species Encountered

Abies grandis
Achillea millefolium
Achnatherum lemmonii lemmonii
Achnatherum thurberianum
Adenocaulon bicolor
Agoseris aurantiaca aurantiaca
Agoseris glauca
Agoseris grandiflora
Agoseris heterophylla
Agoseris retrorsa
Allium acuminatum
Allium madidum
Allium tolmiei tolmiei
Alnus incana tenuifolia
Alopecurus pratensis
Alyssum alyssoides
Amelanchier alnifolia alnifolia
Amsinckia menziesii menziesii
Antennaria anaphaloides
Antennaria argentea
Antennaria dimorpha
Antennaria luzuloides
Antennaria rosea
Apocynum androsaemifolium
Aquilegia formosa
Arabis glabra
Arabis holboellii retrofracta
Arceuthobium campylopodum
Arctostaphylos nevadensis
Arnica cordifolia
Arrhenatherum elatius
Artemisia rigida
Asclepias fascicularis
Astragalus diaphanus
Astragalus filipes
Astragalus purshii purshii
Balsamorhiza careyana intermedia
Balsamorhiza sagittata
Barbarea orthoceras
Besseya rubra
Blepharipappus scaber scaber
Bromus arvensis
Bromus carinatus
Bromus inermis inermis
Bromus marginatus
Bromus racemosus
Bromus vulgaris
Calamagrostis rubescens
Calochortus eurycarpus
Calochortus macrocarpus macrocarpus
Calypso bulbosa
Camassia quamash
Carex amplifolia
Carex aquatilis aquatilis
Carex athrostachya
Carex bolanderi
Carex concinnoides
Carex geyeri
Carex hoodii
Carex microptera
Carex multicostata
Carex pachystachya
Carex pellita
Carex praegracilis
Carex rossii
Carex utriculata
Castilleja hispida acuta
Castilleja linariifolia
Ceanothus sanguineus
Ceanothus velutinus
Cerastium glomeratum
Cercocarpus ledifolius intercedens
Chaenactis douglasii douglasii
Chamerion angustifolium
Chimaphila umbellata occidentalis
Cinna latifolia
Cirsium arvense
Cirsium neomexicanum
Cirsium undulatum undulatum
Cirsium vulgare
Clarkia pulchella
Clarkia rhomboidea
Claytonia perfoliata perfoliata
Claytonia rubra rubra
Clematis ligusticifolia
Clintonia uniflora
Collinsia parviflora
Collomia grandiflora
Collomia linearis
Convolvulus arvensis
Cornus sericea sericea
Crataegus douglasii
Crepis atribarba
Crepis intermedia
Crepis occidentalis
Cryptantha celosioides
Cryptantha flaccida
Cryptantha intermedia
Cryptantha rostellata
Cryptantha torreyana
Cryptantha watsonii
Cypripedium montanum
Cystopteris fragilis
Dactylis glomerata
Danthonia unispicata
Delphinium nuttallianum
Deschampsia cespitosa
Dipsacus fullonum
Dodecatheon conjugens
Draba verna
Elymus elymoides elymoides
Elymus glaucus glaucus
Elymus multisetus
Epilobium brachycarpum
Epilobium minutum
Equisetum arvense
Equisetum hyemale

Equisetum laevigatum
Ericameria nauseosa nauseosa
Erigeron chrysopsidis
Erigeron corymbosus
Erigeron linearis
Erigeron philadelphicus
Eriogonum compositum compositum
Eriogonum heracleoides
Eriogonum strictum
Eriogonum umbellatum ellipticum
Eriogonum vimineum
Eriophyllum lanatum
Erodium cicutarium
Erythronium grandiflorum
Eurybia conspicua
Euthamia occidentalis
Festuca idahoensis
Festuca occidentalis
Festuca rubra
Floerkea proserpinacoides
Fragaria vesca
Fragaria virginiana platypetala
Frasera speciosa
Fritillaria atropurpurea
Fritillaria pudica
Galium aparine
Galium boreale
Galium multiflorum
Galium triflorum
Gayophytum ramosissimum
Geranium viscossimum viscossimum
Geum macrophyllum perincisum
Geum triflorum ciliatum
Goodyera oblongifolia
Grindelia nana nana
Helianthella uniflora douglasii
Heracleum maximum
Hesperochiron pumilus
Heuchera cylindrica
Hieracium albiflorum
Hieracium cynoglossoides
Hieracium scouleri albertinum
Hieracium scouleri scouleri
Holodiscus discolor
Holosteum umbellatum
Hydrophyllum capitatum
Hypericum perforatum
Idahoa scapigera
Iris missouriensis
Juncus arcticus littoralis
Juncus confusus
Juniperus occidentalis
Koeleria macrantha
Lactuca serriola
Lagophylla ramosissima
Larix occidentalis
Lathyrus nevadensis
Lathyrus pauciflorus
Lemna minor
Leymus cinereus
Linnaea borealis
Linum lewisii lewisii
Lithophragma parviflorum
Lithospermum ruderale
Lomatium ambiguum
Lomatium bicolor leptocarpum
Lomatium dissectum multifidum
Lomatium donnellii
Lomatium grayi grayi
Lomatium macrocarpum
Lomatium nudicaule
Lomatium piperi
Lomatium simplex simplex
Lomatium tamanitchii
Lomatium triternatum triternatum
Lonicera ciliosa
Lotus unifoliolatus unifoliolatus
Lupinus caudatus
Lupinus leucophyllus
Luzula multiflora multiflora multiflora
Machaeranthera canescens
Madia citriodora
Madia exigua
Madia glomerata
Madia gracilis
Mahonia repens
Maianthemum racemosum racemosum
Maianthemum stellatum
Medicago lupulina
Melica bulbosa
Melilotus officinalis
Mentha arvensis
Mertensia longiflora
Microseris nutans
Microsteris gracilis gracilis
Mimulus breviflorus
Mimulus guttatus
Moehringia macrophylla
Montia chamissoi
Montia linearis
Myosotis stricta
Navarretia intertexta intertexta
Nemophila pedunculata
Olsynium douglasii inflatum
Onopordum acanthium
Orobanche fasciculata
Orobanche uniflora
Orthilia secunda
Osmorhiza berteroi
Osmorhiza depauperata
Osmorhiza occidentalis
Paeonia brownii
Paxistima myrsinites
Penstemon attenuatus attenuatus
Penstemon deustus deustus
Penstemon gairdneri
Penstemon procerus
Penstemon richardsonii
Perideridia gairdneri borealis
Phacelia hastata
Phacelia heterophylla
Phacelia linearis
Philadelphus lewisii
Phleum pratense
Phlox hoodii
Phoenicaulis cheiranthoides
Phoradendron juniperinum
Physaria occidentalis occidentalis
Picea engelmannii

Pinus contorta latifolia
Pinus ponderosa
Plagiobothrys scouleri scouleri
Plagiobothrys tenellus
Plectritis macrocera
Poa bulbosa
Poa nemoralis nemoralis
Poa pratensis
Poa secunda
Poa wheeleri
Polygonum bistortoides
Polygonum douglasii majus
Polystichum munitum
Populus tremuloides
Potentilla arguta convallaria
Potentilla glandulosa pseudorupestris
Potentilla gracilis flabelliformis
Prosartes trachycarpa
Prunus emarginata emarginata
Prunus virginiana
Pseudoroegneria spicata spicata
Pseudotsuga menziesii
Pteridium aquilinum pubescens
Pterospora andromedea
Purshia tridentata
Pyrola asarifolia
Pyrola dentata
Pyrrocoma carthamoides cusickii
Ranunculus alismifolius
Ranunculus occidentalis
Ranunculus orthorhynchus orthorhynchus
Ranunculus uncinatus uncinatus
Ribes cereum cereum
Ribes lacustre
Rosa gymnocarpa
Rosa nutkana
Rosa woodsii
Rubus parviflorus
Rumex acetosella
Rumex crispus
Rumex salicifolius
Salix lucida caudata
Salix prolixa
Sambucus nigra cerulea
Sanguisorba annua
Saxifraga nidifica nidifica
Saxifraga odontoloma
Schoenoplectus acutus occidentalis
Scirpus microcarpus
Scutellaria angustifolia angustifolia
Sedum stenopetalum
Selaginella wallacei
Senecio hydrophiloides
Senecio integerrimus exaltatus
Shepherdia canadensis
Sidalcea oregana oregana procera
Silene menziesii menziesii menziesii
Silene oregana
Silene scaposa scaposa
Sisyrinchium idahoense occidentale
Spiraea betulifolia lucida
Stellaria longipes longipes
Stenotus lanuginosus
Symphoricarpos albus laevigatus
Symphoricarpos oreophilus
Symphyotrichum foliaceum foliaceum
Taeniatherum caput-medusae
Taraxacum laevigatum
Taraxacum officinale
Taxus brevifolia
Thlaspi montanum montanum
Tragopogon dubius
Trifolium cyathiferum
Trifolium macrocephalum
Trillium petiolatum
Trisetum canescens
Triteleia grandiflora grandiflora
Triteleia hyacinthina
Typha latifolia
Urtica dioica gracilis
Vaccinium membranaceum
Vaccinium scoparium
Ventenata dubia
Veratrum californicum
Verbascum thapsus
Veronica americana
Veronica serpyllifolia humifusa
Vicia americana americana
Viola adunca
Viola vallicola major
Vulpia microstachys microstachys
Vulpia myuros
Woodsia oregana
Wyethia amplexicaulis
Zigadenus paniculatus
Zigadenus venenosus gramineus

Appendix B

Economics Report

ECONOMICS REPORT

KAHLER DRY FOREST RESTORATION PROJECT

Heppner Ranger District
Umatilla National Forest

Date

Prepared by Tim Garber / Brian Spivey

Reviewed by Michael Barger

KAHLER DRY FOREST RESTORATION PROJECT ECONOMICS

Economics

This section incorporates by reference the Kahler Dry Forest Restoration Project Economics Report contained in the project analysis file at the Heppner Ranger District. Specific information on the methodologies, assumptions, and limitations of analysis and other details are contained in the report. A summary of the current conditions of the affected environment and the predicted effects of the Proposed Action and its alternatives are discussed in this section.

Scope of Analysis

The direct revenue and costs are identified for each alternative measuring the value of wood products to determine the estimated value of each alternative and viability of the Kahler Project with the alternatives identified. While there are other economic values in terms of revenues and costs that will be created from the implementation of this project to wildlife (terrestrial, aquatic), recreation, roads, soil, water and vegetation, the values are intangible and subject to individual personal judgment. Therefore given the inability to determine each person's values for each resource respective of the alternatives those values are unavailable and cannot be used.

This section deals with the economic viability of the Kahler Project area timber sales. Economic viability is dependent on costs and revenues associated with a particular timber sale. Timber sales, non-commercial thinning, fuel treatments, and associated resource work can generate employment and stimulate the local economy.

Other environmental factors such as water quality, fish, wildlife, productivity, have value that can be expressed in economic or non-economic terms. However, these other environmental factors do not have financial benefits and cost that are identifiable and quantifiable with relationship to the activities proposed for the Kahler Project. Therefore, an analysis would not show any financial or economic difference in those factors between alternatives. Therefore, economic analysis of those other environmental factors will not be included in this report.

Current Condition

The affected area, or economic impact zone, for the Umatilla National Forest consists of Grant, Morrow, Umatilla, Union, Wallowa, and Wheeler counties in Oregon. The Kahler Project includes Wheeler and Grant counties in Oregon. Economic profiles have been developed for Wheeler and Grant counties and are available at the Heppner Ranger district. The profiles summarize demographic, employment, and income trends in those counties. Refer to the Umatilla National Forest, land and Resource Management Plan, Final Environmental Impact Statement, Appendix B, for additional detail description of the main social and economic characteristics of the area (USDA 1990).

Direct and Indirect Effects

Timber values and logging costs have the most direct effect on the economic viability of this project. Market conditions may fluctuate widely throughout the year, and depending on the time of year the

sales are offered for auction, the current estimates may or may not be accurate, which could have an impact on the final sales values. Rising or falling fuel and delivered log prices could create a substantial increase or decrease in sale operation and manufacturing costs.

Table 1: Financial Summary Alternative #2

Units	Vol/ccf	**value**	Total ($)Stump-to-truck	Total($) Log Haul	Road Maint. $/total	total ($)BD & Erosion	Total Temp Roads ($)	**Sum of Costs**	**Net Value**
1 Ground based saw	53000	20,193,000	3,975,000	2,385,000	265,000	53,000	26,500	6,704,500	13,488,500
1 Ground based Green Bio	13000	390,000	975,000	585,000	65,000	13,000	6,500	1,644,500	(1,254,500)
2 Helicopter saw	5165	1,967,865	1,394,550	232,425	25,825	5,165	-	1,657,965	309,900
2 Helicopter Green Bio	0	-	-	-	-	-	-	-	-
3 Skyline saw	5813	2,214,753	726,625	261,585	29,065	5,813	5,813	1,028,901	1,185,852
3 Skyline Green Bio	646	19,380	80,750	29,070	3,230	646	646	114,342	(94,962)
4 Shrub Stepp/ Juniper	4916	147,480	368,700	221,220	24,580	4,916	2,458	621,874	(474,394)
Totals Stump to Truck	82540	24,932,478	7,520,625	3,714,300	412,700	82,540	41,917	11,772,082	13,160,396
Road Const and Oblit			7.1	miles	25,000	Cost per Mile		177,500	
Total Project									**12,982,896**

Table 2: Financial Summary Alternative #3

Units	Vol/ccf	value	$/total Stump-to-truck	$/total logHaul	$/total Road Maint.	total BD & Erosion ($)	Total/$ Temp Roads	Sum of Costs	Net Value
1 Ground Based saw	50820	19,362,420	3,811,500	2,286,900	254,100	50,820	25,410	6,428,730	12,933,690
1 Ground based Green Bio	12705	381,150	952,875	571,725	63,525	12,705	6,353	1,607,183	(1,226,033)
2 Helicopter saw	4083	1,555,623	1,102,410	183,735	20,415	4,083	-	1,310,643	244,980
2 Helicopter Green Bio	0	-	-	-	-	-	-	-	-
3 Skyline saw	6268	2,388,108	783,500	282,060	31,340	6,268	6,268	1,109,436	1,278,672
3 Skyline Green Bio	696	20,880	87,000	31,320	3,480	696	696	123,192	(102,312)
4 Shrub Stepp/ Juniper	4916	147,480	368,700	221,220	24,580	4,916	2,458	621,874	(474,394)
Totals Stump to Truck	79488	23,855,661	7,105,985	3,576,960	397,440	79,488	41,185	11,201,058	12,654,604
Road Const and Oblit			7.1	miles	25,000	Cost per Mile		177,500.00	
Total Project									**12,477,104**

Alternative 1

This alternative would not harvest any timber and therefore would not produce any revenue or support direct, indirect or induced employment, or increased income to local economies. Current downward trends in timber harvesting from National Forests lands would continue into the future. Current employment in the wood products sector of the local economy would remain unchanged.

Alternative 2

Alternative 2 was found to be financially viable with a net value of approximately $24,932,478 . Alternative 2 has a higher net value than alternative 3 because it has higher volume. This is attributed to harvesting more acres.

Alternative 3

Alternative 3 was found to be financially viable with a net value of approximately $23,855,661. Alternative 3 has a lower net value than alternative 2 because alternative 3 has fewer acres.

Cumulative Effects

Past Activities

Past timber harvest activities on all ownerships within the local area have affected the viability of timber harvest to the extent that the present industrial infrastructure and workforce have developed as a result of the past activities. The effects of specific activities on the viability of timber harvest are not measurable.

Present and Reasonably Foreseeable Activities

Due to the competitiveness of the market, and its global nature, none of the alternatives would in themselves affect prices, costs or harvest viability of other present or reasonably foreseeable timber sales in the area.

Appendix C

Fisheries Specialist Report

And

Biological Evaluation

Kahler Dry Forest Restoration Project

Fisheries Specialist Report

And

Biological Evaluation

Prepared by:

/s/ William Dowdy
William Dowdy
Fish Biologist

Reviewed by:

s/s Katherine Ramsey
Katherine Ramsey
Forest Fish Biologist

for:

Heppner Ranger District
Umatilla National Forest

August 19, 2014

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Introduction

This report evaluates the aquatic species and habitat conditions and discloses the potential direct, indirect and cumulative effects of the alternatives for the Kahler Dry Forest Restoration Project (Kahler Project). The specie(s) and habitats evaluated for this project include : Middle Columbia River steelhead *Oncorhynchus mykiss* and their designated critical habitat (DCH), Essential Fish Habitat (EFH), aquatic management indicator species (MIS) and Region 6 Regional Forester Sensitive Species. Middle Columbia steelhead are listed as Threatened under the Endangered Species Act. This report also evaluates the effect of the project on Essential Fish Habitat (EFH) as designated by the Magnuson-Stevens Fishery Conservation and Management Act.

The Kahler Dry Forest Restoration Specialist Report and Biological Evaluation was prepared in accordance with the following guidance and direction:

- Section 7(a)(2) of the Endangered Species Act of 1973 (as amended),
- Magnuson-Stevens Fishery Conservation and Management Act (§ 305(b)) and it's implementing regulations (50CFR § 600).
- National Forest Management Act of 1976
- Clean Water Act of 1972
- Land and Resource Management Plan – Umatilla National Forest (1990)
- PACFISH (1995)

Summary of Effects

Below, in Table 1, is the summary of effects for the Kahler Dry Forest Restoration Project on ESA listed and sensitive fisheries and aquatic species. Discussions leading to Determination of effects can be found on page 36 of this report.

Table 66. Summary of Effects by Alternative

	Effects Determination by Alternative		
Species	**Alternative 1**	**Alternative 2**	**Alternative 3**
Mid-Columbia Steelhead and Designated Critical Habitat	No Effect	may effect, but not likely to adversely affect	may effect, but not likely to adversely affect
Chinook salmon and Essential Fish Habitat (EFH)	No Effect	No Effect	No Effect
Mid-Columbia River Bull Trout and DCH	No Effect	No Effect	No Effect
Western Ridged Mussel	No Impact	may impact individuals or habitat, No Trend towards Listing	may impact individuals or habitat , No Trend towards Listing
Hells Canyon Land Snail	No Impact	No Impact	No Impact

Shortface Lanx	No Impact	No Impact	No Impact
Columbia Clubtail	No Impact	may impact individuals or habitat, No Trend towards Listing	may impact individuals or habitat, No Trend towards Listing
Westslope Cutthroat	No Impact	No Impact	No Impact

Scale of Analysis and Affected Environment

The Kahler Dry Forest Restoration Project is proposed in the headwaters of the Kahler Watershed (HUC 1707020401) in Grant and Wheeler Counties, Oregon. The Project proposes timber harvest, non-commercial thinning, mechanical fuel treatments, road use, construction, and maintenance, and prescribed burning. The Kahler Watershed is part of the Lower John Day River Sub-basin and the John Day River Basin, a tributary to the Mid-Columbia River. The watershed area is approximately 197,999 acres, of which 32,893 acres (17 percent) are managed by the US Forest Service (USFS). See Table 2. The Kahler Watershed is the Analysis Area for cumulative effects and contains the Kahler Project Area.

Table 67. Management of the Kahler Watershed

Manager	Acres	Percent
US Forest Service	32,893	17%
Other	165,106	83%
total	197,999	100%

TES and MIS Aquatic Life Histories

Threatened, Endangered and Sensitive (TES) Fish and Habitat
Middle Columbia River (MCR) Steelhead and their designated critical habitat are the only species and habitats listed under the Endangered Species Act (ESA), which are found in the project area (Figure 1). Information on the Regional Forester's sensitive species suspected or known to occur on the Umatilla National Forest can be found in Table 3.

Management Indicator Species (MIS)
Steelhead trout (anadromous) and rainbow trout (resident redband) are the designated aquatic Management Indicators Species (MIS) for the Umatilla National Forest. The Forest Plan was amended in 1995 by PACFISH which incorporated standards and guides to allow for near-natural rates of habitat restoration, and avoid adverse effects to listed species. Steelhead and rainbow trout are different life history expressions of the same species. Streams surveys and broadscale efforts, i.e. PACFISH/INFISH Biological Opinion, (aka "PIBO") monitoring are in place to collect data and monitor habitat conditions.

Middle Columbia River Steelhead and their Critical Habitat
Steelhead are the anadromous form of rainbow trout, a salmonid species native to western North America and the Pacific Coast of Asia. Redband trout are another name for native resident rainbow trout in the Interior Columbia River Basin and are indistinguishable visually from its anadromous form as juveniles. MCR Steelhead rear in freshwater streams for their first 1 to 3 years prior to smolting. They then migrate

to the ocean where they can spend up to 3 years before returning to their native freshwater stream to spawn. Unlike Pacific salmon, steelhead are iteroparous, meaning they do not necessarily die after spawning and are able to spawn more than once, although this varies among runs.

Steelhead display two broad life history patterns typically called summer-run and winter-run. Steelhead spawning occurs between March and May. Prior to spawning, maturing adults hold in pools or in side channels to avoid high winter flows. Typically, they spawn in stream reaches with a moderate to high gradient. Fry typically emerge between April and June. Summer steelhead in the NFJD can rear in freshwater habitat up to 4 winters. Migration to the ocean typically occurs at age 2 for wild summer steelhead, while most hatchery smolts migrate at age 1 (Carmichael and Taylor, 2009).

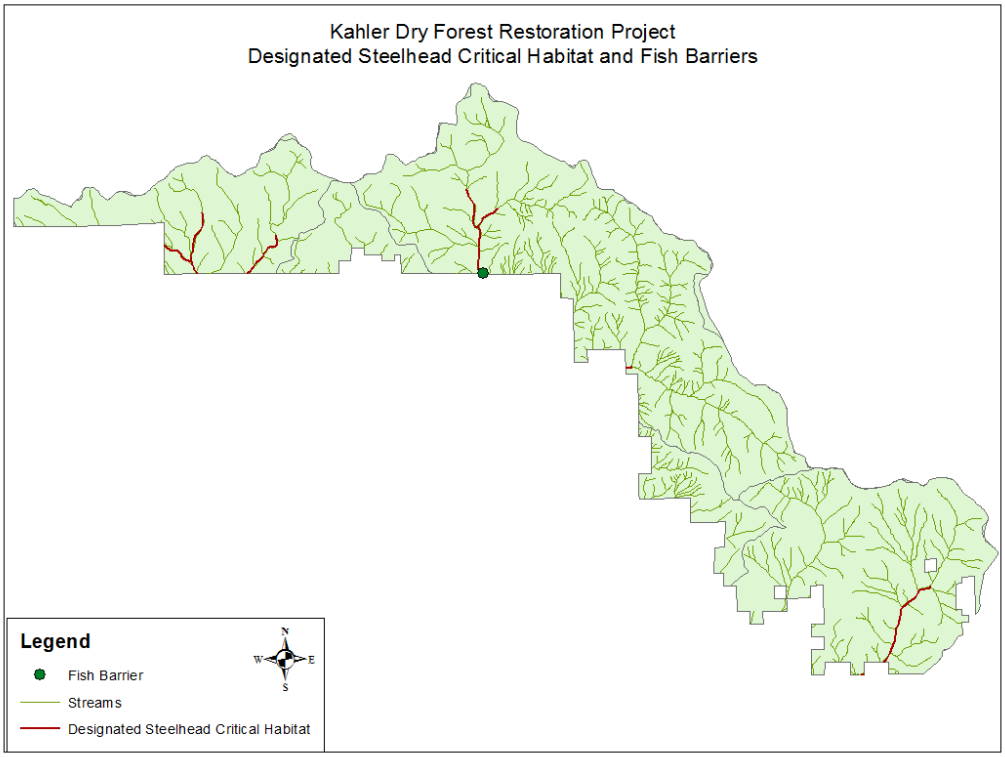
The North Fork John Day (NFJD) summer steelhead population is distinct but, part of the larger John Day River Major Population Group (MPG), within the Mid-Columbia Steelhead ESU. This population of steelhead occupies the highest elevation, and wettest area in the John Day basin. According to the Oregon Mid-C Steelhead Recovery Plan (Carmichael and Taylor 2009), the NFJD River Summer Steelhead population is at very low risk based on current abundance and productivity. This analysis was based on population abundance/productivity and spatial structure/diversity. Abundance/productivity is based on adult spawner returns and smolt to adult ratios (SAR). Spatial structure/diversity is based on analysis of spatial extent or range of the population, genetic variation, spawner composition, population connectivity and major life history strategies. Although the NFJD summer steelhead population is rated as highly viable and meeting recovery goals, the John Day River MPG remains below viable status due to the "maintained" population status for the other three populations in this MPG(Ford et al, 2010; NMFS, 2011).

Designated critical habitat for Middle Columbia River steelhead within the NFJD subbasin includes all rivers and stream reaches accessible to steelhead below long-standing natural barriers (*Federal Register* Vol. 70 (170); September 2, 2005). There are 7.49 miles of designated critical habitat for Middle Columbia River steelhead within the project area (Figure 1). Only 5.1 miles of that habitat are accessible to steelhead due to a 12 foot high waterfall on Henry Creek. The waterfall prevents steelhead from accessing 2.39 miles of designated critical habitat.

Mid-Columbia Spring Chinook Salmon and Essential Fish Habitat (EFH)
The federal Magnuson-Stevens Act (MSA) requires analysis for effects to Essential Fish Habitat (EFH) specifically for Pacific salmon. EFH includes all streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the historically accessible habitat to Pacific salmon species. The riparian zone adjacent to these waterways is also considered EFH. This zone is defined as shade, sediment, nutrient/chemical regulation, streambank stability, and LWD/organic matter.

There is **no EFH** within the project area. The closest EFH is on the North Fork John Day River (~5.5 miles downstream of the project area).

Figure 4. Designated Steelhead Critical Habitat within Kahler Dry Forest Restoration Project



Bull trout and their critical habitat

Bull trout (Salvelinus confluentus) are members of the Salmonidae family. They are often referred to as char, which is the common name for members of the genus *Salvelinus*. In general, chars are cold water species that inhabit Pacific slope drainages from northern California through British Columbia to extreme southeastern Alaska (Meehan and Bjornn 1991). Bull trout were separated from Dolly Varden (Salvelinus malma) in 1978 (Haas and McPhail 1991); which are a species that is phenotypically similar to bull trout. Dolly Varden are considered a coastal form of char, while bull trout are largely restricted to interior regions of the northwest.

Bull trout originated in the Columbia River Basin (Cavender 1978) and dispersed through headwater exchanges and perhaps ocean migrations (Bond 1992). In general, bull trout are a cold water species that inhabits Pacific slope drainages from northern California through British Columbia to extreme southeastern Alaska (Meehan and Bjornn 1991). Natural climactic warming and loss of cold water habitats since the Pleistocene period exacerbated by effects of human activities have reduced their distribution (Cavender 1978). Bull trout no longer exist in California, although a few fish may have survived a reintroduction using stock from Oregon.

There are **no Bulltrout** or their designated critical habitat within the project area. The closest designated critical habitat is on the North Fork John Day River (~5.5 miles downstream of the project area)

Redband Trout

Redband trout are an unclassified form of rainbow trout found east of the Cascade Mountains in Oregon and Washington, in northern California, and in eastern British Columbia. Behnke (1979) noted two main evolutionary lines of rainbow trout dating back to the Pleistocene; the coastal rainbow trout, and the inland redband trout. Both of these evolutionary lines include steelhead populations of their respective

areas. The redband evolutionary line can be further subdivided to account differentiation that has occurred due to isolation since the Pleistocene. These divisions range from the golden trout of the Kern River, California, to the Kamloops trout of British Columbia. Due to stocking of hatchery rainbow trout by humans and natural interbreeding between the highly migratory coastal and inland forms, genetically pure populations of redband can generally be found isolated above migratory barriers where stocking has not occurred (Behnke 1979). Positive identification can only be determined by electrophoretic or DNA analysis. Because redband trout are prevalent over such a wide area, and because the systematics are, as of yet, not clearly defined, the Forest, after consulting with local representatives from state fish and wildlife agencies, has chosen to address redband trout as those genetically pure, native rainbow trout east of the Cascade Mountains.

Redband trout require stream and riparian habitat conditions in the area favorable to spawning and rearing. Factors concerning their habitats include water temperature, water quality, timing and quantity of peak stream flows, and physical in-stream and riparian habitat characteristics. Good water quality is essential for spawning and rearing. Redband require similar in-stream habitat characteristics as other cool-water salmonids. A variety of habitat types are important in providing adequate habitats for all life stages.

Redband trout are found in approximately 5.0 miles of streams within the project area.

Regional Sensitive Invertebrate and Vertebrate Species

A number of sensitive invertebrate and aquatic vertebrate species are known or suspected on the Umatilla National Forest. Their known or suspected presence in the analysis area is described in Table 3.

Table 68. Regional Forester's List of Sensitive Invertebrate and Vertebrate Species Present or suspected on the Umatilla NF

Regional Sensitive Invertebrate	Habitat Description*	Habitat Present in Analysis Area	Species Present in Analysis Area	Known Current Distribution
Western Ridged Mussel *(Gonidea angulata)*	Occur in streams of all sizes of low to mid-elevation watersheds. Common in stable stream reaches, tolerant of fine sediments and occupy depositional areas.	Possibly Alder Cr., East Bologna Canyon Cr., Henry Cr. and Wheeler Cr. below the project area.	Assumed present throughout analysis area.	Widely distributed west of the Continental Divide, CA to BC. It is mainly distributed east of the Cascades.
Hells Canyon Land Snail *(Poplar oregonian)*	Found in mod xeric, open, dry large-scale basalt taluses at lower elevations on steep, cool NE facing slopes in major river basins.	No	No	Limited portion of the northern Hells Canyon drainage, and the lower Salmon River.
Shortface Lanx (*Fisherola nuttalli*)	Occurs in large low to mid-elevation riverine habitats. Common in unpolluted, cold, well oxygenated, perennial streams with cobble-boulder substrate.	No	No	Found throughout the Snake River, Mid-Columbia basin limited to the Upper and Lower Deschutes, Lower John Day, Upper Columbia (Okanagan R.)
Columbia clubtail (*Gomphus lynnae)*	A variety of river habitats, which can range from sandy or muddy or rocky, shallow rivers with occasional gravelly rapids. Water flow tends to be slow-moving.	Yes	Assumed present throughout analysis area	Yakima River, Benton Co. John Day River, Wheeler and Grant Co. from Twickenham to Monument, Owyhee River, Malheur Co.
Westslope Cutthroat Trout *(Oncorhynchus clarkii lewisi)*	Cold clear, water, high mountain streams with variable habitat complexity	No	No, the project area is outside the historic, known current and suspected spatial range of the species	Found throughout the Mid-Columbia River Basin, NFJD and Upper John Day R. subbasins

*Frest and Johannes 1995, Nedeau et al. 2009, Neitzel and Frest 1990, NatureServe Explorer 2009, Paulson 1999, Scheuering 2006, forest stream survey data (on file).

The westslope cutthroat present in the NFJD subbasin on the Umatilla National Forest (UNF) may have originated from earlier transplants from the Upper John Day subbasin, where they are considered native. Westslope cutthroat are considered a sensitive species on the UNF. The only known or suspected populations are located in high-elevation watersheds of the NFJD subbasin, far upriver from the Kahler analysis area.

Existing Condition

Methodology and Assumptions

For this document, the environmental baseline discussion and discussion of effects use FS habitat stream survey data and ODFW stream survey data as well as GIS analysis and the Interior Columbia Basin Ecosystem Management Project (ICBEMP) summary values (McKinney et al. 1996, see table 6) as directed under ICBEMP memorandum FS agreement No. 03-RMU-11046000-007, and reports in published scientific literature. Water temperature data is referenced from the Umatilla National Forest monitoring records. The seven-day moving maximum and average summer time water temperatures are measured. Stream surveys follow the Region 6 Level II stream survey protocol (following a modified Hankin and Reeves 1988 protocol).

Surveys have been completed and updated for the major streams in the Project Area. The surveys were conducted to document stream conditions and establish a baseline. See Table 4 for a list of completed stream surveys and the year they were surveyed.

Table 69. Hankin-Reeves Stream Surveys for the Kahler Project Area

STREAM NAME	SURVEY YEAR
Alder Creek and tributaries	1992 ,2007, 2013
2 unnamed tributaries	1994, 2013
Henry Creek	1992, 1994,2007, 2013
Candis Creek (tributary to Henry)	1992, 2013
Davis Creek (tributary to Henry)	1992
Kahler Creek	1992, 2013
Tamarack Creek	1991, 2013
Whiskey Creek (tributary to Tamarack)	1994
Wheeler Creek	1992, 2007

The Kahler Project proposes timber harvest, non-commercial thinning, mechanical fuel treatments, road use, construction, and maintenance, and prescribed burning. Each of these activities carries potential for effects to some component of aquatic habitat. Water quality, habitat quality, and the ability of the watershed and riparian areas to act as a buffer to timber activity and its connected actions are components of aquatic habitat considered in this analysis. Pool frequency and quality, large woody debris (LWD), width/depth ratios, and water temperature are habitat components that are potentially affected by timber activities. These habitat parameters are specifically addressed as PACFISH Riparian Management Objectives (RMO's) (referencing Section 7 Fish Habitat Monitoring Protocol for the Upper Columbia River Basin, USDA Forest Service, 1994), and are summarized in Table 5. These objectives are metrics used to assess the complexity of habitat available for fish within the analysis area.

Table 70. PACFISH RMO's (UNF LRMP as amended by PACFISH, 1995)

Habitat Feature	RMO's

Pool Frquency Wetted Width (ft) Number of pools/mile	 10 20 25 50 75 100 125 150 200 96 56 47 26 23 18 14 12 9
Water Temperature	Compliance with Water Quality standard or maximum Temp. <68 ºF
Large Woody Debris	Eastern Oregon > 20 pieces/mile, >12 inch diameter, >35 ft. length
Bank Stability	>80 percent stable
Width/Depth Ratio	<10, mean wetted width divided by mean depth

Under the Section 7 Habitat Monitoring Protocol for the Upper Columbia River Basin (USDA 1994), PACFISH RMO's are intended to apply to fishbearing Rosgen (1996) C-type channels. These types of channels are most commonly found in low-gradient channels in wide alluvial valley bottoms. For example, monitoring protocol for determining pool frequency requires count of only pools greater than 1 meter (~3 feet) deep in low gradient (1% -2%) stream channels. Streams within the analysis area that do not fit these criteria include Alder Creek, Henry Creek, Kahler Creek and Tamarack Creek. These streams/stream reaches are located in narrow, moderate to steep gradient valleys.

Table 71 Calculated ICBEMP pool frequency values (McKinney et al. 1996)

Wetted Width (ft.)	Pools/mile**
0-5*	39*
5-10	20
10-15	12
15-20	8.4
20-30	5.9
30-35	4.5
35-40	3.9
40-65	2.8
65-100	1.8

*Streams less than 5 feet wide, reaches would be expected to have a lower density of pools; however, there is no available way to calculate an appropriate value so standard would defer to the value of 39 pools per miles selected by the USFWS.
**To calculate the standard pools/mile using ICBEMP value of 0.028 for specific widths 147.8/channel width = standard pools/mile.

Water Quality:

Stream Temperature

The maximum seven-day moving average temperatures for Henry Creek and Wheeler Creek exceeded 64 degrees Fahrenheit every year they were monitored (Table 7). Stream temperature monitoring would continue in the Kahler Watershed until a background range is established.

Both Kahler and Wheeler Creeks had their riparian areas burned durning the Wheeler Point Fire in 1996. Temperature data shows an increase in stream temperature for these streams beginning in 1997. As the riparian area recovers, a gradual decline in stream temperature begins to show starting in 2004.

Table 72. Seven day maximum moving average stream temperatures (^{o}F) for Kahler Area

Year	HENRY CR	KAHLER CR	WHEELER CR
93	74	59	m*
94	72	m	m

95	73	m	m
96	72	m	m
97	71	64	73
98	75	64	78
99	72	63	78
00	69	66	77
01	70	65	78
02	72	64	77
03	72	63	78
04	73	61	72
05	69	61	75
06	73	61	73
07	70	60	p*
08	70	58	69
09	71	61	75
10	69	P	69
11	m	57	71
12	66	57	73
13	71	59	71

*notes: m = missing data, p = partial data.

The headwater streams in the Kahler Project area that are proposed for harvest are intermittent. They stop flowing between approximately July 1 and November 1 each year, and do not contribute to elevated temperatures downstream. Within a few hundred feet of certain springs in or near some streams, there is perennially flowing water. These isolated segments of perennial flow are not included in harvest units, and also do not contribute to elevated temperatures downstream.

Sediment

East Bologna Canyon Creek is currently 303d listed for not meeting the sediment standard. The John Day River downstream of the Kahler Project is also 303d listed for biological criteria and temperature.

The beneficial uses identified by the state for water in the project area, which may be affected by the Kahler Project activities are fish and aquatic life. The practices that the Forest Service uses to insure there would be no degradation to streams from the activities are detailed in the Best Management Practices section of the hydrology specialist report.

Bank Stability

The 2013 stream surveys conducted within the project area collected information on unstable stream banks. The percentages of stable stream bank for surveyed streams are found in Table 8.

Table 73. Percentage of stable stream banks found during 2013 stream surveys

Stream	Percent Stable Stream Bank
Alder Creek	100
Henry Creek	89.4
Kahler Creek	97.3
Tamarack Creek	100

Unnamed Trib to Alder #1	100
Unnamed Trib to Alder #2	96.5
Unnamed Trib to Henry	91.9

Habitat Access:

Physical Barriers

There is one documented natural fish barrier (waterfall) on Henry Creek which is a fish barrier to migrating adult steelhead. The waterfall is below the Forest boundary. Interior redband trout have been observed above this barrier. Figure 2 is a photo of the waterfall taken during 2013.

Figure 5. Waterfall on Henry Creek below Forest Boundary

Habitat Elements:

Additional habitat parameters that are important for determining complex aquatic habitat and considered in this analysis include substrate embeddedness/percent fines, habitat accessibility, off channel habitat and refugia, floodplain connectivity, streambank condition, road density and location (measured as mi/mi^2 and percent drainage network increase), and past disturbance to riparian conservation areas.

Wolman pebble counts were conducted in riffles in 2013 and were used to characterize substrate composition and percent fines throughout the bankful streambed. The Wolman pebble count protocol assesses substrate distribution between the bankful margins of the stream, including outer margins of the streambed that are dry at low flow. Outer margins of the bankfull channel tend to contain more fines than low-flow the wetted channel; therefore, these bankful to bankful measurements may overestimate the percent surface fines in the low-flow wetted channel.

Substrate Embeddedness

Substrate embeddedness is a highly subjective measurement and especially difficult to estimate in most of these stream reaches given the gradient, flow, geology and existing riparian condition of the majority of stream reaches in the analysis area. Wolman pebble counts were conducted as part of the 2013 stream surveys in the project area. The lower stream reaches within the analysis area have a higher percentage of their substrate made up of gravel and cobble providing good spawning habitat. The upper stream

reaches have a higher percentage of their substrate made up of clay, silt and sand. Table 9 shows the percentage of each substrate category that was found in each stream survey reach.

Table 74 Substrate percentages based on 2013 Wolman pebble counts

Stream/Reach	Clay, Silt & Sand %	Gravel %	Cobble %	Boulder %	Bedrock %
Henry Creek - R1	28.4	30.0	36.5	5.1	0.0
Henry Creek – R2	71.6	5.9	8.8	13.7	0.0
Kahler Creek - R1	16.8	27.5	22.1	4.3	29.2
Kahler Creek - R2	54.0	38.6	7.4	0.0	0.0
Unnamed Trib to Alder #2 - R1	39.5	59.2	1.3	0.0	0.0
Unnamed Trib to Henry - R1	61.7	14.3	17.9	6.1	0.0

Large Woody Debris (LWD)

Large woody debris information was collected during the 2013 stream surveys. Of the reaches surveyed, 6 out of 10 do not meet PACFISH RMO's for LWD. Table 10 shows the stream survey reaches and pieces of large woody debris (LWD) per mile. This project may provide opportunity for future large wood recruitment through prescribed fire treatments within RHCA's.

Table 75. 2013 Stream Survey Reaches and LWD/mile

Stream Survey Reach	LWD / mile
Alder Creek - R1	31.1
Alder Creek – R2	13.3
Henry Creek - R1	19.4
Henry Creek – R2	6.3
Kahler Creek - R1	9.9
Kahler Creek - R2	62.3
Tamarack Creek - R1	5.6
Unnamed Trib to Alder #1 - R1	34.9
Unnamed Trib to Alder #2 - R1	40.5
Unnamed Trib to Henry - R1	6.5

Pool Frequency and Quality

Pool quality and quantity was only summarized for those streams surveyed in 2013(Table 11). Streams within the project area are more representative of a Rosgen Type A stream channel. There are few pieces of LWD that create pool habitat, however, there is potential for additional LWD recruitment. Large boulders/bedrock structures create the majority of pool habitat in these streams.

Table 76 Pool frequency in streams surveyed during 2013

Stream/Reach	Surveyed pools/mile	PACFISH standard pool/mile	ICBEMP pool frequency	Residual pool depth (ft)
Alder Cr – R1	4.2	96	39	0.64
Alder Cr – R2	6.67	96	39	0.55
Henry Cr – R1	67.16	96	39	0.76
Henry Cr – R1	6.64	96	39	0.89

Kahler Cr – R1	10.89	96	39	0.68
Kahler Cr – R1	4.67	96	39	0.49
Tamarack Cr – R1	2.56	96	39	0.92
Unnamed Trib (Alder #2 R1)	3.37	96	39	0.73
Unnamed Trib (Henry R1)	1.87	96	39	1.7

Channel Conditions & Dynamics:

Wetted Width/Depth Ratio

Width to depth ratio was calculated for those streams surveyed during 2013. The ratios calculated are average bankfull width to depth ratio in riffles (Table 12). Actual calculations for wetted width to maximum depth of scour pools are not available.

Table 77 Average Bankfull Width/Depth Ratio for streams surveyed during 2013

Stream/Reach	Average Bankfull W:D Ratio
Alder Cr – R1	*
Alder Cr – R2	*
Henry Cr – R1	18.94
Henry Cr – R2	9.28
Kahler Cr – R1	28.60
Kahler Cr – R2	16.34
Tamarack Cr – R1	5.67
Unnamed Trib (Alder #2 R1)	3.61
Unnamed Trib (Henry R1)	9.56

* Width/Depth Ratio not available for Alder Creek

Floodplain Connectivity

The 2013 stream surveys show that floodplain connectivity in the project area is low (Table 13). This may have something to do with the lack of LWD in the streams.

Table 78. Side channel habitat of streams surveyed in 2013

Stream/Reach	Percent Side Channel
Alder Cr – R1	0.0
Alder Cr – R2	0.0
Henry Cr – R1	0.0
Henry Cr – R2	0.4
Kahler Cr – R1	0.0
Kahler Cr – R2	0.0
Tamarack Cr – R1	0.0
Unnamed Trib (Alder #2 R1)	0.0
Unnamed Trib (Henry R1)	0.0

Current status of PACFISH riparian management objectives for fish bearing streams in the analysis area are summarized in Table 14 below. A (+) indicates that a stream is meeting PACFISH objectives while a (-) indicates a stream is not meeting PACFISH RMOs. The specific stream reach data concerning these PACFISH habitat and watershed condition elements are located in the project file. Most recent stream survey data was used and RMOs values reflect an average of stream reaches sampled.

Table 79. Current status of PACFISH RMO's and trends for fish bearing streams in the analysis area

Stream	Reach	Temp.	RMO* Pools/	ICBEMP[1]	Bank	Width:Depth

			mile	Pool/mile	Stability	ratio
Alder Creek	R1	**N/A**	**Non-applicable**	-	+	**N/A**
	R2	**N/A**	**Non-applicable**	-	+	**N/A**
Henry Creek	R1	-	**Non-applicable**	+	+	-
	R2	-	**Non-applicable**	-	+	+
Kahler Creek	R1	+	**Non-applicable**	-	+	-
	R2	+	**Non-applicable**	-	+	-
Tamarack Creek	R1	**N/A**	**Non-applicable**	-	+	+

*Many streams within the analysis area do not meet the minimum channel width requirements to calculate pool frequency PACFISH RMOs.
N/A- data not available to indicate meeting PACFISH RMO
[1]Streams less than 5 feet wide, reaches would be expected to have a lower density of pools; however, there is no available way to calculate an appropriate value so standard would defer to the value of 39 pools per miles selected by the USFWS.

Road Density and Location

There are approximately 173 miles of roads in the Project Area. The road density within the project area is 3.4 miles of road per square mile. There are 31 miles of roads located within Riparian Habitat Conservation Areas(RHCAs), and the RHCA road density is 4.6 miles per square mile. The total road density is equivalent to the average density for the Umatilla National Forest, which is 3.4 miles per square mile (USDA, 1990). Table 15 summarizes the existing road density and number of stream crossings within the project area. The table below describes the roads within RHCAs on Forest Service land only.

Table 80 Existing road densities (mi/mi^2) and number of stream crossings

Existing permanent road density	3.4
Existing RHCA road density	4.6
Existing stream crossings	239

Desired Condition

The Desired Future Condition in the 1990 Forest Plan for riparian/fish is “Stream temperature would be maintained or improved, instream diversity increased, sediment production decreased and stream channel stability maintained.” (USDA, 1990).

A Desired Future Condition in the 1990 Forest Plan for water/soil states "Timing of low and high flows and average annual water yields would remain about the same for the variety of users (Forest Plan, p. 4-10)." The Desired Condition in the Region Six Aquatic Restoration and Conservation Strategy (USDA, 2008) is "DC-7. In-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows are retained. Watershed scale for both Forest planning and project planning."

The Desired Condition in the Region Six Aquatic Restoration and Conservation Strategy (USDA, 2008) is “DC-10. The species composition and structural diversity of native plant communities in riparian management areas including wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris and fine particulate organic matter sufficient to sustain physical complexity and stability."

The Forest Service guidance for reaching the Desired Conditions is elaborated in the Aquatic and Riparian Conservation Strategy (USDA 2008). It is comprised of five elements: riparian management

areas, key watersheds, watershed analysis, watershed restoration, and monitoring. The proposed project contains riparian management areas, is not within a key watershed or the area of a Watershed Analysis, includes active and passive restoration elements, and project monitoring.

Environmental Consequences

Issues Addressed and Indicators for Assessing Effects

This section analyzes the direct and indirect effects of the proposed project on listed and non-listed native species, designated critical habitats and EFH. Direct effects are immediate impacts, both adverse and beneficial, from project-related actions. Indirect effects are caused by, or result from, the proposed action and may occur later in time. Table 16 is a list of indicators that will be used to assess the effects of the action alternatives for the proposed project.

Table 81. Indicators for Assessing Effects for Fisheries

Objective	Indicator	Justification
Water Quality	Stream temperature	UNF and LRMP as ammended by PACFISH, 1995
Water Quality	Sedimentation	UNF and LRMP as ammended by PACFISH, 1995
In-stream Habitat	Large Woody Debris (LWD)	UNF and LRMP as ammended by PACFISH, 1995
In-stream Habitat	Pools per mile	UNF and LRMP as ammended by PACFISH, 1995
Channel Stability	Stream Bank Stability	UNF and LRMP as ammended by PACFISH, 1995

Spatial and Temporal Context for Effects Analysis

Spatial Context for Effects Analysis

The geographical context for estimating direct effects is National Forest System (NFS) lands located within the Kahler watershed and directly affected by implementation of forest vegetation and fire/fuels management activities included in an alternative.

The geographical context for estimating indirect effects is NFS lands located within the Kahler watershed. Analysis of indirect effects considers the influence of direct effects occurring at a different time or place than the direct effects themselves.

The geographical context for estimating cumulative effects is the Kahler watershed. There is no need to extend the cumulative effects analysis area beyond the Kahler affected environment because forest vegetation conditions affected by implementation of either alternative 2 or 3 are common and widely distributed throughout the Kahler planning area, which is within the Kahler watershed.

Temporal Context for Effects Analysis

The temporal context for evaluating environmental effects considers past, present, and reasonably foreseeable actions in the Kahler planning area, as described below.

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

Past Management

According to Wohl, 2000, woody material in the form of logs and limbs is important to streams because it:

- exerts an important control on channel processes…
- increases boundary roughness and flow resistance
- produces a stepped channel profile
- creates sediment and organic material storage sites
- enhances substrate diversity

As stated in the Hydrology specialist report, beaver were decimated by the 1840s in the Pacific Northwest (p. 14). Beaver, by building dams, have the ability to manipulate the riparian landscape. The dams and ponds slow water velocity, provide a site for sediment and organic material storage, and create wetlands and hardwood habitat. The ponds locally increase the volume and capacity of shallow ground water aquifers. Widespread beaver trapping initiated changes in the hydrologic functioning of riparian areas and streams. Beaver ponds, which had effectively expanded flood plains, dissipated erosive power of floods, acted as deposition areas for sediment and nutrient rich organic matter, and locally increased groundwater were not maintained and eventually failed. As dams gave way, stream energy became confined to discrete channels, causing erosion and down-cutting (Elmore and Beschta, 1987).

The decimation of beaver also reduced habitat for riparian hardwoods. Livestock grazing practices before 1916 resulted in the reduction of the numbers of individual riparian hardwoods and their diversity. They also altered the composition of the riparian hardwood community. As head months of livestock have declined in the last 100 years, head months of wildlife have increased. The grazing by livestock and wildlife has been an important factor in the maintenance of low levels of riparian hardwoods.

Since 1981, approximately 10, 926 acres in the Project Area have had some type of commercial harvest which affected the timber canopy. There has also been an insect outbreak which affected 632 acres, a fire that affected 6950 acres, and existing roads which affect 419 acres of canopy. The harvest included overstory removal, regeneration, salvage, and commercial thinning. The harvests before 1995 included trees in riparian areas. The ECA for Alternative 2 is approximately 20 percent. The combination of the decimation of beavers, livestock over-grazing in late 19^{th} and early 20^{th} centuries, declining livestock numbers coupled with increasing wildlife, fire suppression, and riparian timber harvest has resulted in the current riparian canopy which is predominantly conifers, and appears to be deficient in hardwoods. Also, several of the recently surveyed stream reaches are deficient in woody material.

Without beaver ponds and with relatively small amounts of wood in the streams, sediment mobilized in the Kahler Project Area and the Kahler Watershed tends to leave the area, rather than being stored in ponds and behind log jams. In addition, channels and stream banks are less stable, because of the lack of woody material functioning as roughness and flow resistance, and the lack of roots which can stabilize eroding banks.

In the 1980s, concern about livestock grazing's impacts on fish habitat, including sedimentation, initiated changes in allotment management and the construction of range improvements in the Kahler Project Area. The 1990 Forest Plan relied on Best Management Practices to attain consistency with the Clean Water Act. In 1992, the Heppner Ranger District completed an Access and Travel Management Plan which closed approximately half of the roads on the District to the public. They may still be used by permit for management and administrative activities. The 1995 amendment to the Forest Plan called PACFISH

(USDA, 1995) established stream buffers to protect fish habitat. Activities are only allowed in the buffers if they improve habitat. It was believed that without activities, passive restoration would occur, which would improve the habitat. In 2008, the Heppner Ranger District ended Off-road OHV use on the west end of the district, including in the Kahler Area. All of these actions have contributed to reducing long term stream sedimentation on the lands managed by the Forest Service in the Watershed.

Construction, use, and maintenance of the road system are past management activities which are affecting erosion and sedimentation at the present time. Past recreation generally does not affect erosion and sedimentation, except indirectly through road use.

At this time, it appears that active restoration of the forest in the riparian areas is necessary. Past fire suppression is believed to have disrupted the normal fire cycle, and created the conditions for uncharacteristically severe wildfires (Fire and Fuels Specialist Report). Without actively reducing fuel loads and configurations, there is a risk that wildfire in riparian areas would be uncontrollable. It is further believed that if fuels are reduced in the uplands, but not in riparian areas, then wildfire would spread through the riparian areas to other parts of the forest where fuels were not treated. These are the reasons for implementing harvest and fuel reduction in the RHCAs.

Present Activities

Most of the Kahler Watershed has on-going grazing by domestic livestock during the summer months. Time sequenced riparian photo point monitoring has shown that bank stability has increased and sedimentation has decreased in the Little Wall Allotment, approximately 6 miles east of Kahler.

Ponds and watering troughs have been constructed to benefit cattle, wildlife, and fire protection in the Kahler Project Area. Cattle use these ponds during the June through September season. Wildlife use them all year around. They are used for fire suppression as needed during fire season. Because of this use, there are rims of exposed soil around each pond and trough. Cattle and wildlife also make trails along fences, at salt sites, and to access water. These trails are typically 1 foot wide. It is estimated that the cattle and wildlife related soil exposure equals approximately 14 acres in the analysis area. The amount of exposed soil caused by cattle and wildlife is not expected to change with the Kahler Project Action Alternatives. Also, it is not likely that the exposed soil measurably affects stream sedimentation, because many sites are located away from streams and a relatively small area is affected.

Fire suppression occurs on all public and private lands in the Analysis Area. The US Forest Service and the Oregon Department of Forestry are the primary agencies. Most fires are kept at less than 1 acre by suppression activities, and have little effect on sedimentation at the Sub-watershed scale. Large fires may result in a great deal of disturbance to vegetation, soil, and soil cover. As described above, this disturbance recovers within a few years. Fire suppression activities may also cause a great deal of disturbance to vegetation, soil, and soil cover. On lands managed by the Forest Service, these activities are rehabilitated as soon as possible, usually during the first fall after the fire starts. Fire suppression disturbances also recover within a few years.

Recreation and minor forest products are not expected to affect stream sedimentation in the analysis area.

Lands managed by other entities in the Watershed are used for timber production, cattle grazing, agriculture, recreation and the urban areas of Spray and Winlock.

Foreseeable Future Activities

There are no foreseeable future activities.

Climate Change

Luce and Holden (2009) published a study of trends in stream flow over a 58 year period. It noted that while increasing variability in annual stream flows had been recorded, the nature of the changes were largely unexplored. They tested for trends in the distribution of annual streamflow at 43 gages in the Pacific Northwest for water years 1948 to 2006. Seventy-two percent of the stations showed significant declines in the 25th percentile annual flow, with half of the stations exceeding a 29 percent decline. Fewer stations showed significant declines in either median or mean annual flow, and only five had a significant change in the 75th percentile. This demonstrated that increases in variance result primarily from a trend of increasing dryness in dry years.

Lawler et al. (2008), reports that the Blue Mountains of Oregon have gotten warmer and drier since 1970, based on existing weather records. Future climate is predicted to be warmer and wetter, especially in the eastern part of the state. Snow packs in the transitional rain on snow watersheds are expected to melt earlier, with earlier peak flows. Precipitation is expected to be greater in the winter and less in the summer, with an overall increasing trend. The rate of increase in precipitation is expected to accelerate over the next 100 years.

These findings imply reduced stream flows in dry years with the possibility of increasing flows during the winter and increasing, but earlier peak flows during wetter years. Reduced flows translate into reductions in the quality and quantity of aquatic habitat. The upper extent of perennial streams may decrease. In addition, flow has a strong control on stream temperatures and flow reduction would likely exacerbate stream temperature increases. Terrestrial ecology would also be affected by increased fire occurrence, increased forest mortality, and decreased tree growth. Regarding sedimentation, increasing dryness in dry years may translate into less risk of sedimentation after disturbance. Increasing winter flows in wet years may indicate greater sedimentation during those years.

Alternative 1 – No Action

Direct and Indirect Effects

The relevant part of the Purpose and Need for Kahler proposes “to restore dry forest conditions to a resilient, fire adapted landscape … (by reducing) encroachment of western juniper and conifers … to improve … the diversity and productivity of riparian plant communities, and water availability for native vegetation.”

The forest vegetation along streams in the Kahler Project Area ranges from heavy forest to grassy meadows and scab land. In the units, it is predominantly dense forest. As the trees grow, ground fuels accumulate, and ladder fuels expand the connection between ground fuels and the canopy. This process contributes to the risk of wildfire and to the risk that ground fire would spread to the forest canopy.

Fire effects may be beneficial or detrimental, depending on fire severity. Beneficial effects of low severity fires include killing small conifers and the occasional adult conifer, which fall on the floodplain as woody material and retain sediment, expand floodplains, and increase the capacity of the shallow aquifer. Western juniper is a native fire intolerant tree. Because of fire suppression, the number of junipers and other fire intolerant conifers has greatly increased above their historic range of variability. Low severity fire would kill smaller juniper and conifers, which would reduce their use of water. Conifer density and abundance may result in a diminution of water that could be used by other plants and animals. Killing smaller conifers with low severity fire on a periodic basis would prevent future forest density issues.

In addition, low severity fire may reduce conifer encroachment on streams and springs, thereby increasing hardwood habitat and productivity. Killing the small conifers may open up sites for hardwoods to grow, either from plants suppressed by conifers, from hardwood sprouting, or from seeding. Hardwood leaf litter is more productive in the fish food chain than conifer litter. Hardwoods tend to increase bio-diversity. They also tend to grow faster than conifers, so the lost shade is replaced quickly.

Low severity fires may locally burn off grass and sedge thatch, which results in vigorous resprouting and growth, and quickly stabilizes the soil. Locally eroded soil may be deposited in channels and floodplains and provide hardwood habitat.

Post-fire mortality in riparian areas of both the Biscuit and B&B Complex Fires resulted in reduced canopy cover over streams, thus leading to higher stream temperatures (USDA Forest Service, 2004, 2005). This elevation in stream temperature can impact aquatic organisms in the short-term. However, increases in vegetative cover over streams between the second and fourth year after the B&B Complex Fire suggest that stream shade is recovering, thus ameliorating impacts of fire on aquatic organisms (Halofsky and Hibbs, 2009). Similar riparian effects would be expected if a high severity fire were to occur in the project area.
All of these processes would continue under this Alternative. Sedimentation from road use would remain at the on-going levels under this alternative.

Cumulative Effects

The physical attributes and processes of riparian areas would continue under this Alternative. However, because of 100+ years of fire suppression, the biological components (wood, vegetation, fish, and wildlife) are increasingly threatened by the risk of uncharacteristically severe wildfire. This risk would continue under this Alternative. In the Project Area, approximately 1135 acres (20 percent) have burned out of approximately 5687 acres of riparian areas since 1944.

By far the largest recorded fire was the 1996 Wheeler Point Fire. It burned a total of 22,727 acres, including 6950 acres on the UNF. Of the 826 acres of riparian areas that burned, approximately 660 burned with high severity. The entire canopy was killed in these areas, and shade was reduced to near zero. Similar to what was seen in the Biscuit and B&B Complex Fires, the reduction in shade likely increased stream temperatures, and possibly affected biological criteria and dissolved oxygen. The subsequent sedimentation increase from the Wheeler Point fire was modeled at 3.9 tons per square mile (Table 17), a 71.5 percent increase over background sedimentation.

Table 82. 1996 Wheeler Point Fire Sediment

Source	Tons/mi^2	Area (mi^2)	Area tons
Wheeler Pt. Fire*	3.90	51.30	200.20
Sum	3.90		200
Wheeler Pt. Fire percent above background			71.5%

* WEPP Disturbed Model. See Hydrology specialist report for more detail.

The natural background sedimentation is estimated to be approximately 5.35 tons per square mile per year (see Watershed Complexity section in Hydrology specialist report). The background sedimentation from existing roads was modeled at approximately 0.09 tons per square mile (Table 18). No other existing sediment sources are believed to be relevant. The background sediment yield figures would remain the same under this alternative.

Table 83. Existing Condition Background Sedimentation Rate in Tons/Mi^2 per year.

Alternative 1 Background Sedimentation			
Source	tons/mi^2	area (mi^2)	area tons
slope, banks[1]	5.35	51.30	274.46
existing gravel roads[2]	0.0134	51.30	0.69
existing native roads[2]	0.0650	51.30	3.34
existing paved[2]	0.0103	51.30	0.53
sum	5.44		280

Notes: 1. Harris and others, 2007. 2. WEPP Road Model. See Hydrology specialist report for more detail.

It is expected that a high severity wildfire would have the impacts described above under Indirect Effects, and that they would be similar to the 1996 Wheeler Point Fire.

Alternative 2 – Proposed Action

Upland Forest Thinning

The Kahler project proposes to use variable density thinning with skips and gaps to reduce tree density, shift species composition, and promote old forest structure across approximately 10,000 acres within the project area. Approximately 10-15% of each proposed unit would remain untreated in "skips" that are half an acre or larger in size, and approximately 10-15% of each proposed unit would become open "gaps" that are ½ to 2 acres in size. Between the skips and gaps, units would be thinned to a variable density with an average residual basal area that is determined by the unit's plant association (generally 30-50 ft2/acre). There would be an option to remove select young (<150 years old) grand fir and Douglas-fir trees that are 21 inches or greater in diameter and interacting with the crown of a desirable leave tree. No other trees that are 21 inches or greater would be removed. Tree species preference would be for ponderosa pine and western larch. Diseased trees and those with severe mistletoe infestations would be targeted for removal where they are outside historical ranges. Trees may be removed using ground-based, skyline, or helicopter methods. Minimum snag and downed wood standards would be maintained. Thinning of western juniper (7 inches to 21 inches in diameter) may occur within commercial harvest units in order to reduce and/or eliminate its encroachment into upland forest stands and Class 4 riparian areas where it did not historically occur in order to maintain or improve the quality of upland forest habitat, the diversity and productivity of riparian plant communities, and water availability for native vegetation.

Shrub Steppe Enhancement

Western juniper and other conifer species (including ponderosa pine and Douglas-fir) have spread from historically occupied habitat into grassland and shrub-steppe habitats in the Kahler area, based on examination of 1939 aerial photographs. Shrub-steppe habitats are characterized as having some component of upland shrubs, including bitterbrush, sagebrush, and mountain mahogany. Conifers were often absent from these areas, largely due to periodic fires. These areas provide unique habitat for a number of groups of wildlife, including invertebrates, birds, small mammals, and large herbivores. Encroachment of juniper and other conifers from historically occupied sites has impacted site characteristics, including microclimate. Invading conifers compete with characteristic grassland and shrub-steppe vegetation for limited resources. In order to improve habitat conditions in grassland and shrub-steppe where encroachment has occurred, western juniper up to 21 inches in diameter and not

showing old growth characteristics would be removed where it did not historically occur. As juniper was historically present in some areas within these proposed units (rock bluffs, scabs, and other sites with shallow soils), measures would be taken to ensure that large, old juniper and smaller diameter juniper regeneration are retained in these areas. Grassland/shrub-steppe enhancement through conifer reduction would occur on approximately 1,500 acres in the project area.

Prescribed Fire

Following mechanical treatment, approximately 31,000 acres of the project area would be treated using prescribed fire. Ignition may take place from within RHCAs. Burning may occur in spring or fall; acreage would not be burned all at once, but rather in small increments over a period of several years. This treatment would reintroduce fire to a fire-dependent ecosystem blackening about 50-75% of the area to lessen the impact of a future wildfire, improve forage quality for big game, and encourage ponderosa pine recruitment. Existing roads and the use of natural barriers would be used to contain prescribed fires. All ignition methods may be used, including hand held drip torch, ATV-mounted drip torch, and helicopter ignition.

Noncommercial Thinning

Noncommercial thinning would occur on approximately 6,135 acres; 1,077 acres outside harvest units and 5,058 acres within harvest units. The noncommercial thinning treatment would cut conifer seedlings, saplings, and small poles, generally up to 7 inches in diameter at breast height (dbh), and western juniper trees less than 12 inches diameter, to help meet forest vegetation needs identified in the Kahler project's purpose and need, including tree vigor improvement for insect and disease resistance, restoring and maintaining a sustainable species composition, increasing forage for native and domestic ungulates, and addressing fire hazard by reducing ladder fuels.

For the noncommercial thinning treatments, tree species would be retained in this order of preference: ponderosa pine, western larch, Douglas-fir, Engelmann spruce, grand fir, lodgepole pine, and western juniper.

Noncommercial thinning units would be treated by hand using chainsaws, or treated by mechanical equipment such as masticators. Stands would meet or exceed minimum stocking levels after treatment, and no reforestation would be required. Created slash would either be lopped and scattered to within 18 inches of the ground surface, mechanically treated (grapple piling, chipping, or slash busting), or hand piled and burned, depending on post-treatment fuel loads and site characteristics or limitations.

Note that trees being cut in the noncommercial thinning treatment may have commercial value depending on tree diameter and tree-size limitations associated with the harvest system or processing equipment being used. Generally, trees 7 inches dbh or smaller are not considered to have commercial value, although smaller-diameter trees may have value for chips, hog fuel, and other non-sawtimber products, depending on market conditions and a treatment unit's characteristics (proximity to markets, etc.). Markets for small-diameter trees are unreliable, so it is unknown at this time whether trees below 7 inches dbh would be cut in the commercial treatments. Due to uncertainty about market conditions, the need to cut trees less than 7 inches in diameter (less than 12 inches in diameter for western juniper) would be analyzed as a noncommercial treatment for this environmental assessment.

Riparian Area Thinning

Approximately 680 acres of dry upland, high density forest stands are within intermittent stream riparian habitat conservation areas (category 4 RHCAs) in proposed units and would be treated to maintain or restore riparian habitat and upland vegetation including improvement of channel function and floodplain connectivity using a variable width no-mechanical zone adjacent to the stream channels. The no-mechanical zone width would vary depending on topography, stream type and vegetation. Within selected areas of the no-mechanical zone, hand thinning of small diameter (≤7" dbh) trees may occur. Selected trees may be felled along streams and left in the channel to provide for down wood. Some skipped areas within units would be located adjacent to stream no-mechanical zones to create variability along the stream corridor.

Tamarack Fire Lookout Thinning

An administrative site that includes a rental cabin, fire lookout, and communications equipment on Tamarack Mountain would be treated to improve public and firefighter safety, improve fire sighting capabilities from the lookout, and reduce the risk of loss from wildfire. Approximately 25 acres of surrounding forest stands and travel corridors have been identified for thinning. A portion of this thinning occurs within the C1 management area. Thinning prescriptions would be tailored to improve sight line distances in order to prevent potential wildfires into this area. To improve sight line distances, thinning from above would occur with skips/ gaps incorporated. Some trees over 21 inches DBH may be felled or topped.
In order to facilitate a fire safety buffer to the tower, a group opening thinning would occur within the 3.5 acre administration site. Select trees nearest the lookout cabin would be retained.

CONNECTED ACTIONS

In addition to the above treatments, the following connected actions would occur as a part of this project:

Hazard Tree Removal

Hazard tree removal would occur along Forest Service roads within the project area along haul routes. Hazard trees are assessed as imminent or likely depending on their failure potential. All trees rated imminent would be felled and removed. Trees rated as likely would be evaluated by a qualified person to determine the risk to operations. Where possible, hazard trees may be felled and left on the ground to contribute to wildlife habitat.

Aspen Restoration

Approximately 43 acres of aspen were identified during field reconnaissance (6 acres were identified as extirpated). Select aspen stands (clones) that are in the project area would be treated in order to enhance aspen regeneration and recruitment success. Aspen stands outside of units would be limited to non-mechanical methods. Restoration treatment options would include: combinations of prescribed burning, fencing and reducing conifer competition. Treatment combinations would vary depending on the condition of the aspen stand. Competing conifers that are less than 150 years old may be reduced up to 100ft around the clone.

Reforestation

In units with a low proportion of early seral trees (primarily due to past logging) reforestation of ponderosa pine and/or western larch may occur after harvest and burning activities are complete. Reforestation would primarily occur to the larger gaps 1-2 acre openings where contributing ponderosa pine or western larch seed is expected to be low and where artificial regeneration would help facilitate desired future conditions.

Treatment of Residual Debris

All units with residual fuel loads above the Forest Plan standard would be treated manually (lop and scatter or piled), mechanically (grapple piling, grinding, crushing), removed off site and used as Biomass material, and/or with prescribed burning to reduce fuel loads to standard. Burning of residual materials would depend upon the harvest system used. The types of burning treatment options would range from all residual materials left in the units to be burned when conditions permit, to materials piled and burned at each landing. Landings would be about ¼ acre in size and occur on average once every 25 acres. Fire would be applied by hand-held drip torch, ATV-mounted drip torch, or helicopter. Line construction would occur to facilitate holding along private boundaries (approximately 6 miles by mechanical means and approximately 2 miles by hand). Burning could occur in either spring or fall for up to five years after thinning or harvest activities are complete. Existing roads and or natural barriers would be used to contain prescribed fires. Water would be drafted from pre-approved sources for control.

Access

A new permanent road 0.3 miles in length would be constructed to alleviate stream crossing issues currently occurring on the O-2400140 OHV trail (proposed for closure). This new permanent road would take the place of the closed O-2400140 OHV trail, which would be administratively closed as an OHV trail and decommissioned after project implementation as funds allow. The current stream crossing is on a class 4 stream which is a tributary to East Bologna Canyon and approximately 0.3 miles upsteam of Steelhead designated critical habitat. The new segment of road will eliminate the stream crossing by tying into an existing road.

Temporary roads may be used to access some proposed units, and would be obliterated following the project (Table 23). Some closed system roads would be re-opened to access treatment units for the duration of activities. Opening would involve removal of closure devices, brush clearing, and blading as necessary. These roads would be re-closed using the same type of closure device (signs or barricades) following the completion of activities. Waterbars and/or seeding with native seed would be applied as needed to prevent soil movement.

All roads and road crossings would be evaluated as to their potential negative impacts to wildlife and aquatic resources and remedies, including closures, may be addressed.

Alternative 3 – modified Proposed Action

Alternative 3 was developed to meet the Purpose and Need for the Kahler Dry Forest Restoration Project, while addressing the issues identified in Chapter 1.

This alternative would drop some commercial thin units, modify unit boundaries, or change unit prescriptions to retain marginal and satisfactory cover for elk in larger patches distributed across the

landscape. Dropped unit acres generally provide dense cover habitat that was identified during project development and reconnaissance as receiving moderate to high elk use or having habitat characteristics (dense understory vegetation, high canopy closure, etc.) that are selected for by elk.

Alternative 3 would provide larger patches of cover that would be available for elk during periods of high disturbance (e.g. hunting season) as refugia. Dropping these acres would also partially address Issue 2 by retaining dense multi-strata ponderosa pine and mixed conifer stands distributed across the landscape to provide for the needs of associated wildlife species, including the pileated woodpecker. A reduction in the acres of commercial thinning would also reduce the miles of temporary road and closed roads required to access treatment units, which partially addresses Issue 3. Dropping treatment acres would also partially address Issue 4 because RHCAs proposed for treatment would be retained in their current condition. Road closures proposed under Alternative 2 would also be altered slightly under this alternative. There would be an additional 0.9 miles of year-round closure on two road segments, and 1.8 fewer miles of seasonal road closure (close entire 2100-035 road and 0.5 miles of 2407-020 year round; remainder of 2407-020 would remain open year round).

Upland Forest Thinning

Alternative 3 would also utilize variable density thinning with skips and gaps to reduce tree density, shift species composition, and promote old forest structure. Approximately 9,200 acres of upland forest thinning would occur within the project area.

Juniper Non-Commercial Thinning

In Alternative 3, an additional 153 acres of western juniper would be non-commercially thinned in order to open up certain areas for wildlife movement.

Shrub Steppe Enhancement

Under Alternative 3, Shrub/Steppe areas would be treated the same as Alternative 2 - approximately 1,500 acres.

Prescribed Fire

Prescribed fire would be the same under Alternative 3 as Alternative 2 - approximately 31,000 acres of the project area would be treated.

Noncommercial Thinning

Noncommercial thinning would occur the same as in Alternative 2 but with an additional 153 acres of juniper thinning. Portions of two units (23 and 12) would be non-commercially thinned (by hand) of juniper in marginal elk cover stands to address fuels, silviculture, and wildlife concerns related to juniper encroachment in these stands which would help retain elk cover adjacent to the Wheeler Point burn.

Riparian Area Thinning

Riparian areas treatment would be decreased to 657 acres under Alternative 3.

Tamarack Fire Lookout Thinning

Thinning operations near the Tamarack Fire Lookout under alternative 3 would be the same as Alternative 2.

CONNECTED ACTIONS

The connected actions in Alternative would be the same as Alternative 2: Hazard tree removal (less due to changes in use and maintenance of access and haul roads described below) would occur where necessary, 43 acres of aspen restoration, reforestation where needed, and treatment of residual debris.

Access

The miles of roads would be decreased under Alternative 3 to promote wildlife. (See Table 23 for comparison of alternatives). The proposed OHV trail reroute and decommissioning seen under Alternative 2 would be carried forward under this alternative.

Treatment Comparison Tables by Alternative

Table 84. Timber Harvest Acreages by Alternative

	Alternative 2 (Acres)	Alternative 3 (Acres)
Commercial Thinning	9,998	9,166
Non-Commercial Thinning	687	687
Juniper Non-Commercial Thinning	0	153
Shrub/Steppe Non-Commercial Thinning	38	38
Shrub/Steppe	1,496	1,496
Total Treatment	**12,219**	**11,540**

Table 85. Alternative 2 Riparian Treatment (Class 4 Buffers)

Harvest System	Commercial Thin	NCT	Shrub/steppe	Grand Total
Ground-Based	348		70	418
Helicopter	61			61
NCT		49		49
Sky/GroundBased	27			27
Sky/Heli	68			68
Skyline	59			59
Grand Total	**563**	**49**	**70**	**682**

Table 86. Alternative 3 Riparian Treatment (Class 4 Buffers)

Harvest System	Commercial Thin	NCT	NCT_JUOC	Shrub/steppe	Grand Total
Ground-Based	328		0	70	398
Helicopter	61				61
NCT		49			49
Sky/GroundBased	27				27
Sky/Heli	68				68
Skyline	53				53
Grand Total	**537**	**49**	**0**	**70**	**657**

Table 87. Other Activities

	Alternative 2	Alternative 3
Underburning and piling	7,000* acres	6,420* acres
Landscape Underburning	31,019 acres	31,019 acres
Anticipated volume (Board Feet)	~49 mmbf**	~47 mmbf**
Stream Restoration		
Headcut Repair	None	
Material Source Expansion	The Notch or Crawford Springs, Davis Pit and/or T8 R26 Sec05	
Forest Plan Amendments	4 (one with 2 parts)	4 (one with 2 parts)
Primary issues addressing	See "Issues" section above	

* These acreages are double-counted because they represent additional treatments applied to acreage already affected by another activity (such as noncommercial thinning occurring after the upland forest commercial thinning activity has been completed). Acreages without asterisks are associated with the primary activities; acreages with asterisks are secondary or follow-up treatments occurring after a primary activity has been completed.

** These numbers are rough estimates based on preliminary volume estimates. A more precise volume estimate would be performed prior to timber sale.

Table 88. FS Road Miles by Alternative

	Alternative 2	Alternative 3
Open	80.4	76.9
Seasonal	5.7	5.7
Closed	58.2	53.5
OHV Trail Use	1.5	1.5
FS Haul	145.8	134.6
New Construction (Closed Road)	0.3	0.3
Private Road	1.2	1.6
Temporary Road	10	8.4
Total Proposed Road Closures including Seasonal/OHV Trail	19.1	17.3
Percent Total Roads Closed including Seasonal	9%	9%
Percent Total Roads Closed During Hunting Season	6%	6%
New Open Density Mi/SqMi)	1.4	1.4
Decommission Roads	5.6	5.6

Best Management Practices, Forest Plan Standards and Guides and Project Design Criteria

Appendix A of this report is a combination of Forest Plan Standards and Guides and Best Management Practices (BMP's) that were chosen to apply to the proposed action and action alternatives. This list also includes Kahler Project design criteria that have been specifically developed for the Kahler Proposed Action and action alternatives. This list includes all of the measures that were listed in the Notice of Proposed Action (June 2012), and several additional

measures that were developed during the analysis. Table 23 displays whether or not a measure would be implemented under a contractual stipulation; if the measure is a Forest Plan Standard and Guide, or if it was developed based on those Forest Plan Standard and Guides; if the measure is taken from the National Best Management Practices for Water Quality Management on National Forest System Lands (2012); and how and if the measure was refined as a project design criteria specifically for the Kahler Project. Unless otherwise stated, these measures apply to the proposed action and all action alternatives.

Direct and Indirect Effects

For Fisheries purposes, there is virtually no difference between Alternative 2 and Alternative 3. For this reason, they would both be analyzed simultaneously under the Action Alternatives section.

Specific design elements were developed in order to avoid retarding the attainment of RMOs. These are included in the Harvest System Soil and Water Prescriptions for Water Bodies, (7/30/2014, ECF), and described in the Hydrology specialists report.

Action Items

Descriptions of the proposed silvicultural, mechanical fuel, and prescribed burning treatments in the Kahler Project are described above under each action alternative.

Mechanical Timber Treatments

These Alternatives (see Alternative Comparison Tables 18-22 of this report) propose commercial thinning harvest, non-commercial thinning and possibly biomass harvest, and mechanical fuel treatments in the same units. Harvest systems would be ground based, helicopter, skyline/ground based, skyline/helicopter, and skyline only. All harvest systems would include falling and bunching using heavy equipment which would operate outside of heavy equipment exclusion zones along streams. The harvest and possible follow-up mechanical fuel treatments would be done with up to 3 passes of heavy equipment. The potential increase in sedimentation would be mitigated by several Design Criteria, including WQ10, heavy equipment use will be suspended when the soil is too wet.

The activity fuels in the thinning units would be burned or mechanically treated after harvest. After the activity fuel treatments in units, there would be landscape scale burning. Actions connected to the harvest and burning include: log haul on existing roads including those in RHCAs, road maintenance, re-opening, and re-commissioning, new temporary road construction, use of existing skid trails as roads, decommissioning, and closing of open roads. After the harvest activities and prescribed burning, skid trails, landings, and sites with disturbed soil would be treated to reduce erosion and compaction. A subset of temporary roads and trails would be identified for subsoiling and advanced rehabilitation .

These activities have the potential to impact stream temperatures and canopy, biological criteria, and sedimentation. Treatments would be limited to Class 4 RHCA's and are aimed at reducing the risk of fire spreading into Class 1, 2, and 3 RHCA's. There would be no silvicultural treatments or lighting in RHCAs of Class 1, 2, or 3 streams. Because there would be no treatments in these RHCAs, the main effect of the project would be a reduction in the risk of fire spreading into the Class 1, 2, and 3 RHCAs. Stream temperature impacts would be seen by maintaining the riparian canopy in the event of a fire spreading.

The action Alternatives propose activities within class 4 RHCAs. Alternative 2 proposes 682 acres of commercial and/or non-commercial thinning, mechanical fuel treatments, and shrub/steppe treatments in

the RHCAs (see Table 19). Alternative 3 proposes 657 acres of the same treatments (see Table 20). Thinning treatments would use a variable-width, no-mechanical-equipment zone adjacent to the stream channels (see Hydrology report Appendix A Prescription). Certain trees may be felled along channels and left there to contribute to channel function by providing down wood to retain sediment. Inside the no-mechanical-equipment zone, there would also be lighting of activity fuel and landscape prescribed burning. Within the prisms of existing roads, there would be normal maintenance, brushing, and re-opening activities. Outside the no-mechanical-zone, there would be similar treatments, but they would be mechanized.

The Class 4 intermittent streams dry up early July and remain dry through October. For this reason, it is unlikely that the silvicultural treatments and burning would have an effect on stream temperature or biological criteria either in the Project Area or downstream. The Project contains BMPs which are designed to prevent impacts to groundwater and stream sedimentation.
There would be log hauling on existing roads in all RHCAs. Re-opening closed roads, road maintenance and road reconstruction would cut small trees and shrubs growing in the rights-of-way. This would slow the passive recovery of vegetation in riparian areas. However, the reduction in vegetation is so small that it is unlikely to measurably change the existing canopy cover, which in turn would be unlikely to measurably affect stream temperature, biological criteria, or sedimentation.

The commercial and non-commercial thinning, mechanical fuel treatments, and prescribed burning activities are expected to result in a more open canopy with a single stratum of mature trees. Certain BMPs would act to limit the loss of shade, such as WQ-17, Leave all trees on stream banks. However, the reduction in riparian canopy and stream shade is not expected to contribute to stream temperatures during the critical hot weather/low flow period of creeks downstream of the project area, because the Class 4 intermittent streams in the Kahler Project area typically stop flowing in July and remain dry through October.

The harvest combined with the fuel treatments are expected to make the riparian canopy more resilient to wildfire by reducing or removing intermediate and ladder fuels, and ground fuels.

Prescribed Burning

These Alternatives propose to prescribe burn the units with activity fuels, followed by landscape underburning of most of the project area. The landscape burning would be divided into 19 burn blocks, totaling approximately 31,019 acres. Included in this total are 1189 acres in the Wall Creek Watershed and 1139 acres in the Upper Rock Creek Watershed. The burning would extend beyond the Kahler Watershed so that existing roads can be used for fire lines. It is possible that a modest amount of fireline would need to be constructed to keep prescribed fire off of private lands. No other fire lines are expected to be built, unless there is a resource need that is currently unknown.

Alternative 2 contains approximately 682 acres of Class 4 RHCAs which would contain activity fuels and would be burned as a unit, and later underburned as part of a burn block. Alternative 3 contains approximately 657 acres of Class 4 RHCAs with the same activities. There are additional 1912 acres of Class 4 RHCAs in the Kahler project area which would be underburned in Alternative 2 and 1937 acres in Alternative 3. Since these acres are not in units, they are not dense, dry forest stands. Many are range land with a few trees. Some are wetlands. There would be no lighting of fire in Class 1, 2, and 3 RHCAS, but it would be allowed to back into them. The backing fire is not expected to reach shade casting vegetation and trees, because the burn prescription would call for low intensity burning. Also, fuels along flowing streams tend to have higher moistures than upland fuels, and so are less likely to burn.

Ignition would also occur in RHCAs adjacent to private land boundaries, to ensure that prescribed fire would not cross the boundaries. The areas ignited would be limited to approximately 100' along the boundary, so no more than 0.5 acres would be ignited in each RHCA. This burning may affect shade casting vegetation and trees. However, because of the low fire intensity, trees larger than 12 inches are not likely to be affected (see BMP Effectiveness section above). Grass, forb, and hardwood vegetation is expected to resprout after burning. Trees smaller than 12 inches may be affected, but because of the low fire intensity, low coverage of fire area (see below), and because the streams dry up in summer, it is not expected that there would be a measurable increase in stream temperatures downstream or a measurable increase in sedimentation.
During prescribed burning "windows," riparian areas usually have higher fuel moistures than adjacent upland areas, and would be expected to burn at lower intensities than the uplands. Also, prescribed fire personnel have the ability to locally manipulate burn intensities by varying the rate and location of ignition. This ability increases the likelihood that burn intensities would be kept low in riparian areas, thus protecting shade casting trees and reducing the likelihood of erosion and sedimentation.

Monitoring of three prescribed burn units in 2005 found that 7 percent of green trees 12 inches dbh and larger were killed by the burns. Nineteen of the 22 dead trees were in a unit which was burned at a higher intensity in order to reduce juniper encroachment. The other two units had less than 1 percent mortality to 12 inch and larger trees (Farren, 2006a). The monitoring was done 12 to 24 months after the burning. Observations made after 2005 indicated that there had been more mortality after the original monitoring. Because of this monitoring and observations, it is expected that 1 to 3 percent of shade casting trees would be killed by prescribed burning which reached into riparian areas. It is possible that tree mortality at these levels would measurably affect shade and temperature, but unlikely during the critical period in July and August as streams are typically not flowing.

The prescribed burn monitoring in 2005 also found that 75 percent of the areas had not burned or had low burn severity after burning, 22 percent had moderate burn severity, and 3 percent had high burn severity. The high severity areas were indicated by consumption of the duff layer, root crowns and surface roots of grasses. However, the high severity areas were not continuous, but part of a mosaic of burn severities, including unburned (Farren 2006a). The areas of high severity burns contained exposed mineral soil, and would be expected to erode during high intensity precipitation or run-off. However, because the high severity areas were not continuous, and were interspersed with areas of intact duff and vegetation, surface flow of water did not carry a measurable amount of sediment into streams. Similarly, it is unlikely that the prescribed burning proposed by Alternative 2 would cause measurable increases in stream sedimentation.
Hazard tree falling may cut some large, green, merchantable sized trees. Any trees or snags cut in RHCAs would be left where they fall, unless they were within the silvicultural prescription or if the stream met PACFISH standards for current and future large woody material. It is possible that some of the hazard trees cast shade on streams. However, hazard trees tend to be relatively scarce. When hazard trees were cut along 20 miles of Forest Road (FR) 10 in 2003, there were a total of 102 trees cut, an average of approximately 5 trees per mile. It was estimated in 2008 that 19 hazard trees were growing in RHCAs on a total of 12.4 miles of FR 1003 and FR 1012. This equals approximately 1.5 hazard trees in RHCAs per mile of road, which is a relatively low density of hazard trees. The Action Alternatives propose to cut hazard trees along 25 miles of haul routes in RHCAs. Assuming that hazard trees in the Kahler Project RHCAs are growing at similar densities to those along FR 1003 and 1012, relatively few would be cut.

Hazard trees are selected because they threaten to fall on a road or travelway, and because they have at least one defect. The defects suggest that these trees are likely to fall in the relatively near future, thus

they tend to be shorter-lived than trees without defects. The defects may involve dead or fallen tops, which reduces their ability to cast shade. Because hazard trees tend to be relatively scarce, short-lived, and may have dead or missing tops, it is unlikely that falling them for this project would measurably affect stream temperatures.

Road/ Stream Crossing Treatments

This project proposes to retrofit the crossing of Tamarack Creek by Highway 207 to make it more fish friendly. The lower crossing of Tamarack Creek and the crossing of the no-name creek that flows north of Unit 57 would be improved for the passage of all aquatic organisms. The retrofitting and passage improvements would be similar to road construction, and the effects would have similar mitigations.

Temporary Roads

The new temporary roads are located outside RHCAs. They are not expected to cause a change in total road erosion at the subwatershed scale. The use of skid trails in the RHCAs and the rehabilitation of the skid trails and new temporary roads are not expected to cause stream sedimentation because of the use of BMPs and project design criteria. Any effects would be localized and of limited duration.

Action Alternatives Effects on Fisheries Indicators

Sediment

The proposed activities would cause a limited amount of soil exposure with the possibility of erosion. Eroded soil has the potential to increase stream sedimentation. However, all of these activities have been designed to minimize effects to sedimentation. The designs include the use of Best Management Practices, Design Criteria, and Management Requirements from the Forest Plan. Design criteria include the use of PACFISH RHCAs. All the RHCAs are in place, but silvicultural treatments are proposed for some of them.

Heavy equipment trails have the potential to impact ephemeral streams by introducing fine sediment. The fine sediment may be carried downstream during rainfall and runoff flows. The trails may also capture the ephemeral flows, and begin to function as Class 4 streams. Ephemeral streams are protected from these impacts by Design Criteria. See Appendix A, at the end of this report, for a list of Design Criteria for the Kahler Project.

According to the hydrology specialist report (page 23) measurable effects to sedimentation are unlikely. The Project would **not degrade** this indicator under either action alternative.

Temperature

The proposed activities would cause a slight reduction in shade casting vegetation. Certain BMPs would act to limit the loss of shade, such as WQ-17, Leave all trees on stream banks. Prescribed fire may impact the shade vegetation as well. However, because of the low fire intensity, trees larger than 12 inches are not likely to be affected (see BMP Effectiveness section above). Grass, forb, and hardwood vegetation is expected to resprout after burning. Trees smaller than 12 inches may be affected, but because of the low fire intensity, low coverage of fire area, and because the streams dry up in summer, it is not expected that there would be a measurable increase in stream temperatures downstream or a measurable increase in sedimentation. The Project would **not degrade** this indicator under either action alternative.

Large Woody Debris (LWD)

The proposed activities may cause a slight increase in woody debris available for streams. As part of the mechanical fuels treatments in RHCA's, certain trees may be felled along channels and left there to contribute to channel function by providing down wood to retain sediment. Similarly, prescribed fire may cause tree mortality in the RHCA's and provide for future LWD recruitment to the streams. The Project would **improve** this indicator. Alternative 2 would lead to more improvement for this element than alternative 3, given more acres of RHCA treatment (682 vs 657 acres, a difference of 25 acres and approximately 1.4 miles of category IV RHCA).

Pools/Mile

Due to the woody debris within the RHCA's being left to contribute to channel function, it is likely that some of the wood would end up in the stream channels and create scour pools during high water flows. This would increase the number of pools per mile on a limited basis because the RHCA treatments are limited to Class 4 RHCA's. The Project would **not degrade** and possibly **improve** this indicator under each action alternative.

Bank Stability

Based on recent stream surveys, bank stability is greater than 89 percent for streams surveyed (see Table 7). Certain BMPs would act to limit the loss of shade, such as WQ-17, Leave all trees on stream banks. This BMP along with others would help ensure that bank stability is maintained. The Project would **maintain** this indicator under each action alternative.

Cumulative Effects

The Kahler Watershed is the Analysis Area for cumulative effects. It contains the Kahler Project Area.

The Forest Service portion of the Kahler Watershed contains approximately 168 miles of roads. The Kahler Project would use those existing roads and build 3.0 miles of temporary roads in upland locations on NFS land. Alternative 2 would use 1.2 miles of private road and Alternative 3 would use 1.6 miles of private road. The total road density is approximately 3.4 miles of roads per square mile of Watershed. This road density is equivalent to the 3.4 miles per square mile for the entire Umatilla NF (USDA, 1990). Approximately 109 miles would be used to haul logs. After project work is complete and road restoration/rehabilitation is complete, there would be a net reduction of roads and an anticipated net reduction in sediment from those roads.

Paved roads on the NFS lands generally receive annual maintenance. Unpaved roads generally do not. Maintenance schedules are not available for roads under other ownerships. Ditch cleaning of paved roads, and blading and ditch cleaning of gravel and native surface roads may cause localized sedimentation in the vicinity of culverts, dips, and road-stream crossings. This sedimentation would be most likely when precipitation and overland flow occurred after maintenance, but before vegetation and surface armoring were re-established.

Closing open roads does not necessarily reduce the hydrologic impacts of roads. However, when closed roads are not used, they often develop a ground cover which may slow overland flow and reduce sediment which enters streams at road crossings. Rehabilitation activities accelerate this process. Advanced rehabilitation can also improve infiltration of water into the soil, and reduce constriction of streams. Establishing conifers and hardwoods on rehabilitated roadbeds maintains and increases soil porosity,

which may eventually restore the pre-road capacity of the soil to hold water. When this occurs, the risk of erosion is greatly reduced.

It is always possible to have erosion and sedimentation following ground disturbing activities when there is intense precipitation. However, the Kahler Project is designed to maintain existing water quality using BMPs, and because of the regrowth of vegetation and fall of forest litter, it is not likely to cause a measurable increase in stream sedimentation at the Watershed scale.

Table 17 shows the assumed hill slope and stream bank sedimentation of 5.35 tons per square mile per year for the Kahler Project. The existing road system is modeled to contribute an additional 0.09 tons per square mile to steams. Table 16 shows the modeled sedimentation for the year after the Wheeler Point Fire, an additional 3.90 tons per square mile per year. The Kahler Project is designed to prevent a destructive fire like Wheeler Point.

Table 89. Action Alts Sedimentation from Timber Harvest in Tons/mi^2 and Tons/year.

Alternatives 2 and 3 Harvest			
Source	tons/mi^2	area mi^2	area tons
grav haul^2	0.0296	51.30	1.52
nat. haul^2	0.1319	51.30	6.77
paved haul^2	0.0092	51.30	0.47
ct, nct, mcfuel^3	0.0670	51.30	3.40
sum	0.24		12
Alts 2 and 3 percent above background			4.3%

Notes: 2. WEPP Road Model. 3. WEPP Disturbed Model..

The harvest part of the Kahler Project is modeled to increase sedimentation by approximately 0.24 tons per square mile per year (4.3 percent) over the first 5 years of the project (Table 23). This rate of sedimentation from harvest would end when harvesting activities ended and sediment inputs woud decline to background rates from roads and hillslopes (Table 18).

Table 90. Action Alts Sedimentation from Prescribed Fire in Tons/mi^2 and Total Tons/year.

Alternatives 2 and 3 Prescribed Burning			
Source	tons/mi^2	area mi^2	area tons
landscape^3	0.2200	51.30	11.40
act fuel^3	0.0670	51.30	3.40
sum	0.29		12
Alts 2 and 3 percent above background			4.3%

Notes: 3. WEPP Disturbed Model.

Table 24 shows the Action Alternatives sedimentation from prescribed fire in tons per square mile and total tons of sedimentation per year in the Kahler Area. This increase would be approximately 0.29 tons per square mile, or approximately 4.3 percent above background. It would begin after the harvest was complete, and occur during the second approximately 5 years of the project.

Compare the 4.3 percent increase in tons per square mile per year of sedimentation for the Kahler Project with the 71.5 percent increase for the Wheeler Point Fire. The sedimentation modeled for the Kahler Project is limited to approximately 10 years, and is well below the background rate of sedimentation. It is unlikely to be measurable at the watershed scale. The modeled sedimentation from the 1996 Wheeler Point Fire would likely be measurable at the watershed scale.

The Kahler timber harvest, prescribed burning, non-commercial thinning, and connected road activities proposed inside and outside of RHCAs would be expected to immediately reduce existing fuel loads and reduce the risk of wildfire that could affect stream temperatures, biological criteria, dissolved oxygen, and sedimentation. After the project, the canopy is expected to be more open and have more of a single stratum of mature trees than without the project. This type of forest would be more resilient to wildfire, and would be more likely to tolerate prescribed low intensity maintenance underburning every 5 to 10 years.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All of these alternatives would be consistent with Forest Plan direction regarding native fish populations. None of the potential effects of timber and fire/fuels management under any of these alternatives would be expected to retard progress towards PACFISH Riparian Management Objectives. Application of PACFISH direction would maintain or improve fish habitat conditions in the analysis area therefore there would not be adverse modifications to critical habitat or adverse effects to listed fish, under any action alternative as per applicable PACFISH standards and guides. Columbia Basin Ecosystem Management Project (ICBEMP) summary values were incorporated into the analysis as directed under ICBEMP memorandum FS agreement No. 03-RMU-11046000-007 .

Applicable PACFISH Standards and Guidelines for:

Timber Management

TM – 1 Prohibit timber harvest, including fuelwood cutting, in Riparian Habitat Conservation Areas, except as described below. Do not include Riparian Habitat Conservation Areas in the land base used to determine the Allowable Sale Quantity, but any volume harvested can contribute to the timber sale program.

b. Apply silvicultural practices for Riparian Habitat Conservation Areas to acquire desired vegetation characteristics where needed to attain Riparian Management Objectives. Apply silvicultural practices in a manner that does not retard attainment of Riparian Management Objectives and that avoids adverse effects on listed anadromous fish.

Fire/Fuels Management

FM-1 Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of Riparian Management Objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to long-term ecosystem function, listed anadromous fish, or designated critical habitat.

FM-4 Design prescribed burn projects and prescriptions to contribute to the attainment of the Riparian Management Objectives.

Effects to Management Indicator Species

For Redband trout, a Forest management indicator species, no alternatives would result in population level impacts nor a negative habitat trend at either the watershed or Forest scale. As a result, the proposed activities under these alternatives would not affect the viability of Redband trout at the Forest scale. Thus, continued viability for redband trout as a species is expected on the Umatilla National Forest under all alternatives.

For Steelhead, a Forest management indicator species, no alternatives would result in population level impacts to viability nor a negative habitat trend at either the watershed or Forest scale. Any impacts to individuals would be immeasurable. As a result, the proposed activities under these alternatives would not affect the viability of Steelhead trout at the Forest scale. According to the 5-year review of the Middle Columbia River (MCR) Steelhead, published by NOAA Fisheries (Ford et al, 2010), the North Fork John Day population continues to be rated highly viable. This project is not expected to retard recovery of Middle Columbia River steelhead within NFS lands.

First Foods

The Kahler Dry Forest Restoration Project alternatives would not impact fisheries resources, which are one of the First Foods valued by Native American tribal members, who hunt and gather salmonid species in their usual and accustomed areas within the analysis area. The determination was made that the project “may effect, but are not likely to adversely affect” Mid-Columbia Steelhead or steelhead designated critical habitat. The project would have no impacts to Chinook salmon which are not found within the project area.

Biological Evaluation and Determination of Effects

Mid-Columbia Steelhead and Designated Critical Habitat

Alternative 1

Under this alternative, there would be no direct, indirect and cumulative impacts to this species and its habitat from the Kahler Dry Forest Restoration Project. In response to not implementing the project, it is expected that the trees and ground fuels would continue to grow and ladder fuels would continue to expand the connection between ground fuels and the canopy. This process contributes to the risk of wildfire and to the risk that ground fire would spread to the forest canopy.

Detrimental effects of high severity fire include reductions in stream shade on a large enough scale to affect stream temperature, and exposure of sufficient soil so that eroded material interferes with fish habitat. High severity fire interferes with the productivity of the soil, so vegetative regrowth is not optimal.

Considering this and cumulative effects, there is the possibility that the riparian vegetation and stream habitat response to no timber management or prescribed fire would be measureable in the event of a wildfire. But as there would be no planned activity occurring under this alternative, there is no mechanism for direct, indirect effects and there would be no contribution to cumulative effects from federal actions to any ESA listed fish species, their designated critical habitat or to any USFS R6 sensitive fish, aquatic invertebrates or their habitat. Therefore, there would be ***no effect*** to Proposed, Endangered, and Threatened fish species and DCH and ***no impact*** to Sensitive fish and aquatic invertebrate species and their habitat.

Alternatives 2 and 3

For the reasons stated above, the implementation of the Kahler Dry Forest Restoration Project under the proposed action Alternatives **'may effect, but are not likely to adversely affect'** Mid-Columbia steelhead, or steelhead designated critical habitat. The overall direct, indirect effects of any of this project's action alternatives would result in negligible and discountable effects to MCR steelhead and their DCH at the project scale and thus at the forest scale. The project is consistent with the Forest Plan as amended by PACFISH; the project activity would not further reduce viability of the NFJD River MCR steelhead population, on the Umatilla National Forest and may reduce future risks of uncharacteristically severe wildfire on MCR steelhead and their DCH within the project area. According to the 5-year review of the Middle Columbia River (MCR) Steelhead, published by NOAA Fisheries, the North Fork John Day population continues to be rated highly viable (NOAA, 2011).

Chinook salmon and Essential Fish Habitat (EFH)

Alternatives 1, 2 and 3

Chinook salmon are not present in the project area, and there would be no effects to EFH downstream of the project area due to distance and limited effects to stream channels within the project area. The implementation of the project would have **No Effect** on Chinook salmon or essential fish habitat.

Mid-Columbia River Bull Trout and DCH

Alternatives 1, 2, and 3

There are no bull trout *(Salvelinus confluentus)* or DCH in the project area; the implementation of the Kahler Dry Forest Restoration Project would have **No Effect** on bull trout or its designated critical habitat**.**

Western Ridged Mussel

Alternative 1

The no action alternative would have **no impact** to the WRM. Under this alternative, there would be no direct, indirect and cumulative impacts to this species and its habitat from the Kahler Dry Forest Restoration Project.

Alternatives 2 and 3

Any effects on sediment, water temperature, pool frequencies, and large woody debris, may indirectly affect WRM habitat within the project area such effects are expected to be small to the point of unmeasurable. Therefore, the implementation of the project **May Impact individuals or habitat but is Not likely to result in a trend toward federal listing**. The project would be consistent with the Forest Plan as amended by PACFISH.

Hells Canyon Land Snail

Alternatives 1, 2 and 3

The watershed analysis and project area are outside both the historic, known current and suspected spatial range of the species. The implementation of the project would have **No impact** on the Hells Canyon land snail or its habitat.

Shortface Lanx

Alternatives 1, 2 and 3

The watershed analysis and project area are outside both the historic, known current and suspected spatial range of the species. The implementation of the project would have **No impact** on the Shortface Lanx or its habitat.

Columbia Clubtail

Alternative 1

The no action alternative would have **no impact** to the Columbia Clubtail. Under this alternative, no direct, indirect and cumulative impacts to this species and its habitat.

Alternatives 2 and 3

Any effects on sediment, water temperature, pool frequencies, and large woody debris, may indirectly affect WRM habitat within the project area such effects are expected to be small to the point of

unmeasurable. Therefore, the implementation of the project **May Impact individuals or habitat but is Not likely to result in a trend toward federal listing**. The project would be consistent with the Forest Plan as amended by PACFISH.

Westslope Cutthroat

Alternatives 1, 2 and 3

The watershed analysis and project area are outside both the historic, known current and suspected spatial range of the species. The implementation of the project would have **No impact** on the Westslope Cutthroat or its habitat.

References

Behnke, R. J. 1979. Monograph of the native trouts of the genus Salmo of western North America. US Forest Service, Region 2, Lakewood, Colorado.

Bond, C. E. 1992. Notes on the nomenclature and distribution of the bull trout and the effects of human activity on the species. In: .E. Reiman and J. D. McIntyre. Demographic and habitat requirements for conservation of bull trout. U.S. Department of Agriculture, Forest Service, Intermountain Research Station, General Technical Report INT-302, September 1993. 38 pp.

Cavender, T. M. 1978. Taxonomy and distribution of the bull trout (*Salvelinus confluentus*) from the American Northwest. California Fish and Game. 64(3): 139-174.

Elmore, Wayne and Robert L. Beschta, Riparian Areas, Perceptions in Management; Rangelands, Vol. 9, No. 6 (December, 1987), pages 260-265.

Ford, M.J. (Ed.), T. Cooney, P. McElhany, N. Sands, L. Weitkamp, J. Hard, M. McClure, R. Kope, J. Myers, A. Albaugh, K. Barnas, D. Teel, P. Moran and J. Cowen. 2010. Status Review Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Northwest. Draft U.S. Department of Commerce. NOAA Technical Memorandum NOAA-TM-NWFSC-XXX. 346 p. [Online] URL:http://www.nwr.noaa.gov/Publications/Biological-Status-Reviews/upload/SR-2010-all-species.pdf (last accessed August 15, 2014).

Frest, T. J., and E. J. Johannes. 1995. Interior Columbia Basin mollusk species of special concern. Final report: Interior Columbia Basin Ecosystem Management Project, Walla Walla, WA. Deixis Consultants, Seattle, WA. Contract #43-0E00-4-9112. 274 pp. plus appendices.

Haas, Gordon R. and J. D. McPhail. 1991. Systematics and distribution of Dolly Varden (*Salvelinus malma*) and bull trout (*Salvelinus confluentus*) in North America. Canadian Journal of Fisheries and Aquatic Sciences. 48: 2191-2211.

Halofsky, J.E., Hibbs, D.E., 2009. Controls on early post-fire woody plant colonization in riparian areas. Forest Ecology and Management vol. 258, issue 7 (September 2009).

Hankin, D.G., and G.H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Canadian Journal of Fisheries and Aquatic Sciences 45: 834-844.

Lawler J. J., M. Mathias, A. E. Yahnke, and E. H. Girvetz. 2008. Oregon's Biodiversity in a Changing Climate. Report prepared for the Climate Leadership Initiative, University of Oregon.

Luce, C.H. and Z.A. Holden, Declining annual streamflow distributions in the Pacific Northwest United States, 1948–2006, GEOPHYSICAL RESEARCH LETTERS, VOL. 36, L16401, doi:10.1029/2009GL039407, 2009.

Meehan, W. R. and T. C. Bjornn. 1991. Salmonid Distributions and Life Histories. Chapter three in: Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitat, William R. Meehan, Editor, 1991.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life. Version 7.1 NatureServe, Arlington, VA. Available http://www.natureserve.org/explorer. (Accessed: Nov. 29, 2011).

Nedeau E.J., A.K. Smith, J. Stone, and S. Jepsen. 2009. Freshwater Mussels of the Pacific Northwest SecEdition.The Xerces Society, Portland OR.

Neitzel D.A., T.J. Frest. 1990. Survey of Columbia River Basin Streams for Columbia Pebblesnail and Shortface Lanx. Fisheries. Vol. 15(2): 2-3.

Paulson, D. 1999. Dragonflies of Washington. Seattle Audobon Society, Seattle, WA. 31 pp.

Scheuering, E. 2006. Columbia Clubtail species fact sheet. Interagency Special Status/Sensitive Species Program (ISSSSP) webpage. USDA Forest Service/USDI Bureau of Land Management, Oregon and Washington. Available Online (http://www.fs.fed.us/r6/sfpnw/issssp/species-index/fauna-invertebrates.shtml).

Technical Reports

Clean Water Act (1972) and amendments. http://www.epa.gov/npdes/pubs/cwatxt.txt

Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment. Carmichael R.W., and B.J Taylor. Oregon Department of Fish and Wildlife (ODFW). 2009.

McKinney, S.P., J. O'Connor, C.K. Overton, K. MacDonald, K. Tu, S.Whitwell. 1996. A Characterization of Inventoried Streams in the Columbia River Basin. Aqua-Talk USDA 11:1-119.

National Marine Fisheries Service, 1996. Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale. Prepared by the National Marine Fisheries Service Environmental and Technical Services Division Habitat Conservation Branch. 33p.

National Marine Fisheries, 2011. Middle Columbia River steelhead 5-Year Status Reviews. Portland, OR [online]. http://www.nmfs.noaa.gov/pr/pdfs/species/middlecolumbiariver_steelhead_5yearreview.pdf. [Last accessed August 15, 2014)

National Marine Fisheries Service, 2011. 5-Year Review: Summary and Evaluation of Middle Columbia River Steelhead. Prepared by the National Marine Fisheries Service. 14p. http://www.westcoast.fisheries.noaa.gov/publications/status_reviews/salmon_steelhead/steelhead/5-yr-mcr.pdf

Section 7 Fish Habitat Monitoring Protocol for the Upper Columbia River Basin. U.S. Department of Agirculture, Forest Service, Pacific Northwest Region, 1994.

Umatilla National Forest. 1990. Land and Resource Management Plan, Umatilla National Forest, USDA Forest Service, Pacific Northwest Region, Pendleton Oregon.

USDA and USDI. 1995. Decision notice/decision record finding no significant impact: environmental assessment for the interim strategies for managing anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho and portions of California (PACFISH).

USDA Forest Service, 2004. Biscuit Fire Recovery Project Final Environmental Impact Statement [online]. Available from www.fs.fed.us/r6/rogue-siskiyou/biscuit-fire/feis (accessed 10 March 2005).

USDA Forest Service, 2005. B&B Fire Recovery Project Final Environmental Impact Statement [online]. Available from www.fs.fed.us/r6/centraloregon/projects/units/sisters/b-b-fire/bb-final-feis.shtml (Accessed 17 October 2006).

USDA Forest Service, National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1, National Core BMP Technical Guide, FS 990a, April, 2012.

USDA Forest Service, Pacific Northwest Region, Aquatic and Riparian Conservation Strategy, August 13, 2008.

USDA Forest Service. 2012. General Water Quality Best Management Practices. Available on file at the Umatilla National Forest, Supervisors Office, Pendleton, Oregon.

Appendix A

Measures listed here are intended to address concerns for water quality, hydrology, fish and fish habitat, wildlife and wildlife habitat, noxious weeds, soils, and recreation. In general, these measures were designed to reduce potential effects of the action on the environment, and to meet existing laws, regulations and policy. Measures are grouped here under the action that they are related to, or if more general, under a heading for specific resources. The following abbreviations plus a number will designate measures designated for or developed for each resource or action in Table 23. The alpha-numeric label has been tracked from previous versions of Table 23 that appeared in the June, 2012 Notice of Proposed Action.

WQ - Water quality, hydrology and fisheries concerns

SL- Soils

Table 91. Proposed Measures for Kahler Project Design and Implementation.

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
Mechanical Vegetation Management Activities Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that my result from mechanical vegetation treatment activities. Includes measures for protection of Riparian Habitat Management Areas (RHCA's), minimization measures for ground-based skidding and yarding operations, erosion prevention and control measures, and mitigations for winter harvest and mechanical site treatment.					
WQ1	Harvest unit design should ensure favorable conditions of water flow, water quality and fish habitat.	N/A	Forest Plan p. 4-77, General SG's for Water	Veg-1, p. 128	N/A
WQ2	Prevent downstream water quality degradation by the timely identification of areas with high erosion potential and adjustment of harvest unit design.	Yes	Forest Plan p. 4-59, Class IV Streams SG's for Riparian/Fish Habitat	Veg-1, p. 128	N/A
WQ3	Delineate the location of protection areas and available water sources as a guide for both the purchaser and the sale administrator, and to ensure their recognition and proper consideration and protection on the ground.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-1, p. 128	N/A
WQ4/ WQ49/ PF2	Equipment staging, parking and refueling will be outside of RHCAs and in areas designated by the sale administrator that have previous soil disturbance. This includes prescribed fire activities.	Yes	PACFISH RA-4, p. C-17. General Riparian Area Management SG's	Veg-2, p. 131; Road-10, p. 123	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ5	Landings, skid trails, and slash piles would be chosen to avoid, minimize or mitigate potential for erosion and sediment delivery to nearby waterbodies. Sale administrator would work with contractor to locate these areas on the ground wherever possible.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-1, p. 128; Veg-4, p. 134;Veg-6; 136	IDT discussed locations of landings, skid trails and slash piles in project planning.
WQ6	Erosion control and sediment plans will cover all disturbed areas including skid trails and roads, landings, cable corridors, temporary road fills, water source sites, borrow sites or other areas disturbed during mechanical vegetation treatments.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-1, p.128; Veg 2, p.131.	N/A
WQ8	Install sediment and stormwater controls prior to initiating surface disturbing activities to the extent practicable.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-1, p.128; Veg 2, p.131.	N/A
WQ9	Avoid ground equipment operations on unstable, wet or easily compacted soils and steep slopes as described per FS Plan.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-1, p.128; Veg 2, p.131.	N/A
WQ10/ SL1	Use of ground based harvest equipment will not be permitted when soils reach field capacity (heightened moisture content), to limit the potential of long-term detrimental soil conditions, as described in the Forest Plan, or if ruts greater than 2-4 inches occur. Log haul will only be permitted on dry or frozen roads.	Yes	Forest Plan p. 4-77, General SG's for Water; Forest Plan p. 4-80, SG's for Soil Productivity; PACFISH RF-2, C5, p. C11	Veg-4, p. 134	N/A
WQ11	Implement mechanical treatments on the contour on sloping ground to avoid or minimize water concentration and subsequent accelerated erosion.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-2, p. 131	N/A
WQ12	Required skid trails will be reviewed by a soils specialist the extent practicable.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-3, p. 132	N/A
WQ13	Specify RHCA layout, maintenance, and operating requirements in contracts, design plans and other necessary project documentation.	Yes	Forest Plan p. 4-77, General SG's for Water	Plan-2, p. 14; Plan-3, p. 17; Veg-3, p. 132	N/A
WQ14	Use mechanical vegetation treatments in the RHCAs only when suitable to achieve long-term desired conditions and management objectives.	N/A	Forest Plan p. 4-77, General SG's for Water	Plan-3, p. 17; Veg-3, p. 132	See comm. thinning and non-comm. thinning under alt. descriptions.

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ15	Modify mechanical vegetation treatment prescription and operations in the RHCAs as needed to maintain ecosystem structure, function and process.	N/A	Forest Plan p. 4-77, General SG's for Water	Plan-3, p. 17; Veg-3, p. 132.	N/A
WQ16	Utilize yarding mechanisms or mechanical treatments that avoid or minimize disturbance to the ground and vegetation consistent with project objectives.	Yes	Forest Plan p. 4-77, General SG's for Water	Plan-3, p. 17; Veg-3, p. 132.	N/A
WQ17	Avoid felling trees into streams or waterbodies, except as planned to create habitat features. Leave all trees on stream banks. See Table 15 below for possible near stream falling pattern.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-3, p. 132	Retain trees as necessary for canopy cover and shading, bank stabilization and as a source of large woody debris within the RHCA.
WQ18	Trees may be felled in RHCAs when they pose a safety risk. If possible, keep felled trees on site meet woody material objectives. Also, hazard trees along roads within RHCAs or within 100 feet of stream crossings which are cut must be left on site. When feasible, fall hazard trees toward streams.	Yes	PACFISH RA-2, p. C-17	N/A	If hazard trees are within the outer 50’ of an RHCA in units 3 and 27, and are within the silvicultural prescription, they may be removed. If they are not within the silvicultural prescription, they must remain on site.
WQ19	Locate transportation facilities for mechanical vegetation treatments, including roads, landings and main skid trails, outside of the RHCA to the extent practicable.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RF-2, p. C-10	Veg-3, p. 132	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ20	Do not use drainage bottoms as turn-around areas for equipment during mechanical vegetation treatments.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RF-2, p. C-10	Veg-3, p. 132	N/A
WQ21	Use suitable measures to disperse concentrated flows of water from road surface drainage features to avoid or minimize erosion, gully formation and mass failure in the RHCA and sediment transport to the waterbody.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RF-2, p. C-10	Veg-3, p. 132	N/A
WQ22	Aquatics specialists would monitor the RHCA during whenever possible during mechanical operations to evaluate compliance with prescription and mitigation requirements.	N/A	Forest Plan p. 4-77, General SG's for Water; PACFISH p. C-22	Plan-3, p. 17. Also, Veg 3.	N/A
WQ23	The source location, quantity, and timing of water use for dust abatement will be approved by the FS before sale, in order to protect water resources during low flows. Pond sources may be available and the pump must be screened. Pump screens are required by Endangered Species Act, and administered by Oregon Department of Fish and Wildlife.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RA-5, p. C-17	Road 4, WatUses 3.	No more than 10 percent of a stream's flow will be pumped for dust abatement.
WQ24	All skid trails, forwarder trails, and landings which are within Riparian Habitat Conservation Areas will be stabilized as necessary to reduce soil erosion and compaction. This may include planting, seeding, protection of plants, earthwork, and cultivation practices. Stabilization work will be done each year in October. Planting, seeding, protection of plants and shallow cultivation (chain harrowing) will generally be done by the Forest Service as funds are available.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH, RF-2, RF-3, p. C-10, C-11	Veg 3, Veg 4, Veg 6	Any seeding will use native seed provided by the FS. If the FS is unable to provide native seed, non-persistent exotic species may be used if approved by Forest Botanist. Hay and straw used for mulch or erosion control will also be provided by the FS.

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ25	Activities would be mitigated by operating in dry or frozen conditions. Outside of these exceptions, heavy equipment will not operate off roads within the RHCAs.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH, RF-2, RF-3, p. C-10, C-11	Veg 3, Veg 4, Veg 6	N/A
WQ26	Wetland areas less than an acre will have a 100 ft. buffer. Wetlands and the area to the outer edges of riparian vegetation if less than one acre are protected under PACFISH Category 4 strategies/buffers. Ponds less than one acre are not protected. Wetlands and ponds greater than 1 acre are protected under PACFISH Category 3 strategies/buffers, with a 150' buffer from the edge of the wetland	N/A	Forest Plan p. 4-77, General SG's for Water; PACFISH, Standard Widths Defining RHCAs, p. C-8	Plan 2, Plan 3, Veg 3	N/A
WQ27	Design and locate skid trails and skidding operations to minimize soil disturbance to the extent practicable.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH, RF-2, RF-3, p. C-10, C-11	Veg 3, Veg 4, Veg 6	N/A
WQ28	Equipment crossing ephemeral draws that do not classify as Class IV will be confined to designated crossings. There will be minimum 100 foot spacing between designated stream crossings. Skidding up and down ephemeral draws will be prohibited. Equipment crossing swales that do not classify as Class IV channels will be confined to crossings approved by the FS, and may not otherwise operate within the swale, in order to minimize soil disturbance and sedimentation. Debris may be placed into the crossings to reduce soil disturbance, compaction, and erosion. However, the debris must be removed before the unit is closed out. Trees within these swales may be cut and dragged or lifted out. Skidding up and down the swales will be prohibited. If crossing swales during runoff is anticipated, culverts, bridges, and/or rock/earth work will be used to stabilize and armor channel banks and bottoms and prevent erosion .	Yes	Forest Plan p. 4-77, General SG's for Water PACFISH, RF-2, RF-3, p. C-10, C-11	Veg 3, Veg 4, Veg 6	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ29	Directionally fell trees to facilitate efficient removal along pre-designated yarding patterns with the least number of passes and least amount of disturbed area.	Yes	Forest Plan p. 4-77, General SG's for Water; also Forest Plan p.4-59 #2.	Veg 4	Where conditions and safety permit, trees will be felled away from residual conifers, large broken or hollow top snags, dispersed campsites, fences, landlines, research plots and improvements (i.e. fences, stock ponds, section corner monuments, etc).
WQ30	Use suitable measures to stabilize and restore skid trails when needed. This may include seeding, protection of plants, earthwork, and cultivation practices. Reshape the surface to promote dispersed drainage and install suitable drainage features.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RA-5, p. C-17.	N/A	N/A
WQ31	Skid trails, forwarder trails, and other log transportation routes will be controlled by the Forest Service to meet the Best Management Practices and applicable management requirements during timber sale contract administration.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RA-5, p. C-17	N/A	N/A
WQ32	Landing locations are selected for least amount of excavation and erosion potential, where sidecast will neither enter drainages nor damage other sensitive areas.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RA-5, p. C-17	N/A	N/A
WQ33	Locate landings outside of the RHCAs and avoid locating landings on steep slopes or highly erodible soil.	Yes	PACFISH RA-2, p. C-17	N/A	N/A
WQ34	Design roads and trail approaches to minimize overland flow entering the landing.	Yes	PACFISH RA-2, p. C-17	N/A	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ35	Existing landings will be used where possible.	Yes	PACFISH RA-2, p. C-17	N/A	N/A
WQ36	Use suitable measures as needed and/or restore and stabilize the landing after use.	Yes	PACFISH RA-2, p. C-17	N/A	N/A
WQ37	Winter harvest will be considered in areas with sensitive riparian conditions or other potentially significant soil erosion and compaction hazards.	Yes	Forest Plan p. 4-77, General SG's for Water	Road 4, Veg 7	N/A
WQ38	Ensure culverts do not become plugged from logging activities and thereby do not affect the functionality of the roads	Yes	Forest Plan p. 4-77, General SG's for Water	Road 4	N/A
WQ39	Avoid locating skid trails on steep areas (> 35% slope) where frozen skid trails may be subject to soil erosion the next spring.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Veg 4	N/A
WQ40	Install and maintain suitable erosion control on skid trails prior to spring runoff.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Veg 4.	N/A
SL2	Within commercial harvest units, no harvest or heavy equipment will leave designated roads or trails, to limit the potential of detrimental soil disturbance. The exception to equipment leaving designated trails will be specific to harvester/forwarder operations. In the event that harvester/forwarder is used, they will be required to have no less than 1 foot of slash (depth) under both equipment tracks. This slash load should buffer the weight of equipment when operating on other than designated trails.	N/A	N/A	N/A	Yes
SL3	If Grapple piling is used for fuels reduction, equipment will be required to travel over ≥1 foot of slash, and utilize designated trails. Once the equipment reaches a starting point it will back out of the unit riding on material being piled.	N/A	N/A	N/A	Yes

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
SL4	All temporary roads (legacy or new) that are used for this project would be rehabilitated. These roads will be either scarified or subsoiled where possible depending upon the soil depth and slash will be placed over the surface. See subsoiling prescription below.	N/A	Forest Plan p. 4-86 Transportation Goal	N/A	See subsoiling prescription in Soils Report Appendix C.
Road Management Activities Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and instream riparian resources that may result from road management activities.					
WQ41	Road blading would be done only when necessary. Ditches would not be routinely bladed, and exposed soil areas on road prisms, ditches, cuts, and fills would be seeded with plants non-palatable to wildlife if funds are available. To minimize the need for blading, haul roads would not be used when detrimental rutting occurred because of wet weather.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water;	Road 4	N/A
WQ42	Newly created roads would favor lower slope routes when consistent with other environmental protections. They would be located outside of RHCAs	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water;	Road 4	N/A
WQ43	Temporary roads will be located to minimize or mitigate adverse effects to soil, water quality and riparian resources.	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 4	N/A
WQ44	Maintain the natural drainage pattern of the area wherever practical, apply soil protective cover on disturbed areas.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 2, Veg 2. Apply soil cover is in Veg 2, Veg 4, Veg 6	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ45	Temporary roads will be inspected to verify that erosion and stormwater controls are implemented and functioning and are appropriately maintained.	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 1, Road 5	N/A
WQ46	There will be measures to close and/or physically block re-opened closed roads and temporary road entrances so that unauthorized motorized vehicles cannot access the road after project implementation.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 6	N/A
WQ47	Implement suitable measures to re-establish stable slope contours, and surface and subsurface hydrologic pathways on temporary roads where necessary and to the extent practicable to avoid or minimize adverse effects to soil, water quality and riparian resources.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 6	N/A
WQ48	Implement measures to promote infiltration of runoff and intercepted flow and/or desired vegetation growth on the road prism and other compacted areas.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 6	N/A
Wild land/Prescribed Fire Activity Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and instream riparian resources that may result from wild land/prescribed fire activities.					
WQ47	Alter prescribed fire prescriptions and control actions in the RHCA's as needed to maintain ecosystem structure, function and processes.	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water; Also, PACFISH FM-1, p. C-15	Fire 2- Use of Prescribed Fire	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ50	Slash piles will be placed 50 ft. from the stream or lopped and scattered within the 50 ft. buffer.	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water; Also, PACFISH FM-1, p. C-15	Fire 2, Veg 2.	N/A
WQ51	Lighting during prescribed burning will take place in RHCAs. This will be done to improve the effectiveness of existing roads and trails as fire breaks. Lighting in RHCAs eliminates the need for constructed fire lines. Burning of course would be done during dry conditions	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water; PACFISH FM-4, p. C-16	Fire 1, Fire 2	N/A
WQ52	An aquatics specialist will be present with ignition in the RHCAs	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water; PACFISH FM-4, p. C-16	Fire 1, Fire 2	N/A
Protection of Native Plants and Shrubs Objective: To preserve habitat and minimize disturbance to native plants and shrubs.					
WQ53	Do not cut or drive over shrubs, hardwoods, or trees unnecessarily in RHCA's.	Yes	N/A	N/A	N/A

Appendix D

Fire and Fuels Report

Kahler Dry Forest Restoration Project

Fire and Fuels Report

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for:
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Umatilla National Forest

June 23, 2014

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Introduction

The Kahler Dry Forest Restoration Project is designed to restore dry forest conditions to a resilient, fire adapted landscape by moving the project area towards its historic range of variability in forest structure, tree density, species composition and Fire Regime Condition Class.

There is a need to address the following conditions:

- Reestablish the character of a frequent fire regime to the landscape to aid in maintaining open stand conditions and fire-tolerant species, improve big game forage, and reduce conifer encroachment.
- Reduce the risk of loss from wildfire and improve fire sighting capabilities from Tamarack Lookout.
- Restore and promote open stands of old forest dominated by ponderosa pine, thereby moving the area toward its historical range in structure, density, and species composition.
- Maintain and promote old trees (>150 years old) throughout the project area.

This specialist report describes the environmental consequences of modifying three vegetation components in the Kahler planning area: species composition, forest structure, and stand density. Vegetation modifications would be accomplished by implementing the following treatment activities (see Table 1), either as direct or connected actions: upland forest commercial thinning, juniper thinning and shrub-steppe enhancement, riparian-area thinning, danger-tree removal, upland forest noncommercial thinning, aspen restoration, reforestation, activity fuel reduction, and landscape underburning (prescribed fire).

Table 92: Silvicultural and Fuels activities included in the Proposed Action for Kahler Dry Forest Restoration Project

Proposed Activity	Alternative 2 (Acres)	Alternative 3 (Acres)	Activity Objectives and Specifications
Upland forest commercial thinning	9,435	8,629	Variable-density thinning (VDT), or thinning by using the individuals, clumps, and openings approach (ICO), also with skips and gaps, will be used to adjust forest composition, forest structure, and stand density.
Noncommercial thinning outside of harvest units	638	638	NCT is applied in stands where trees to be cut are not merchantable or do not have commercial value; it is used to adjust species composition, forest structure, and stand density. Treatment may be lop and scatter or thin, pile and burn.
Noncommercial thinning in harvest units	4,718*	4,315*	It is assumed that 50% of upland forest commercial thinning acreage will also require noncommercial thinning to reach the stand density objectives. Treatment may be lop and scatter or thin, pile and burn.
Juniper thinning and shrub/steppe enhancement	1,426	1,426	Western juniper invaded shrublands historically dominated by mountain mahogany or bitterbrush, and it invaded dry-

			forest sites historically dominated by ponderosa pine. Thinning will reduce juniper abundance.
Juniper noncommercial thinning	0	153	Thinning will reduce juniper abundance in dry forest stands historically dominated by ponderosa pine.
Shrub/steppe noncommerical thinning	38	38	Thinning will reduce conifer abundance in historical shrubland.
Dry forest Riparian Treatment (Class 4 Buffers)	682*	657*	Intermittent channels on dry-forest sites (class IV riparian habitat conservation areas; RHCAs) may have uncharacteristic vegetation conditions. Thinning will help restore them, and allow fire to be reintroduced as well.
Aspen restoration	10*	10*	Aspen is a keystone ecosystem type, but it has a limited distribution in the Kahler planning area. Conifer removal, thinning, fencing, and other treatments will be used to help restore quaking aspen ecosystems.
Reforestation in VDT gaps	1,000*	920*	Reforestation will be used to help restore early-seral species (primarily ponderosa pine and western larch) in gaps created by using VDT.
Reforestation in Wheeler Point fire	5,000	5,000	Microsite planting will occur on up to 5,000 acres of the Wheeler Point fire where competition from shrubs (primarily snowbrush ceanothus) is low enough to allow this approach to be successful.
Mechanical Line (miles)	6.1	6.1	Facilitate holding capabilities for activity fuel treatment and landscape burning
Handline (miles)	2.0	2.0	Facilitate holding capabilities for activity fuel treatment and landscape burning
Activity fuels treatment (mechanical)	1,770*	1,678*	Mechanical treatment is planned for units where slash loads are greater than average and would benefit from piling, crushing, and/or masticating prior to implementing prescribed burning
Activity fuels treatment (burning)	6,605*	6,040*	Post-harvest fuel reduction burning; acreage values assume that 70% of CT treatment area will be underburned.
Landscape underburning	31,019	31,019	High-frequency, low-severity fire is a keystone ecosystem process for dry-forest sites. It functioned as a thinning agent by killing small trees, and it cycled nutrients every 5-20 years. Most of the dry-forest sites have stagnant nutrient cycles and too many seedlings, so fire's proper function will be restored as soon as possible (assumes 50-70% of area will be underburned).

* These acreages are double-counted because they represent additional treatments applied to acreage already affected by another activity (such as noncommercial thinning occurring after the upland forest commercial thinning activity has been completed). Acreages without asterisks are associated with the primary activities; acreages with asterisks are secondary or follow-up treatments occurring after a primary activity has been completed.

Summary of Effects

Alternative 2 and 3 effectively move conditions toward the Kahler project area's historic range of variability in forest structure, tree density, species composition, and fire regime condition class. Alternative 2 is more successful, directly following treatment, at reducing passive crown fire and maintaining fuel loadings acceptable to the Forest Plan when compared to Alternative 3 and the No Action Alternative.

Affected Environment

Analyses described in this report pertain to National Forest System lands occurring in the following subwatersheds: Alder Creek (170702040108), Lower Kahler Creek (170702040104), Upper Kahler Creek (170702040103), Haystack Creek (170702040105), and Bologna Canyon (170702040101). This planning (analysis) area contains approximately 32,840 acres. The majority (approximately 19,913 acres) of the planning area is located in Wheeler County; approximately 12,927 acres are located within Grant County (see Figure 1).

Forest Plan management areas that are unsuitable for prescribed fire (D2 Research Natural Area, 84 acres) are not included in the affected environment for the fire and fuels analyses. Private land within and adjacent to the planning area were also not included in the affected environment. Fire occurrence and fuels information on private property was not available and therefore not included in this analysis.

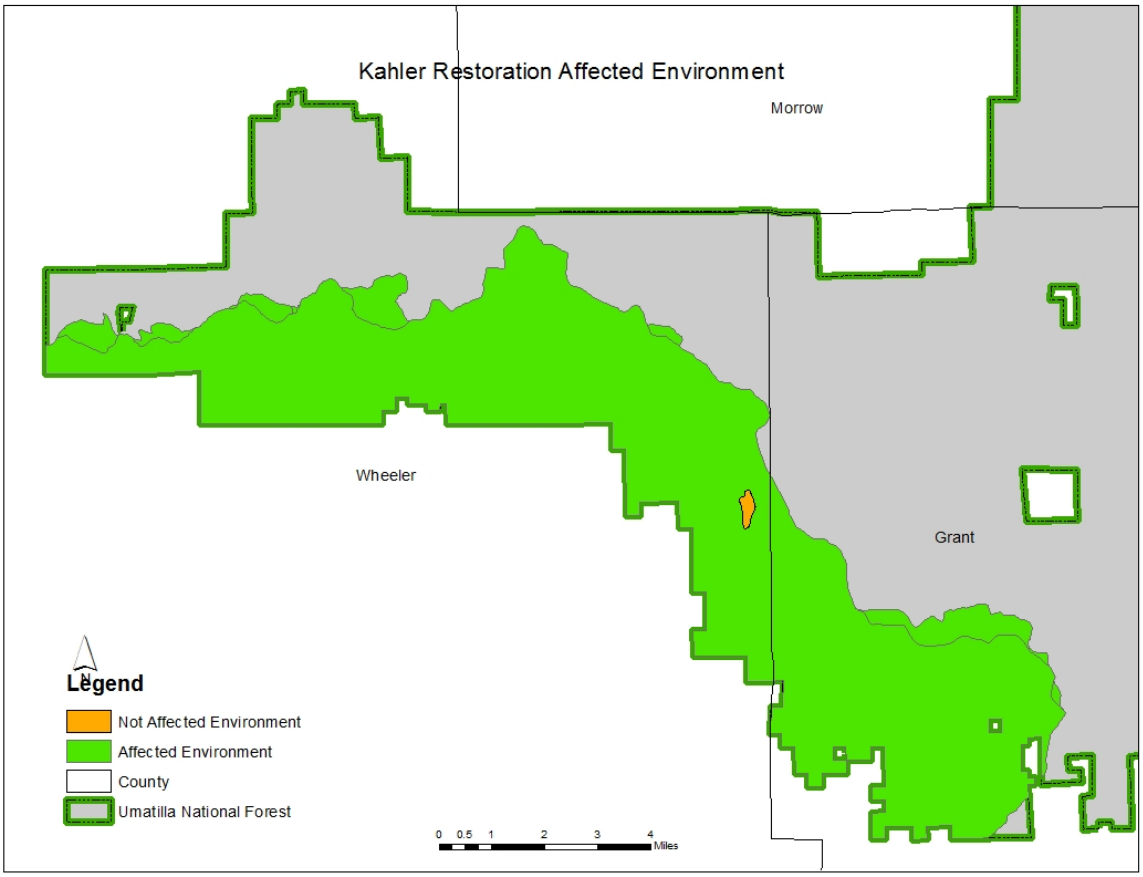


Figure 6 – Affected environment for forest vegetation analyses. The orange areas show locations of Forest Plan management areas that are unsuitable for prescribed fire (D2 Research Natural Area); they are not included in the affected environment for the fire and fuels analyses. Private land within and adjacent to the planning area were also not included in the affected environment.

The communities of Winlock (see Figure 2) and Monument (see Figure 3) are identified as Communities at Risk within the County Wildfire Protection Plan (CWPP) identified boundaries of the Wildland Urban Interface (WUI) adjacent to the Kahler project area. The communities are primarily defined as an Intermix Community where structures are scattered throughout a wildland area; they can either be clustered close together or spread out to one structure per 40 acres.

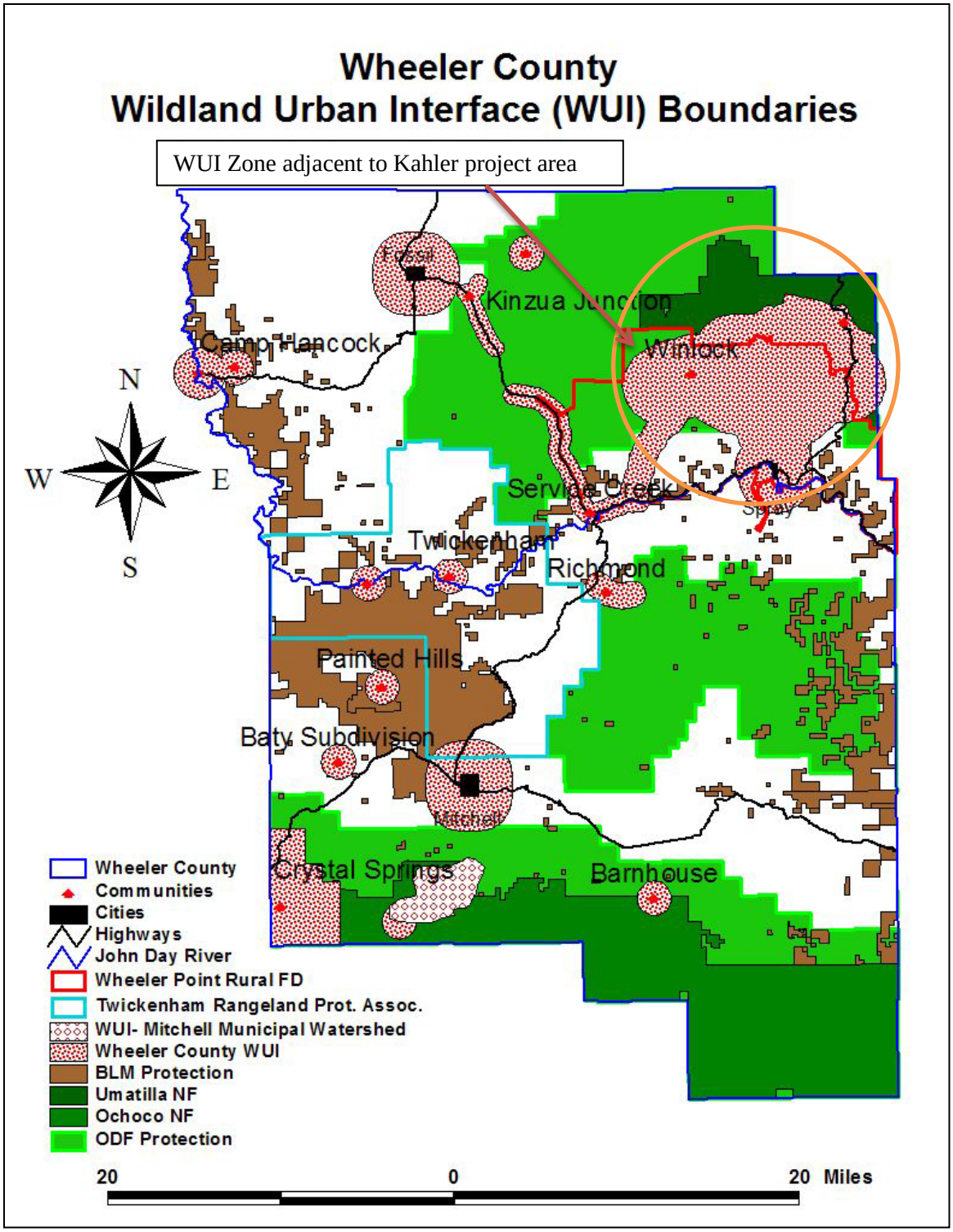


Figure 7. Wildland Urban Interface Zones in Wheeler County (Wheeler Co. 2006)

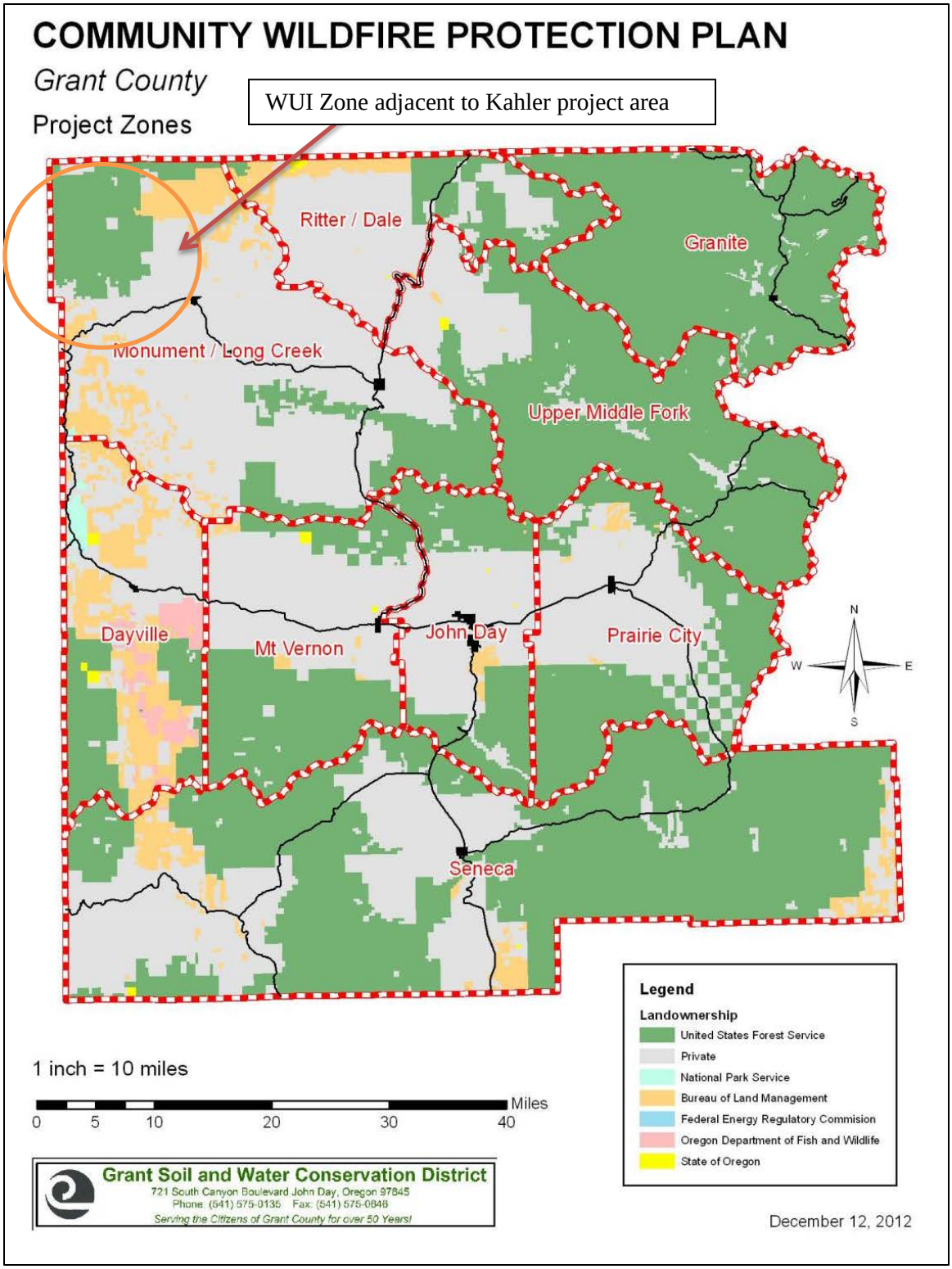


Figure 3. Grant County Wildland Urban Interface Project Zones (Jerome 2013).

Existing Condition

Prior to Euro-American settlement, dry ponderosa pine and mixed conifer forests were burned by frequent low- or mixed-severity fires. These mostly surface fires maintained low and variable tree densities, light and patchy ground fuels, simplified forest structure, and favored fire-tolerant trees, such as ponderosa pine, and a low and patchy cover of associated fire-tolerant shrubs and herbs (Hessburg, P; Agee, J; Franklin, J 2005). The Kahler area has seen an interruption in the natural fire disturbance regime in which it evolved. This has created changes in species composition, stand structure, density and fuel loads. As a result, the existing levels of fire severity (low, moderate, stand replacement) are out of their historic proportion to each other. Fewer acres are burning at low intensities and more acres have burned, or are projected to burn, at moderate to high intensities (greater than four foot flame lengths).

Historical Range and Variability

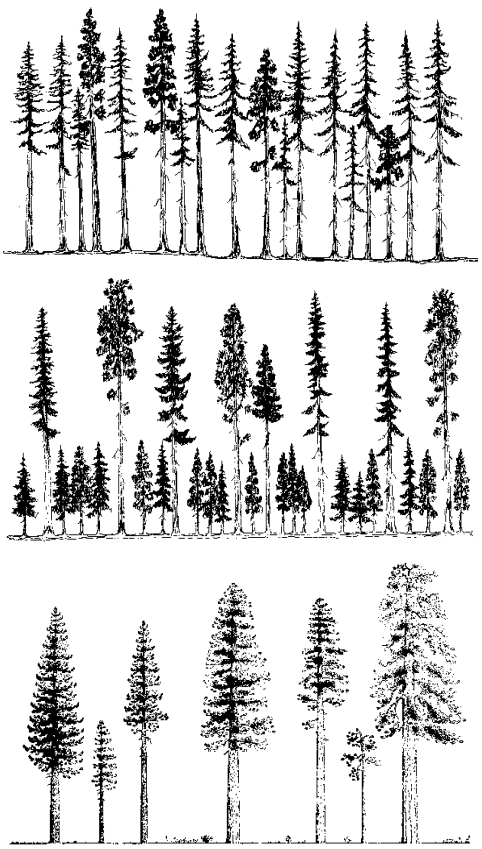
Historical Range and Variability (HRV) is a theory developed to provide a representative time series of reference conditions to guide land management decisions across a broad historical envelope of possible ecosystem conditions, such as burned area, vegetation cover type area, or patch size distribution (Keane et al, 2009; Aplet and Keeton, 1999). In order to gain an understanding of what the landscape historically looked like, an HRV analysis was completed for species composition, forest structure and stand density in the Kahler forest vegetation affected environment.

The predominant vegetation type in the Kahler planning area in the mid-1880s was ponderosa pine (66% of the area), followed by mixed-conifer forest containing a mixed species composition (likely including ponderosa pine, Douglas-fir, and grand fir) (20% for the two mixed-conifer types combined), nonforest grassland and shrublands (10%), and five other miscellaneous vegetation types occurring at relatively low levels (2% of the planning area or less individually) (Powell, Forest Vegetation Report, 2014).

The Kahler analysis area is primarily a dry-upland forest vegetation site (Dry UF PVG) (87%). Currently, the predominant forest cover type is ponderosa pine (55%). Comprising the remaining vegetation types is: Douglas-fir (25%), non-forest (12%) grand fir (5%) and western juniper (2%).

Figure 4 (below) displays definitions for structural stages within forested sites. HRV analysis for forest structural stage and stand density class was completed for Kahler. Results suggest that stem exclusion and understory reinitiation forest structural stages are currently over-represented. The old forest single stratum forest structural stage is under-represented. Analysis suggests the high stand density class in Kahler is currently over-represented on Dry UF PVG sites; the low stand density class is under-represented. (Powell, Forest Vegetation Report, 2014).

Stand Initiation (SI). Following a stand-replacing disturbance such as wildfire or tree harvest, growing space is occupied rapidly by vegetation that either survives the disturbance or colonizes the area. Survivors literally survive the disturbance above ground, or initiate new growth from their underground organs or from seeds on the site. Colonizers disperse seed into disturbed areas, it germinates, and then new seedlings establish and develop. A single canopy stratum of tree seedlings and saplings is present in this stage.



Stem Exclusion (SE). In this structure stage, trees initially grow fast and quickly occupy all of their growing space, competing strongly for sunlight and moisture. Because trees are tall and reduce light, understory plants (including smaller trees) are shaded and grow more slowly. Species that need sunlight usually die; shrubs and herbs may become dormant. In this stage, establishment of new trees is precluded by a lack of sunlight (stem exclusion closed canopy) or by a lack of moisture (stem exclusion open canopy).

Understory Re-initiation (UR). As the forest develops, a new age class of trees (cohort) eventually gets established after overstory trees begin to die or because they no longer fully occupy their growing space. This period of overstory crown shyness occurs when tall trees abrade each other in the wind (Putz et al. 1984). Regrowth of understory seedlings and other vegetation then occurs, and trees begin to stratify into vertical layers. This stage consists of a low to moderate density overstory with small trees underneath.

Old Forest (OFSS or OFMS). Many age classes and vegetation layers mark this structural stage containing large, old trees. Snags and decayed fallen trees may also be present, leaving a discontinuous overstory canopy. The drawing shows a single-layer stand of ponderosa pine reflecting the influence of frequent surface fire on dry-forest sites (old forest single stratum; OFSS). Surface fire is not common on cold or moist sites, so these areas generally have multi-layer stands with large trees in the uppermost stratum (old forest multi strata; OFMS).

Figure 4. Forest structure class descriptions from Powell (2010), based on work by Oliver and Larson (1996) and O'Hara et al. (1996) and Spies (1997).

Fire Regimes

A fire regime is a classification of the historic role fire would play across a landscape and describes the historical fire conditions under which vegetative communities evolved and are maintained (Agee 1993). Coarse scale definitions for historical fire regimes have been developed by Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Brunnell (2001). Fire regimes are classified based on the average number of years between fires (frequency) combined with the severity of the fire. There are five historical fire regimes, I, II, III, IV and V. Four historical fire regimes commonly occur in the Blue Mountains (Powell, 2011). They are Fire Regimes I, II, III and IV (see table 2).

Table 93. *Selected characteristics for fire regimes of the Blue Mountains.* HISTORICAL FIRE REGIMES (Powell, 2011)

Fire Regime Characteristic	1 (I)	2 (II)	3 (III)	4 (IV)
Fire return interval (mean; in years)[1]	< 25	< 35	35-100+	35-100+
FRCC: fire frequency interval[2]	0-35 years	0-35 years	35-200 years	35-200 years
Fire severity on upper canopy layer[3]	Low	Replacement	Mixed	Replacement
Upper canopy layer mortality[3]	≤25%	>75%	26-75%	>75%

FRCC: fire severity name[2]	Low/Mixed	Replacement	Mixed/Low	Replacement
Fire intensity adjective[4]	Low	Low-Moderate	Moderate-High	High
Fireline intensity (flame length; feet)[5]	< 3	< 3	3-10	> 10
Fuel component driving fire spread[4]	Surface	Surface	Surface/Canopy	Canopy
Ecosystem example[4]	Ponderosa pine	Grassland/shrub	Mixed-conifer forest	Subalpine forest
Historical burned area (percent)[6]	75	5	15	5
Estimated fire size (acres)[7]	1-3,000	Unknown	1-10,000	1-5,000
Measured fire size (acres)[8]	2,950	Unknown	900	Unknown
Fire size variability (acres; min-max)[9]	50-19,960	Unknown	250-1,940	Unknown
Fire timing (seasonality)[10]	Summer and fall	Spring and summer	Summer and fall	Summer and fall

1 **Fire return interval** (years) is the frequency between successive fire events. Table data for fire return interval was taken from Hall (1976), Heyerdahl and Agee (1996), and Maruoka (1994) and from Schmidt et al. (2002).

2 **FRCC** (fire regime condition class) is a process for evaluating whether current conditions have departed from historical reference conditions and, if so, the magnitude of the departure; the FRCC frequency and severity names, by fire regime group, are taken from Barrett et al. (2010).

3 **Fire severity on upper canopy layer** is the effect of fire on dominant plants: no more than 25% of upper canopy layer plants are killed by low-severity fire, whereas 75% or more are killed by high-severity fire; moderate-severity fires have survival percentages between these extremes (the 25% and 75% mortality thresholds were established by FRCC; see Barrett et al. (2010), page 99.

4. **Fireline intensity, fuel component**, and **ecosystem example** were taken from Keeley et al. 2009 (table 1).

5. **Fireline intensity** refers to the energy release rate of a fire. Since intensity is generally proportional to flame length, fireline intensity is typically expressed as a flame length, in feet. Table data were taken from Agee (1996).

6 **Historical burned area** is an estimate of annual burned area (percent) for the Blue Mountains area prior to Euro-American settlement (defined as pre-1850); table data were adapted from Agee (1996).

7. **Estimated fire size** provides an indication of average wildfire extent (in acres) for the Blue Mountains, as derived using an expert panel approach and involving 50 employees from the Malheur, Umatilla, and Wallowa-Whitman National Forests (Johnson 1993).

8 **Measured fire size** provides an indication of average wildfire extent (in acres) from a Blue Mountains fire history study (Heyerdahl and Agee 1996, Heyerdahl 1997); the appendix provides a detailed listing of fire size (acres) and fire-free interval (years) for the four Blue Mountain areas sampled for this study.

9. **Fire size variability** shows how historical wildfire extent varied (in acres) from a Blue Mountains fire history study (Heyerdahl and Agee 1996, Heyerdahl 1997); the appendix provides a detailed listing of fire size (acres) and fire-free interval (years) for the four Blue Mountain areas sampled for this study. Note that the fire size variability characteristic might have been influenced by the number of fires sampled (fire regime 1 included 210 fires; fire regime 3 included only 8 fires), and because the mapped fire extent was truncated at the study area boundary for each sampled fire.

10 **Fire timing** refers to the typical season of wildland fire. Table data taken from Agee (1996).

The Kahler project planning area is comprised of approximately 73 percent Fire Regime I, 7 percent Fire Regime II and 20 percent Fire Regime III (see Figure 5).

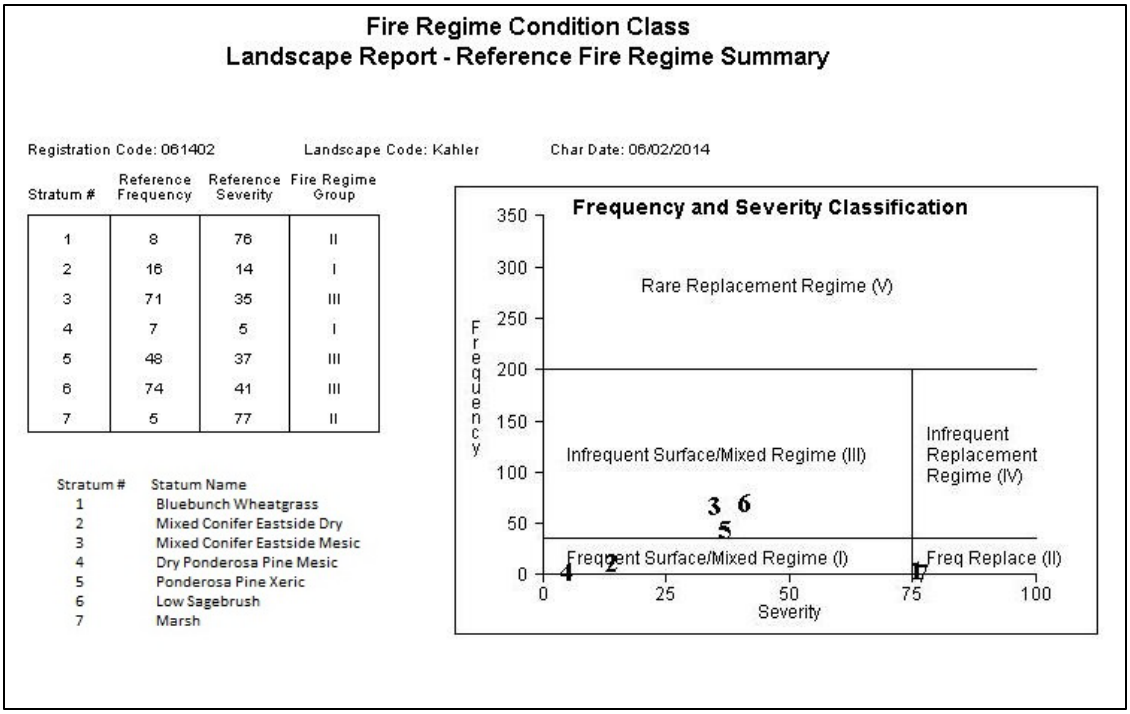


Figure 5. Fire Regime Condition Class (FRCC software application 3.0.3.0) landscape report—reference fire regime summary for the Kahler project area. Fire Regimes present in the Kahler area are: I, II and III, with the majority of the area in Fire Regime I.

Fire Regimes and Current Vegetation

Ponderosa pine (Dry Ponderosa Pine- Mesic) and dry Douglas-fir (Mixed Conifer-Eastside Dry) are best described as Fire Regime I with a fire frequency interval of 0-35 years. Historically fire was typically surface-driven and of low intensity (flame lengths under 3 feet). Dry mixed conifer sites are typically characterized as having low to mixed fire severity that resulted in an intricate network of timbered patches and clearings of various sizes. These sites would have occurred in the Kahler area in conjunction with transitions between climate, topography and vegetation flammability, especially in relation to aspect and fire severity (Perry et al, 2011). Fire, and subsequent suppression by humans, has had an influence on the analysis area as a whole, and is primarily responsible for the current forest stands in most of the area (Weaver 1943, Mutch et al. 1993). In addition to fire exclusion, timber harvest, herbivory from native and domestic ungulates, and spruce budworm infestations have contributed to the stand species composition, density and structure that are now present in Kahler.

Nearly 16% of the Kahler analysis area is currently in a state of regeneration as a result of the Wheeler Point fire which burned in 1996. The area is classified as Fire Regime I. The fire burned a total of 22,727 acres; the majority of which burned under high severity, stand replacement fire conditions. Factors contributing to the intense fire behavior were: extreme weather conditions, fuel and terrain alignment, and fire exclusion. Historically, frequent fires would have reinforced the occurrence of low or mixed severity fires within the Kahler area, because frequent burning would have spatially isolated conditions that supported high-severity fires. Dry forest landscapes were rarely affected by more severe climate-driven events (Hessburg, P; Agee, J; Franklin, J 2005).

About 12% of the analysis area supports non-forest vegetation, most of which is grass. Dry meadows and bunchgrass communities are common non-forest types. This area is classified as Fire Regime II with a fire frequency interval of 0-35 years. Historically fire was surface driven and stand-replacing.

Western juniper (Ponderosa Pine-Xeric), mixed conifer (Eastside Mesic), and low sagebrush sites are categorized as Fire Regime III with a historical fire frequency interval of 35-200 years and a combination of surface and canopy fuels as a driver for fire spread. Historically fire would have burned with moderate to high intensities (flame lengths of 3 to 10 feet) with mixed mortality on the upper canopy layer.

Fire Regime Condition Class

Fire Regime Condition Class (FRCC) is a descriptor used to characterize an area's departure from historic fire regimes (Powell 2004). There are three condition classes for each fire regime and they are based on the degree of the vegetation departure from historical vegetation characteristics. The departure is a result of changes to vegetation characteristics such as species composition (structural stages, stand age, and canopy closure), fuel composition, fire frequency and severity, and other disturbances such as insect and disease. Condition Class 1 is considered low departure, which means vegetation is similar to what was present historically. Condition Class 2 is a moderate departure, and Condition Class 3, is a high departure from historic conditions (see Table 3).

Table 94. Fire Regime Condition Class Descriptions

Condition Class	Percent Deviation from Historical Conditions	Description	Species Composition and Structure
1	0-33 percent	Within the historical range of variability of the vegetation characteristics; fuel composition; fire frequency, severity and pattern	Species composition and structure are functioning within their historical range.
2	34-66 percent	Fire regimes have been moderately altered from historical range. Fire frequencies have departed from natural historical frequencies by one or more return intervals. The result is moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns.	Species composition and structure have been moderately altered. For example: Grassland – Moderate encroachment of shrubs and trees or invasive exotic species. Forestland – Moderate increase in density, encroachment of shade tolerant trees species, and moderate loss of fire tolerant tree species.
3	67-100 percent	Fire regimes have been substantially altered from their historical range. Fire frequencies have departed	Species composition and structure have been substantially altered from their historical range. For

		from natural frequencies by multiple return intervals. Dramatic changes occur to one or more of the following: fire size, intensity, severity and landscape patterns.	example: Grassland – High encroachment and establishment of shrubs, trees, or invasive exotic species. Forestland – High increases in density, encroachment of shade tolerant tree species, or high loss of fire tolerant tree species. High mortality or defoliation from disease and insect.

The Kahler analysis area is classified as having a landscape FRCC departure of 2. This is derived from a weighted average based on the BioPhysical Settings determined by the Most Similar Neighbor (MSN) data and the effects of prescribed fire, wildfire, and herbivory from domestic ungulates (Justice 2014). Figure 6 displays the representative strata and landscape departure for the Kahler analysis area.

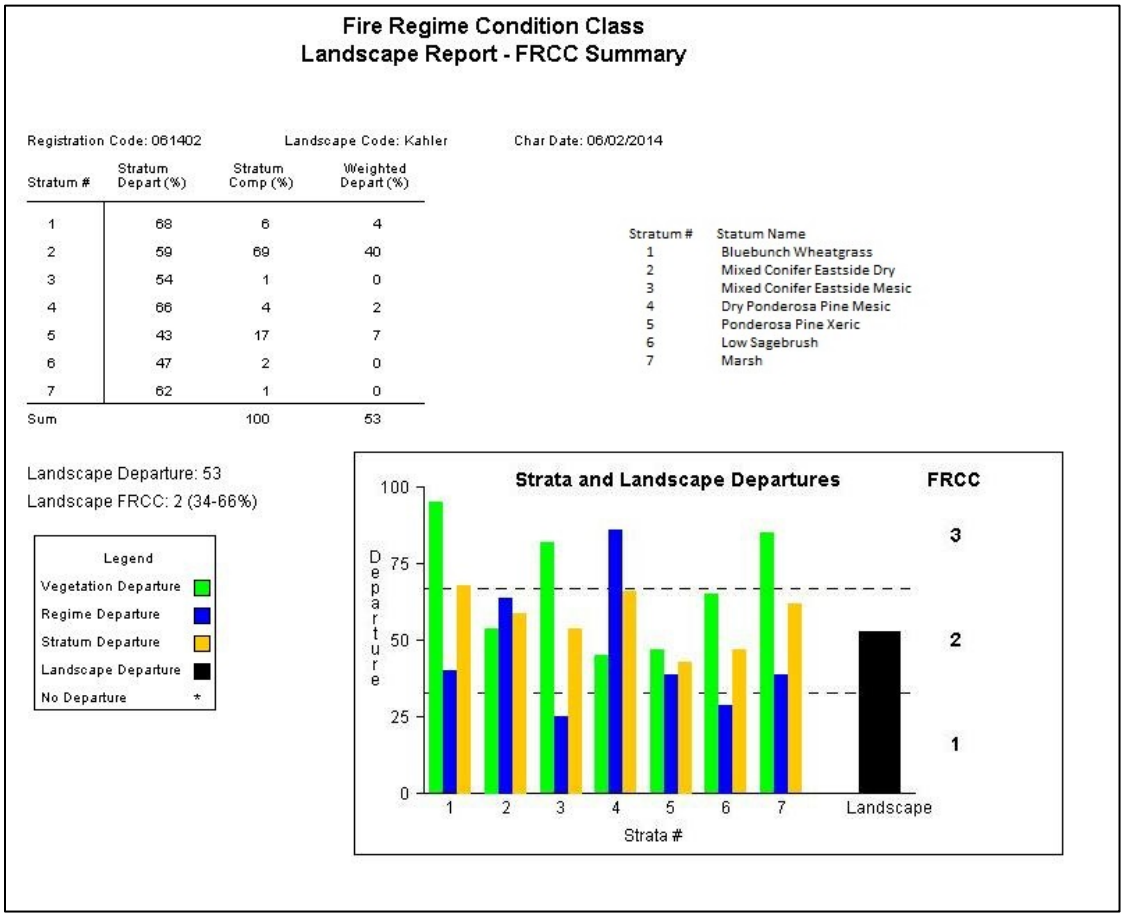


Figure 6. Fire Regime Condition Class (FRCC software 3.0.3.0) landscape report—FRCC summary for the Kahler project area. The Kahler area is 53% (FRCC 2) departed from historic conditions.

Fire Resistant Forests

Agee and Skinner (2005) state that drier forests are in need of active management to mitigate fire hazard. They developed a set of principles important to address in fuel reduction treatments: reduction of surface fuels, increasing the height to live crown, decreasing crown density, and retaining large trees of fire-resistant species (Table 4). Following these principals helps to increase firefighter safety and to reduce fire intensities, tree mortality, and restoration needs post wildfire (tree planting, etc).

Table 95. Fire Regime Condition Class Descriptions: Principles of fire resistance for dry forests (Powell 2013; adapted from Agee, 2002 and Hessburg and Agee, 2003)

Principle	Effect	Advantage	Concerns
Reduce surface fuels	Reduces potential flame length	Fire control is easier; less torching of individual trees	Soil disturbance: less with prescribed burning, more with certain mechanical treatments
Increase height to live crown	Requires longer flame length to begin torching	Less torching	Opens understory; may allow surface wind to increase
Decrease canopy bulk density (foliage biomass)	Makes tree-to-tree crown fire spread less likely	Reduces crown fire potential	Surface wind may increase and surface fuels may be drier
Favor fire-tolerant tree species	Reduces potential tree mortality	Improves vegetation tolerance to low- and mixed-severity fire	If used too broadly, it could simplify composition at landscape scale

Because of a shift in vegetation from large open, old forest single stratum ponderosa pine and Douglas fir stands, the Kahler area has more surface fuels (dead and down material), a higher level of crown density, and a lower level of height to live crown ratio than would have historically occurred.

Fire Occurrence

Fire records indicate that there have been 141 detected and fully suppressed fires from 1970 to 2013 in the Kahler project area (Table 5). Of those fires, 72 percent were ignited by lightning. In comparison, 68 percent of fires on the Heppner Ranger District have been ignited by lighting. Also of note, at least one fire has been detected and suppressed nearly every year since 1970 within the Kahler project boundary (no fires in 1985, 1993, and 1995).

Table 96. Wildfire acres by decade within the Kahler Project Area

Decade	Number of Fires	Acres burned
1970-79	37	37
1980-89	30	74
1990-99	31	6,961
2000-09	29	118
2010-13	14	12

Large Fire records show 3 fires, greater than 100 acres, burned in the Kahler analysis area (see Table 6).

Table 97. Large Fires (100 acres or greater) within the Kahler Analysis Area

Fire Name	Year	Acres burned in analysis area	Total burned acres
Mahogany Butte	1944	1,042	1,594
Thorn Spring	1961	750	786
Wheeler Point	1996	6,950	22,727

Fire Behavior

Fire behavior is determined by fuel, weather, and topography. Fuel is the only element that can be manipulated to influence fire behavior characteristics. Fine fuels and small woody fuels are the major contributors to fire spread rates by carrying the ignition and flaming front of a fire (Rothermel 1983). Small woody fuels influence the rate of spread and fire intensity (Agee 1993). Large fuels do not contribute greatly to fire spread, though they do remain burning after the fire front has passed (Andrews 1986) and contribute to fire duration, fire residency, and fire severity.

Surface fuel loading and average tons per acre vary throughout the project area. Representative fuel models within the Kahler project area are derived from Anderson (1982). Table 7 displays the approximate acres of each fuel model in the Kahler area. Figure 7 defines the fuel models present in Kahler. The majority of the Kahler project area is represented by Fuel Model 2.

Table 98. Current fuel models within the Kahler Project Area.

Fuel Model	Percent of Area	Approximate Acres
1	8	2,560
2	56	18,497
4	< 1	91
5	9	2,936
8	10	3,354
9	7	2,166
10	4	1,477
12	5	1,762

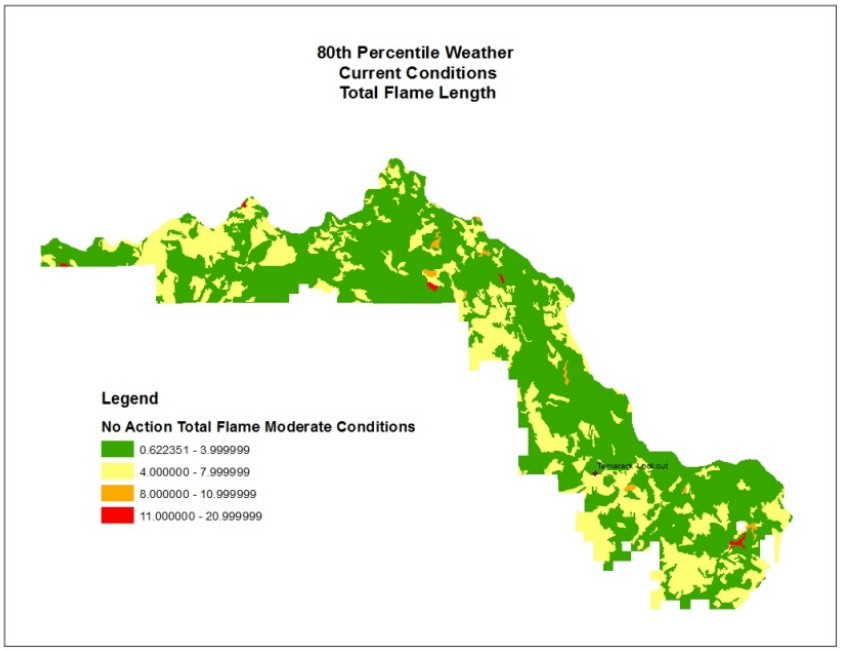
Historically, dry forest sites were maintained by surface fires. Fires were ignited predominantly by lightning during the time of year when moisture content of fine fuels was lowest (Agee 1993, Rorig and Ferguson 1999). Fire controlled regeneration of fire-intolerant species, reduced density of small-diameter stems, consumed litter and down wood, opened the stands to increased sunlight, led to vertical stratification of fuels by eliminating ladder fuels between the forest floor and the

overstory canopy, and maintained relatively stable plant associations (Youngblood et al, 2009).

Fire behavior predictions for the Kahler area were developed using moderate (80th percentile) and extreme (97th percentile) weather conditions. Total flame length calculations and crown fire predictions were used to display fire characteristics and compare conditions. Table 8 shows the difference between conditions under the two weather scenarios. Moderate weather conditions show the majority (22,068 acres) of the Kahler area as having less than four foot flame lengths. Typically, fires with less than four foot flame lengths can be suppressed at the head or flank by ground personnel. Fire with greater than four foot flame lengths often require the use of equipment (dozers, engines, aircraft) for successful fire suppression. Under severe weather conditions the majority (24,964 acres) of the stands in the Kahler area are predicted to have flame lengths greater than four feet. Figure 8 displays predicted flame lengths under moderate and severe weather conditions.

Table 99. Current flame lengths for the Kahler project area under moderate and severe conditions.

Flame lengths Moderate Conditions		Flame Length Severe Conditions	
Under 4 ft:	Over 4 ft:	Under 4 ft:	Over 4 ft:
67%	33%	24%	76%



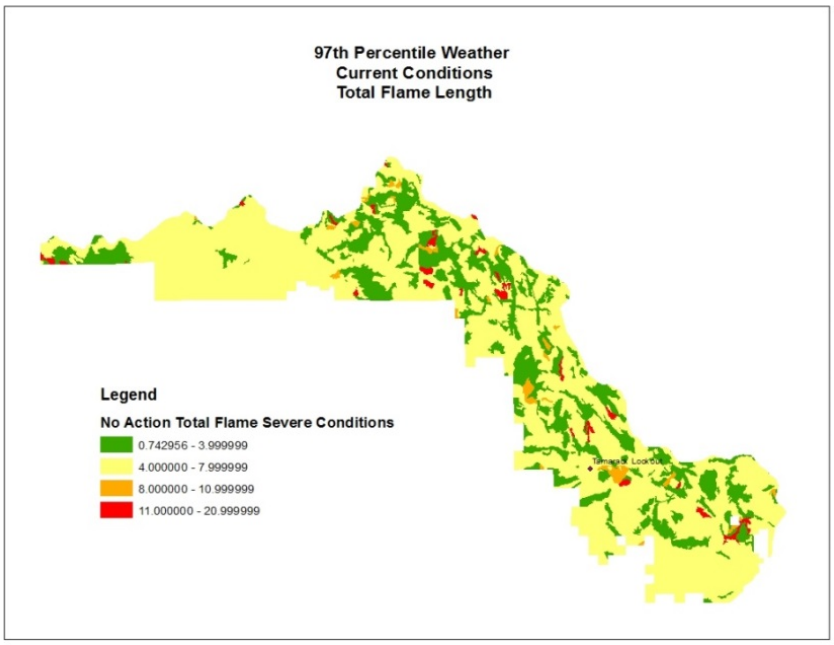


Figure 8. Maps displaying the predicted flame lengths under the current conditions for the Kahler area. Moderate weather (above) shows the majority of the area to be under 4 foot flame lengths. Severe weather conditions show the majority of the area to be above 4 foot flame lengths. This is a prediction of fireline intensity which can hinder firefighter's capabilities to contain a wildfire.

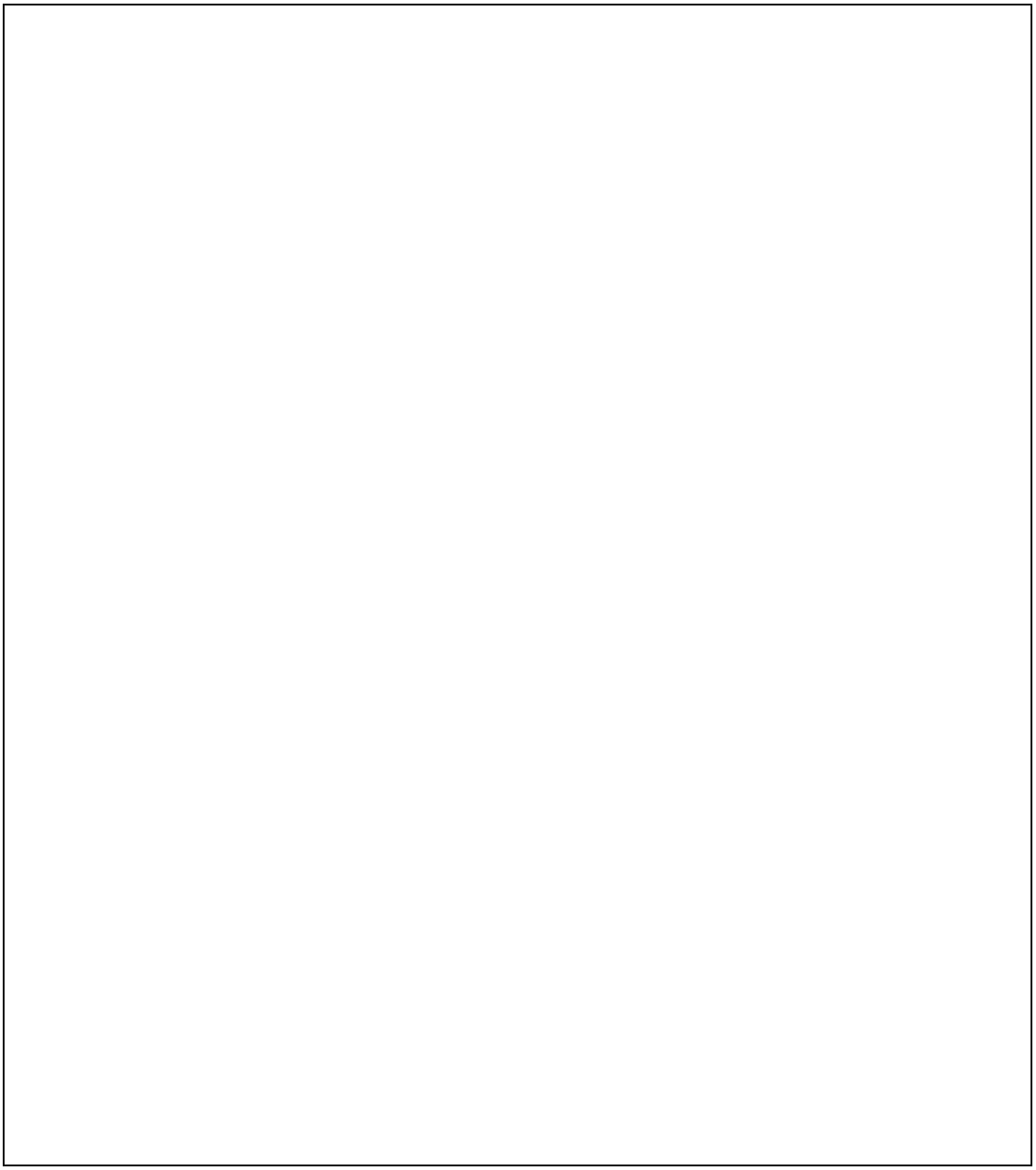


Figure 9. Fire types as defined by Scott and Reinhardt (2001). Under current conditions (moderate and severe), the Kahler area is predicted to have both surface fire and passive crown fire.

Figure 9 defines fire types: surface and crown (passive, active, and independent crown). Table 9 shows the two fire types predicted for the Kahler area under 80th and 97th percentile weather conditions. Fire behavior predictions for the Kahler area indicate surface fire as the dominant fire type under moderate conditions (18,620 acres). Under severe conditions passive crown fire increases and becomes the more likely fire type across the landscape (17,103 acres). This may lead to increased radiant heat, spot fires, resistance to control and increased fire growth rates.

Table 100. Current predicted fire type for the Kahler project area under moderate and severe conditions

Type of Fire Moderate Conditions		Type of Fire Severe Conditions	
Surface Fire	Passive Crown Fire	Surface Fire	Passive Crown Fire
57%	43%	48%	52%

The Wheeler Point fire (Figure 10), located within the Kahler project area, ignited under severe weather conditions. The characteristics of the fire were extreme and did not act as fire would have historically in the Kahler area. Live fuel moisture levels were well under 50% and dead fuel moistures were in the single digits. A hot summer with extremely low relative humidity contributed to what became a fire that displayed a high resistance to control (Wryn, personal communication, 2014). Within the first few hours of ignition the Wheeler Point fire crossed control lines due to prolific spotting, high probability of ignition, high fuel loads (Fuel Models: 11, 10, 9, 8, and 2) and extremely erratic winds. It then grew to approximately 400 acres. By the next day, the fire had travelled from private ground to the National Forest. The fire became well established with high intensity stand replacement characteristics where it was able to sustain running crown fire followed by an intense surface fire contributing to extreme rates of fire spread (characterized by both active and independent crown fire). Holding the fire on any existing road at the time failed. High density stands of ponderosa pine and mixed conifer, slopes (averaging 20%), and continued erratic winds pushed the fire to its final size of 22,727 acres.

Figure 10. Wheeler Point fire nearly 18 years after it ignited in August 1996 (June 2014). Vast amounts of grass, ceanothus brush, and dead and down wood contribute to the potential for a fast moving fire with great intensities and a high resistance to control.

Tamarack Lookout and Rental Cabin

Constructed circa 1934, Tamarack Lookout serves as a critical fire detection structure for the Umatilla and adjacent National Forests, Bureau of Land Management, Oregon Department of Forestry, and private land owners. Currently Tamarack Lookout (see Figure 11), a rental cabin, and a communication site (National Forest, Oregon Department of Forestry, and Oregon State Police) are at risk of loss from wildfire due to stand encroachment surrounding the site. Heavy fuel loads adjacent to the site contribute to fire risk. A continuous canopy layer surrounds the structures and tree heights obscure detection capabilities.

Figure 11. Tamarack Lookout, rental cabin (not shown) and communication site are located within in the Kahler project area. The site has investments from multiple agencies and is at a high risk for loss if a wildfire is ignited in the area.

Desired Condition

The desired future condition of the Kahler Dry Forest Restoration Project is to restore vegetation conditions and disturbance regimes where species composition and structure are functioning within their

historical range. The Land and Resource Management Plan for the Umatilla National Forest (the Forest Plan) describes the acceptable fuel loading in tons/acre for each management area in the Kahler planning area. For further information on fire and fuels goals as they pertain to the Forest Plan refer to the Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans section in this report.

For fire-adapted ecosystems to function in the future, multiple treatments over time will be imperative. In a 2012 study on the ecological effects of fuel reduction treatments, results showed that single entry mechanical treatments did not serve as surrogates for fire. Rather, restoration to pre-settlement conditions required repeated treatment over time (McIver, J., Stephens, S. et al). The combination of thinning and burning shift diameter distributions toward larger trees; however, no single entry will mitigate the history of fire exclusion and fuel accumulation in dry coniferous forests (Youngblood 2010). Therefore, multiple prescribed fire entries every 10 to 15 years post-treatment is recommended to maintain the Kahler analysis area. In doing so, stand densities may be better managed and fire tolerant species would be favored. This would allow for a more fire resistant forest over the long term.

Environmental Consequences

Issues Addressed and Indicators for Assessing Effects

Fire Regime Condition Class (FRCC), fuel loading, and potential fire behavior are used as indicators for fire and fuel conditions. In addition, three indicators are used to characterize the environmental consequences of implementing the silvicultural and fuels activities associated with each of the alternatives: species composition (forest cover types), forest structural stages, and stand density classes, as they pertain to HRV in the Dry UF PVG. For more information on HRV as an indicator, refer to the Environmental Consequences and Resource Indicators and Measures and the Alternatives sections of the Kahler Vegetation Report (Powell 2014).

Methodology

The Kahler forest vegetation analyses utilized a variety of information sources. Some of the vegetation characterizations were derived by using complicated processes such as MSN imputation procedures and FVS post processors. For this reason, the methodologies, modeling, and procedures employed during creation of forest vegetation databases are described in a separate specialist report (Justice 2014). The area was modeled for commercial thinning (2015), piling, burning piles, and landscape underburning (2020). It was not modeled for underburn treatments every 10-15 years after treatment (beginning 2035), as recommended by this report because that would be beyond the scope of the project.

FireFamilyPlus 4.0 was used to determine weather conditions for moderate and extreme scenarios. All weather data came from the Tupper Remote Automated Weather Station located on the Umatilla National Forest, Heppner Ranger District.

BehavePLUS 5 was used to provide fire behavior information for the non-forest vegetation sites. Sites were assigned a fuel model 2 based on expert opinion, GIS analysis and field reconnaissance. The same weather parameters were used in the Behave calculations as were used in FVS for the forested sites.

ArcGIS 10.1, Microsoft Access and Excel were used for all maps and data interpretation. ArcGIS was used to determine fire history and occurrence.

FRCC Software Application 3.0.3.0 was used to determine the appropriate Fire Regime and Condition Class rating for Kahler vegetation. Expert opinion, past fire and silvicultural activity data from the GIS

database, and the Blue Mountain fire regime (Powell 2011; Justice 2014) were used to develop the Condition Class rating.

Years 2015, 2021, and 2065 are used in all alternatives to make comparisons and highlight differences between alternatives.

Incomplete and Unavailable Information

I am not aware of any incomplete or unavailable information that would have influenced the Kahler fire and fuels analyses.

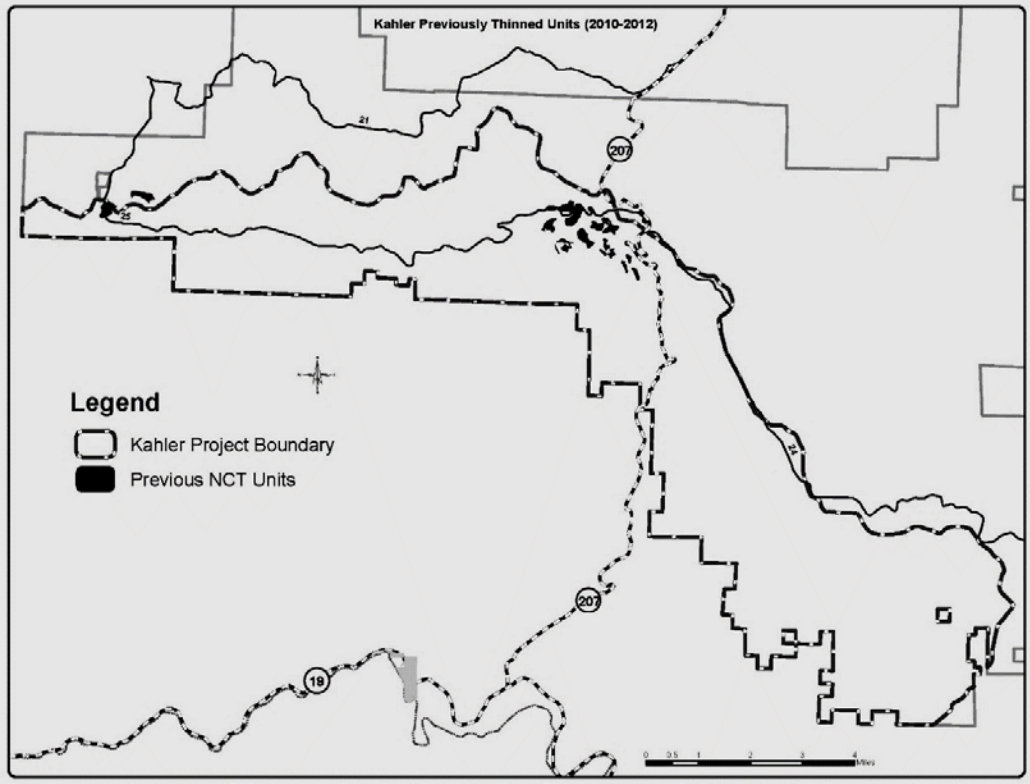
Spatial and Temporal Context for Effects Analysis

Upon implementation, silvicultural activities included in alternative 2 (proposed action) would directly effect approximately 16,255 acres of the affected environment; fuels activities would affect approximately 31,019 acres for landscape burning (Figure 1). It is estimated that 50-70% of the acres proposed in the landscape underburn will have direct effects from fire.

Upon implementation, silvicultural activities included in alternative 3 would directly effect approximately 15,199 acres of the affected environment; fuels activities would affect approximately 31,019 acres for landscape burning (Figure 1). It is estimated that 50-70% of the acres proposed in the landscape underburn will have direct effects from prescribed fire.

The timeframe for cumulative effects analysis for the affected environment is a 50-year period because this period adequately reflects the response of species composition, forest structure, and stand density to silvicultural and fuels manipulations (Powell 2014).

Two present actions could directly effect forest vegetation conditions in the Kahler planning area: (1) a District-wide noncommercial thinning project authorized by categorical exclusion (Decision Memo) in 2009, and (2) the Long Prairie Fuels Reduction project (Figure 12). Both of the ongoing actions involve noncommercial thinning activities designed to increase residual tree vigor, address dwarf-mistletoe and other insect or disease issues, and reduce ladder fuels. The cumulative effects analysis also explicitly considers direct and indirect effects expected from implementation of silvicultural activities included in Kahler alternatives 2 or 3.



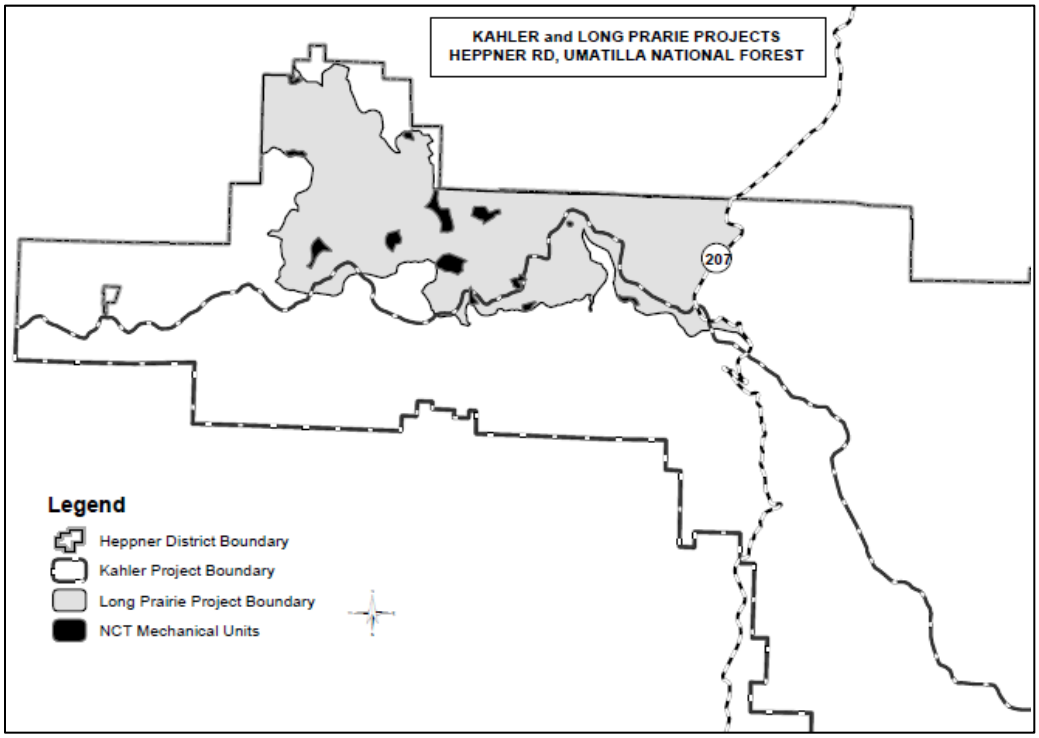


Figure 12. Present (on going) actions in the Kahler planning area- non-commercial thinning authorized by 2009 categorical exclusion (CE) (top) and the Long Prairie fuels reduction project authorized by CE in 2010 (bottom).

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

For the purpose of evaluating environmental effects, this report considers past, present, and reasonably foreseeable actions in the Kahler planning area, as described below. Future vegetation conditions incorporate direct and indirect effects from three sources: (1) implementation of proposed activities included in Kahler action alternatives (alternatives 2 and 3); (2) present (ongoing) activities; and (3) implementation of reasonably foreseeable actions. The timeframe for cumulative effects analysis is a 50-year period because this period adequately reflects the response of species composition, forest structure, and stand density to silvicultural and fuels manipulations. (Powell 2014)

Past actions influenced existing conditions in the planning area. A database was developed by using Most Similar Neighbor imputation procedures to characterize existing vegetation conditions (Justice 2014). Existing conditions are current as of 2012, reflecting stand exams completed during 2010 and 2011, compilation of a vegetation database in late 2011 (by using MSN), and field validation of vegetation information during 2011 and 2012. Existing conditions reflect the historical influence of wildfire, insect and disease activity, timber harvest, noncommercial thinning, tree planning, grazing, and other non-silviculture changes.

Present (ongoing) actions were considered when evaluating cumulative effects. Two present actions could potentially affect forest vegetation conditions in the Kahler planning area: (1) a District-wide noncommercial thinning project authorized by categorical exclusion (Decision Memo) in 2009, and (2) the Long Prairie Fuels Reduction project (Figure 12). Both of the ongoing actions involve noncommercial thinning activities designed to increase residual tree vigor, address dwarf-mistletoe and other insect or disease issues, and reduce ladder fuels. The cumulative effects analysis also explicitly considers direct and indirect effects expected from implementation of activities included in Kahler alternatives 2 or 3. The noncommercial thinning and prescribed fire treatments authorized by CE represent incremental actions that, in my judgment, are fully responsive to the Kahler project's purpose and need.

Fire suppression and grazing are on-going activities in the Kahler area. Grazing temporarily reduces fine fuel loads in palatable grasses. Fire suppression allows fine dead fuel loading to increase slightly over time, until they decay naturally or are consumed by fire. Both fire suppression and grazing affect condition class by allowing fire intolerant species to establish, increase stand density, increase canopy bulk density, and lower canopy base height. This, in turn, increases fire intensity which has a direct effect of fire suppression capabilities and resistance to control.

Reasonably foreseeable actions were considered for the cumulative effects analysis. Actions are considered to be reasonably foreseeable if Forest Service planning activities (scoping, etc.) have been initiated for them. Based on a review of the Forest's schedule of proposed actions (SOPA), no reasonably foreseeable actions potentially affecting vegetation conditions in the Kahler planning area are anticipated over the next 5 years.

Alternative 1 – No Action

Direct and Indirect Effects

Because Alternative 1 does not include any silvicultural or fuels activities, it is not expected to result in direct or indirect effects on HRV as it pertains to species composition, forest structure, and stand density.

Nor is it expected to result in direct or indirect effects on FRCC, fuel loading, and fire behavior. No harvest or prescribed fire activities would occur under the direction of this environmental analysis. Fire suppression would continue as it has increasing the amount of fire return intervals missed.

Historical Range and Variability

Species composition

Results of an HRV analysis for species composition as it is estimated to exist in 2065, suggest that without implementing silviculture and fuel reduction activities, we can expect Douglas-fir to be substantially over-represented on dry-forest sites, grand fir to be slightly over-represented on dry-forest sites, ponderosa pine to be substantially under-represented on dry-forest sites, and western larch to be slightly under-represented on dry-forest sites. In the absence of treatment (no action), only western juniper is estimated to occur within its historical range in 2065. In early-seral species composition (the ponderosa pine and western larch cover types on dry-forest sites) are replaced with late-seral cover types (Douglas-fir and grand fir) because thinning and prescribed fire are not being used to periodically adjust composition. Since it is assumed that wildfire continues to be suppressed for the No Action alternative, then this keystone ecosystem process is also not available to function as a natural adjustment agent. (Powell, Forest Vegetation Report, 2014)

Forest Structure

HRV analysis for forest structure as it is estimated to exist in 2065, suggests that without implementing silviculture and fuel reduction activities included in the Kahler proposed action, we can expect the old forest multi-strata and understory reinitiation structural stages to be substantially over-represented on dry-forest sites, old forest single stratum to be substantially under-represented on dry-forest sites, and stand initiation to be slightly under-represented on dry-forest sites. In the absence of treatment (no action), only the stem exclusion structural stage is estimated to occur within its historical range in 2065. In addition, late-seral, multi-cohort (multi-layer) stand conditions (as represented by the old forest multi-strata (OFMS) and understory reinitiation (UR) forest structural stages) are replacing the historically dominant early-seral, single-cohort (single-layer) forest structures (the old forest single stratum (OFSS), stem exclusion (SE), and stand initiation (SI) stages). Transitions from early-seral structures to late-seral structures are associated with the No Action alternative because thinning and prescribed fire are not being used to periodically interrupt this natural successional progression. Since an assumption is that wildfire continues to be suppressed for the No Action alternative, then a keystone ecosystem process referred to as short-interval surface fire is not available to function as a natural thinning agent. (Powell, Forest Vegetation Report, 2014)

Stand Density

Results of an HRV analysis for stand density as it exists in 2065 suggests that without implementing silvicultural and fuel reduction activities in the Kahler proposed action on dry-forest sites, we can expect the low and moderate stand density classes to be substantially under-represented, and high stand density to be substantially over-represented. In the absence of treatment (no action), none of the stand density classes are estimated to occur within their historical ranges in 2065. Relatively open stand conditions (low and moderate stand density classes) are replaced with dense stand conditions because thinning and prescribed fire are not being used to periodically reduce density. Since an assumption is that wildfire continues to be suppressed for the No Action alternative, then a keystone ecosystem process referred to as

short-interval surface fire is not available to function as a natural thinning agent. (Powell, Forest Vegetation Report, 2014)

Fire Regime Condition Class

Taking no action would result in further deviation from HRV across the landscape. With time, Fire Regimes I, II, and III would become substantially altered from their historical range. The Kahler area, currently classified as a FRCC 2 would shift to a 3. With this shift, changes to fire size, intensity, severity, and/or changes to landscape composition would occur. Low and mixed severity fire regimes would continue on the path toward infrequent moderate to high severity fires.

Regimes dominated by grass and other fine fuels would see further encroachment of shrubs, trees, and invasive species. Forested land would continue to experience increases in tree density, encroachment of shade tolerant species, and/or a high loss of fire tolerant tree species. Old forest multi-strata would increase. Old forest single stratum would nearly disappear. Stands could experience high mortality or defoliation from disease and insects beyond historic norms. For more information on changes to HRV under the No Action Alternative, refer to the Forest Vegetation Report, Alternative 1 (Powell 2014).

Fuel Loading

Without fire, horizontal and vertical fuel loads would continue to increase. Table10 displays the change in fuel models from 2015 to 2065. By 2065, the more open pine and Douglas fir stands with grass understory would transition to denser, closed canopy stands with increased down woody material (FM 9 and 10). The fuel load for Fuel Model 10 exceeds the Forest standard of 9 tons/acre for most management areas (12 tons/acre in Dedicated Old Growth). The loss of open grassy, shrub areas occurs due to ingrowth in Fuel Model 1; the area transitions to a Fuel Model 2 by 2065.

Table 101. No Action Alternative: Fuel Models years 2015, 2021, and 2065

Fuel Model (Anderson 1982)	Year 2015		Year 2021		Year 2065	
	Acres	Percent	Acres	Percent	Acres	Percent
FM 1 (0.74 tons/acre)	2,560	8	295	1	0	0
FM 2 (4 tons/acre)	18,497	56	20,136	61	16,802	51
FM 4 (13 tons/acre)	91	< 1	91	< 1	91	< 1
FM 5 (3.5 tons/acre)	2,936	9	2,145	7	1,870	6
FM 8 (5 tons/acre)	3,354	10	3,637	11	3,019	9
FM 9 (3.5 tons/acre)	2,166	7	3,491	11	6,182	19
FM 10 (12 tons/acre)	1,477	5	1,733	5	4,877	15
FM 12 (34.6 tons/acre)	1,762	5	1,313	4	0	0

Fire Behavior

Due to continued increases in stand density and changes in stand composition toward fire intolerant species, fire intensity levels would remain outside their historic norms. Forested environments would accumulate more dead and down material. Stand density would continue to be high. The area would continue to have a risk of crowning, spotting, and torching. See tables 11 and 12 for a comparison between flame lengths and fire type for the years 2015 to 2065.

Table 102. Predicted flame lengths for the No Action Alternative (years 2015, 2021, and 2065).

	Flame Length					
	Moderate 2015		**Moderate 2021**		**Moderate 2065**	
	Under 4 ft	Under 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
	67	79	66	34	79	21
	Severe 2015		**Severe 2021**		**Severe 2065**	
No Action	Under 4 ft	Under 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
(% of Area)	24	60	30	70	60	40

Table 103. Predicted fire type for the No Action Alternative (years 2015, 2021, and 2065)

	Fire Type					
	Moderate 2015		**Moderate 2021**		**Moderate 2065**	
	Surface	Passive	Surface	Passive	Surface	Passive
	57	43	57	43	88	12
	Severe 2015		**Moderate 2021**		**Severe 2065**	
No Action	Surface	Passive	Surface	Passive	Surface	Passive
(% of Area)	48	52	52	48	85	15

The general decrease in flame lengths and fire type under 2065 conditions is a reflection of the change in fuel model and stand type. This change would cause a reduction in surface wind due to sheltering in high density stand and a change in stand type from open canopy to closed canopy. Increased ladder fuels, lower canopy base height, increased canopy bulk density and a continued reduction in fire tolerant stand type would contribute to the trend of high potential for uncharacteristic fire.

Cumulative Effects

Since there are no direct or indirect effects of implementing this alternative, there are also no cumulative effects associated with alternative 1. Species composition, forest structure, and stand density are expected to change in the future under a No Action scenario, but the changes will be unpredictable and derived primarily from natural disturbance and succession processes.

Past actions, including fire suppression, grazing, timber harvest, tree planting, and noncommercial thinning, helped create existing conditions in the planning area.

Present (ongoing) actions of fire suppression and grazing would continue to effect the Kahler environment. In addition, noncommercial thinning and prescribed fire activities authorized by categorical exclusions in 2009, will reduce stand density, modify forest structure, and shift species composition in the areas being treated. Vertical and horizontal fuels will be impacted in these areas and help to shift the area nearer to a FRCC 1. A reduction in fuel loading and improved likelihood of surface fires is anticipated with the implementation of prescribed fire.

No reasonably foreseeable future actions are anticipated for the Kahler planning area over the next five years, as based on a review of the Umatilla National Forest's schedule of proposed actions (SOPA).

Alternative 2 – Proposed Action

Design Features and Mitigation Measures

Design Features and Mitigation Measures pertaining to fuels treatments are discussed in a separate document which contains design features for all resource areas. Items specific to fuels treatments are described under the section Fire, Fuels and Air Quality.

Direct and Indirect Effects

Direct effects are anticipated to occur only on the portion of the forest vegetation affected environment included in alternative 2. The affected environment includes 10,861 acres of commercial thinning and 5,394 acres of non-commercial thinning. These treatments will temporarily increase surface fuels throughout the units (2-4 years). To reduce the harvest created fuel load, units will be mechanically thinned and/or prescribed burned.

In addition, this alternative proposes 31,019 acres of low intensity prescribed fire to be accomplished in increments of a few hundred to a few thousand acres 5 to 10 years post thinning treatments. Prescribed fire is anticipated to directly effect 50 to 70% of the proposed landscape burn acres in Kahler (approximately 21,713 acres burned). It is recommended that maintenance burning be implemented every 10-15 years following treatment. Table 13 summarizes the proposed activities for all alternatives.

Table 104. Proposed silviculture and fuels activities for No Action, Alternative 2, and Alternative 3

Proposed Activity	No Action Alternative	Alternative 2 (Acres)	Alternative 3 (Acres)
Upland forest commercial thinning	0	9,435	8,629
Noncommercial thinning outside of harvest units	0	638	638
Noncommercial thinning in harvest units	0	4,718*	4,315*
Juniper thinning and shrub/steppe enhancement	0	1,426	1,426
Juniper noncommercial thinning	0	0	153

Shrub/steppe noncommerical thinning	0	38	38
Dry forest Riparian Treatment (Class 4 Buffers)	0	682*	657*
Aspen restoration	0	10*	10*
Reforestation in VDT gaps	0	1,000*	920*
Reforestation in Wheeler Point fire	0	5,000	5,000
Mechanical Line (miles)	0	6.1	6.1
Handline (miles)	0	2.0	2.0
Activity fuels treatment (mechanical)	0	1,770*	1,678*
Activity fuels treatment (burning)	0	6,605*	6,040*
Landscape underburning	0	31,019	31,019

* These acreages are double-counted because they represent additional treatments applied to acreage already affected by another activity (such as noncommercial thinning occurring after the upland forest commercial thinning activity has been completed). Acreages without asterisks are associated with the primary activities; acreages with asterisks are secondary or follow-up treatments occurring after a primary activity has been completed.

Tamarack Lookout and Rental Cabin

Currently the Tamarack Lookout, rental cabin, and communication site (National Forest, Oregon Department of Forestry, and Oregon State Police) are at risk of loss from wildfire due to stand encroachment surrounding the site. Treatment is designed to maintain district administrative facilities sufficient to serve the public and accomplish land and resource management and protection objectives of the Forest. These treatments would improve public and firefighter safety. All facilities will be maintained at the user level which includes consideration of user safety, continuity of service, function, protection of investment, and appearance. The proposed treatment (33 acres) would open the area surrounding the lookout and reduce the risk of direct flame reaching the tower (see Figure 13). Treatment at the cabin site would reduce the risk of direct flame to the cabin (see Figure 14). Further, access and egress on Forest Service road 2407-040 would be improved.

Figure 13. View looking down from Tamarack Lookout. The tower is used to detect wildfires for multiple agencies. The branches of nearby trees almost touch the wooden steps of the tower.

Figure 14. View looking down from the tower toward Tamarack rental cabin. Trees grow directly next to the cabin, propane tank and restroom; branches touch the siding and roof.

Approximately 11 acres of management area C1 – Dedicated Old Growth immediately surround the Tamarack lookout site. Any harvest within this area will require a Forest Plan amendment. Replacement of affected acres with adjacent or nearby old forest stands, if necessary, would also require a Forest Plan amendment to change Forest Plan management areas allocations.

Historical Range and Variability

Composition

Results of an HRV analysis for species composition as it exists in 2015 (post-implementation) and 2065 (reflecting 50 years of vegetation development without any future retreatment of the 2012 acreage) suggest that alternative 2 was extremely effective at addressing the Kahler purpose and need with respect to species composition –immediately after treatment (2015), all of the forest cover types were within their ranges of variation except for western larch, which was slightly below the lower limit of its range. By 2065, dry-forest cover types are still mostly within their ranges of variation with the exception of Douglas-fir, which is substantially above the upper limit of its range. (Powell, Forest Vegetation Report, 2014)

Forest structure

HRV analysis for forest structure as it exists in 2015 (post-implementation) and 2065 (reflecting 50 years of vegetation development without any future retreatment of the 2012 acre-age, other than periodic underburning) suggests that alternative 2 is only moderately effective at addressing the Kahler purpose

and need for forest structure –immediately after treatment (2015), the OFSS structural stage is under-represented, whereas the SE and UR stages are both over-represented. This result is expected because the predicted increase in SE is only a stepping stone between UR (which is substantially over-represented as a Kahler existing condition) and OFSS (which is dramatically under-represented for Kahler). By 2065, the structural stage distribution is worse than it was in 2015. This conclusion is somewhat misleading, however, because close inspection of the 2065 results shows that the OFMS stage is just slightly above HRV (by only 1%), and that the OFSS stage is just slightly below HRV (by only 1%). (Powell, Forest Vegetation Report, 2014)

Stand Density

Results of an HRV analysis for stand density as it exists in 2015 (post-implementation) and 2065 (reflecting 50 years of vegetation development without any future retreatment of the 2012 acreage, other than periodic underburning) suggest that alternative 2 is only moderately effective at addressing the Kahler purpose and need for stand density –immediately after treatment (2015), the low density class, which was predominant historically as evidenced by historical ranges is well within its range of variation (and this is certainly a positive outcome of implementing alternative 2), whereas the moderate and high density classes are both outside of their historical ranges (but high is above its range by just 1%). By 2065, follow-up thinning treatments are needed if an objective is to maintain forest vegetation within its historical range of variation for stand density –all three of the density classes are outside of their historical ranges. (Powell Forest Vegetation Report 2014) . For more information on changes to HRV under Alternative 2, refer to the Forest Vegetation Report, Alternative 2 (Powell Forest Vegetation Report 2014).

Fire Regime Condition Class

The proposed treatments, particularly within the first 10 years of treatment, would effectively move the landscape closer to a Fire Regime Condition Class 1 (approximately 59% of the landscape). Fuel loading and ladder fuels would be reduced, canopy base height would increase, canopy bulk density would decrease, and fire tolerant trees would be favored. However, without the continued use of fire (or a similar treatment), the Condition Class change in Fire Regime I (majority of the area) cannot be maintained over a 20 or more year span.

Fuel Loading

Alternative 2 would reduce fuel loads and bring them nearer to their historic levels and within levels acceptable to the Forest Plan. Surface fuel loading will increase with the thinning treatment proposed for 2015. Fuel reduction treatments (piling, crushing, and/or burning) following the commercial and non-commercial thin are designed to address the need to reduce fuel loads to an acceptable level for the landscape burning to be implemented as the final treatment for the area. Upon completion of the underburn, fire models show the majority (69%) of the landscape to reflect an open ponderosa pine and Douglas-fir stand (Fuel Model 2). An increase in brush is also apparent with approximately 17% of the landscape reflecting a Fuel Model 5. A slight increase in Fuel Model 1 (11%) occurs as well; this is likely due to the shrub-steppe treatment and prescribed fire. Alternative 2, overall, is highly successful immediately following treatment (year 2021) in achieving the desired condition of a fire tolerant stand that reflects historic conditions.

By the year 2065, Alternative 2 moves much of the area closer to Fuel Models 8 and 9 which are represented by closed canopy forests where surface driven fire with low flame lengths can be expected. Occasional areas of heavy dead and down concentrations can be found in this fuel type; severe weather conditions must be present for these concentrations to pose a fire hazard. This alternative maintains the open shrub lands and grassy pine stands in Fuel Model 2 and sets back the heavier dead and down fuels

present in a Fuel Model 10 (as shown in the No Action). The loss of open grassy, shrub areas occurs due to ingrowth in Fuel Model 1; the area transitions to a Fuel Model 2 by 2065.

Table 105. Caparison table of Fuel Models for No Action and Alternative 2 (years 2015, 2021, and 2065)

Fuel Model (Anderson 1982)	Year 2015 No Action	Year 2015 Alternative 2	Year 2021 No Action	Year 2021 Alternative 2	Year 2065 No Action	Year 2065 Alternative 2
FM 1	2,560	2,560	295	3,719	0	0
FM 2	18,497	19,189	20,136	22,690	16,802	18,403
FM 4	91	91	91	91	91	91
FM 5	2,936	3,265	2,145	5,653	1,870	1,006
FM 8	3,354	741	3,637	367	3,019	6,217
FM 9	2,166	0	3,491	0	6,182	6,577
FM 10	1,477	455	1,733	320	4,877	547
FM 11	0	4,760	0	0	0	0
FM 12	1,762	473	1,313	0	0	0
FM 13	0	643		0	0	0
FM 14*	0	644		0	0	0

*Fuel Model 14 is a modeled fuel bed derived from the FVS-FFE modeling system to account for logging slash (Rebain 2013).

Fire Behavior

When looking at the direct effects from the thinning treatments and prescribed fire (year2015 to 2021), the Kahler area is very likely to experience flame lengths greater than 4 feet in height; however, the risk of passive crown fire in both moderate and severe conditions is significantly decreased by 2021. In comparison to the No Action alternative, the proposed treatment decreases the likelihood of a passive crown fire by 4,816 acres in 2021. Over the long-term (2065) flame lengths are decreased under severe conditions across 13% of the landscape (approximately 4,270 acres). That results in an improvement in predicted fire behavior of 4,405 acres when compared to the No Action alternative. The likelihood of passive crown fire is reduced, as well. The combination of thinning and prescribed fire is shown to effectively reduce surface fuels, increase the height to live crown ratio, and decrease crown density.

Table 106. Comparison table for flame lengths under No Action and Alternative 2 (years 2015, 2021, and 2065)

No Action (% of Area)	Flame Length		
	Moderate 2015	Moderate 2021	Moderate 2065

	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
	67	33	66	34	79	21
	Severe 2015		**Severe 2021**		**Severe 2065**	
	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
	24	76	30	70	60	40
	Flame Length					
	Moderate 2015		**Moderate 2021**		**Moderate 2065**	
	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
	68	32	71	29	83	17
Alternative	**Severe 2015**		**Severe 2021**		**Severe 2065**	
2	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
(% of Area)	15	85	2	98	73	27

Table 107. Comparison table for fire type under No Action and Alternative 2 (years 2015, 2021, and 2065)

	Fire Type					
	Moderate 2015		**Moderate 2021**		**Moderate 2065**	
	Surface	Passive	Surface	Passive	Surface	Passive
	57	43	57	43	88	12*
	Severe 2015		**Severe 2021**		**Severe 2065**	
No Action	Surface	Passive	Surface	Passive	Surface	Passive
(% of Area)	48	52	52	48	85	15
	Fire Type					
	Moderate 2015		**Moderate 2021**		**Moderate 2065**	
	Surface	Passive	Surface	Passive	Surface	Passive
	56	44	85	15	88	12*
Alternative	**Severe 2015**		**Severe 2021**		**Severe 2065**	
2	Surface	Passive	Surface	Passive	Surface	Passive
(% of Area)	46	54	67	33	88	12*

*12%=non-forest; grass/shrub overstory

Cumulative Effects

Past actions, including fire suppression, grazing, timber harvest, tree planting, and noncommercial thinning, helped create existing conditions in the planning area. Proposed activities associated with alternative 2 are designed to address the project's purpose and need by helping to move species composition, forest structure, and stand density back within their historical ranges of variability. Moving these ecosystem components back within their historical ranges is expected to improve forest health, vegetation vigor, and ecosystem resilience to fire, insects, and disease.

Present (ongoing) actions of fire suppression and grazing would continue to effect the Kahler environment. In addition, noncommercial thinning and prescribed fire activities authorized by categorical exclusions in 2009 (District NCT and Long Prairie Fuels Reduction), will reduce stand density, modify forest structure, and shift species composition in the areas being treated. Vertical and horizontal fuels will be impacted in these areas and help to shift the area nearer to a FRCC 1. A reduction in fuel loading and improved likelihood of surface fires is anticipated with the implementation of prescribed fire. The noncommercial thinning specifications for the District-wide noncommercial thinning CE were designed in such a way as to address similar issues and concerns as those influencing the Kahler Dry Forest

Restoration project. Therefore, they represent incremental actions (beyond the proposed actions) that are also responsive to the Kahler project's purpose and need.

No reasonably foreseeable future actions are anticipated for the Kahler planning area over the next five years, as based on a review of the Umatilla National Forest's schedule of proposed actions (SOPA).

When considering direct and indirect effects of the project's proposed activities on species composition, forest structure, stand density, change in FRCC, fuel loads, and predicted fire behavior and when evaluating how direct and indirect effects of past actions, present (ongoing) actions, proposed actions, and reasonably foreseeable future actions overlap in both space and time, then the cumulative effects for alternative 2 are considered to be mostly positive (because present/ongoing actions also utilize design criteria similar to those for alternative 2's proposed activities).

The estimated cumulative effects for alternative 2 are considered to be positive when compared with the estimated cumulative effects for alternative 1, and they are considered to be slightly more positive than the estimated cumulative effects for alternative 3.

Alternative 3

Design Features and Mitigation Measures

Design Features and Mitigation Measures pertaining to fuels treatments are discussed in a separate document which contains design features for all resource areas. Items specific to fuels treatments are described under the section Fire Fuels and Air Quality.

Direct and Indirect Effects

Direct effects are anticipated to occur only on the portion of the forest vegetation affected environment included in alternative 3. The affected environment includes 10,055 acres of commercial thinning and 5,144 acres of non-commercial thinning. These treatments will temporarily increase surface fuels throughout the units (2-4 years). To reduce the harvest created fuel load, units will be mechanically thinned and/or prescribed burned.

In addition, this alternative proposes 31,020 acres of low intensity prescribed fire to be accomplished in increments of a few hundred to a few thousand acres 5 to 10 years post thinning treatments. Prescribed fire is anticipated to directly effect 50 to 70% of the proposed landscape burn acres in Kahler (approximately 21,713 acres burned). It is recommended that maintenance burning be implemented every 10-15 years following treatment. Table 17 summarizes the proposed activities for all alternatives.

Table 108. Proposed silviculture and fuels activities for No Action, Alternative 2, and Alternative 3

Proposed Activity	No Action Alternative	Alternative 2 (Acres)	Alternative 3 (Acres)
Upland forest commercial thinning	0	9,435	8,629
Noncommercial thinning outside	0	638	638

of harvest units			
Noncommercial thinning in harvest units	0	4,718*	4,315*
Juniper thinning and shrub/steppe enhancement	0	1,426	1,426
Juniper noncommercial thinning	0	0	153
Shrub/steppe noncommerical thinning	0	38	38
Dry forest Riparian Treatment (Class 4 Buffers)	0	682*	657*
Aspen restoration	0	10*	10*
Reforestation in VDT gaps	0	1,000*	920*
Reforestation in Wheeler Point fire	0	5,000	5,000
Mechanical Line (miles)	0	6.1	6.1
Handline (miles)	0	2.0	2.0
Activity fuels treatment (mechanical)	0	1,770*	1,678*
Activity fuels treatment (burning)	0	6,605*	6,040*
Landscape underburning	0	31,019	31,019

* These acreages are double-counted because they represent additional treatments applied to acreage already affected by another activity (such as noncommercial thinning occurring after the upland forest commercial thinning activity has been completed). Acreages without asterisks are associated with the primary activities; acreages with asterisks are secondary or follow-up treatments occurring after a primary activity has been completed.

Tamarack Lookout and Rental Cabin

Currently the Tamarack Lookout, rental cabin, and communication site (National Forest, Oregon Department of Forestry, and Oregon State Police) are at risk of loss from wildfire due to stand encroachment surrounding the site. Treatment is designed to maintain district administrative facilities

sufficient to serve the public and accomplish land and resource management and protection objectives of the Forest. These treatments would improve public and firefighter safety. All facilities will be maintained at the user level which includes consideration of user safety, continuity of service, function, protection of investment, and appearance. The proposed treatment (33 acres) would open the area surrounding the lookout and reduce the risk of direct flame reaching the tower (see Figure 13). Treatment at the cabin site would reduce the risk of direct flame to the cabin (see Figure 14). Further, access and egress on Forest Service road 2407-040 would be improved.

Approximately 11 acres of management area C1 – Dedicated Old Growth immediately surround the Tamarack lookout site. Any harvest within this area will require a Forest Plan amendment. Replacement of affected acres with adjacent or nearby old forest stands, if necessary, would also require a Forest Plan amendment to change Forest Plan management areas allocations.

Historical Range and Variability

Species Composition

An HRV analysis for species composition as it exists in 2015 (post-implementation) and 2065 (reflecting 50 years of vegetation development without any future retreatment of the 2012 acreage, other than periodic underburning). Results suggest that alternative 3 was extremely effective at addressing the Kahler purpose and need with respect to species composition –immediately after treatment (2015), all of the forest cover types were within their ranges of variation except for western larch, which was slightly below the lower limit of its range. By 2065, dry-forest cover types are still mostly within their ranges of variation with the exception of Douglas-fir, which is substantially above the upper limit of its historical range. (Powell, Forest Vegetation Report, 2014)

Forest Structure

Results of an HRV analysis for forest structure as it exists in 2015 (post-implementation) and 2065 (reflecting 50 years of vegetation development without any future retreatment of the 2012 acre-age, other than periodic underburning) suggest that alternative 3 is only moderately effective at addressing the Kahler purpose and need for forest structure –immediately after treatment (2015), the OFSS structural stage is under-represented, whereas the SE and UR stages are both over-represented. This result is expected because the predicted increase in SE is only a stepping stone between UR (which is substantially over-represented as a Kahler existing condition and OFSS (which is dramatically under-represented for Kahler). By 2065, the structural stage distribution is worse than it was in 2015. This conclusion is somewhat misleading, however, because the 2065 results show that the OFMS stage is slightly above HRV (by 2%) and the OFSS stage is slightly below HRV (by 3%). (Powell, Forest Vegetation Report, 2014)

Stand Density

HRV analysis for stand density as it exists in 2015 (post-implementation) and 2065 (reflecting 50 years of vegetation development without any future retreatment of the 2012 acre-age, other than periodic underburning) suggests that alternative 3 is only moderately effective at addressing the Kahler purpose and need for stand density –immediately after treatment (2015), low density, which was predominant historically as evidenced by the historical ranges is well within its range of variation (and this is certainly a positive outcome of implementing alternative 3), whereas the moderate and high density classes are both outside of their historical ranges (but high is above its range by just 3%). By 2065, follow-up treatments are needed if an objective is to maintain forest vegetation within its historical range of variation for stand density –all three of the density classes are outside of their historical ranges. . For

more information on changes to HRV under Alternative 3, refer to the Forest Vegetation Report, Alternative 3 (Powell 2014).

Fire Regime Condition Class

The proposed treatments, particularly within the first 10 years of treatment, would effectively move the landscape closer to a Fire Regime Condition Class 1 (approximately 55% of the landscape). Fuel loading and ladder fuels would be reduced, canopy base height would increase, canopy bulk density would decrease, and fire tolerant trees would be favored. However, without the continued use of fire (or a similar treatment), the Condition Class change in Fire Regime I (majority of the area) cannot be maintained over a 20 or more year span.

Fuel Loading

Alternative 3 would reduce fuel loads and bring them nearer to their historic levels and within levels acceptable to the Forest Plan. Surface fuel loading will increase with the thinning treatment proposed for 2015. Fuel reduction treatments (piling, crushing, and/or burning) following the commercial and non-commercial thin are designed to address the need to reduce fuel loads to an acceptable level for the landscape burning to be implemented as the final treatment for the area. Upon completion of the underburn, fire models show the majority (68%) of the landscape to reflect an open ponderosa pine and Douglas-fir stand (Fuel Model 2). An increase in brush is also apparent with approximately 17% of the landscape reflecting a Fuel Model 5. A slight increase in Fuel Model 1 (11%) occurs as well; this is likely due to the shrub-steppe treatment and prescribed fire. Due to less acres being commercially thinned, this alternative displays an overall increase in Fuel Model 9 and 10 when compared to Alternative 2. Alternative 3, overall, is highly successful immediately following treatment (year 2021) in achieving the desired condition of a fire tolerant stand that reflects historic conditions.

By the year 2065, Alternative 3 moves much of the area closer to Fuel Models 8 and 9 which are represented by closed canopy forests where surface driven fire with low flame lengths can be expected. Occasional areas of heavy dead and down concentrations can be found in this fuel type; severe weather conditions must be present for these concentrations to pose a fire hazard. This alternative maintains the open shrub lands and grassy pine stands in Fuel Model 2 and sets back the heavier dead and down fuels present in a Fuel Model 10 (as shown in the No Action). The loss of open grassy, shrub areas occurs due to ingrowth in Fuel Model 1; the area transitions to a Fuel Model 2 by 2065.

Table 109. Caparison table of Fuel Models for No Action and Alternative 3 (years 2015, 2021, and 2065)

Fuel Model (Anderson 1982)	Year 2015 No Action	Year 2015 Alternative 3	Year 2021 No Action	Year 2021 Alternative 3	Year 2065 No Action	Year 2065 Alternative 3
FM 1	2,560	2,560	295	3,718	0	0
FM 2	18,497	19,154	20,136	22,277	16,802	18,124
FM 4	91	91	91	91	91	91
FM 5	2,936	3,212	2,145	5,470	1,870	1,006

FM 8	3,354	983	3,637	628	3,019	6,110
FM 9	2,166	80	3,491	205	6,182	6,768
FM 10	1,477	485	1,733	395	4,877	742
FM 11	0	4,497	0	0	0	0
FM 12	1,762	500	1,313	57	0	0
FM 13	0	626	0	0	0	0
FM 14*	0	653	0	0	0	0

*Fuel Model 14 is a modeled fuel bed derived from the FVS-FFE modeling system to account for logging slash (Rebain 2013).

Fire Behavior

When looking at the direct effects from the thinning treatments and prescribed fire (year2015 to 2021), the Kahler area is very likely to experience flame lengths greater than 4 feet in height; however, the risk of passive crown fire in both moderate and severe conditions is significantly decreased by 2021 (see Table 19). In comparison to the No Action alternative, the proposed treatment decreases the likelihood of a passive crown fire by 4,761 acres in 2021. Over the long-term (2065) flame lengths are decreased under severe conditions across 13% of the landscape (approximately 4,270 acres) in comparison to the No Action alternative. That results in an improvement in predicted fire behavior of 4,242 acres when compared to the No Action alternative. The likelihood of passive crown fire is reduced, as well (see Table 20). The combination of thinning and prescribed fire is shown to effectively reduce surface fuels, increase the height to live crown ratio, and decrease crown density.

Table 110. Comparison table for flame lengths under No Action and Alternative 3 (years 2015, 2021, and 2065)

	Flame Length					
	Moderate 2015		**Moderate 2021**		**Moderate 2065**	
	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
	67	33	66	34	79	21
	Severe 2015		**Severe 2021**		**Severe 2065**	
No Action	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
(% of Area)	24	76	30	70	60	40
	Flame Length					
	Moderate 2015		**Moderate 2021**		**Moderate 2065**	
	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
	68	32	71	29	83	17
Alternative	**Severe 2015**		**Severe 2021**		**Severe 2065**	
3	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
(% of Area)	30	70	4	96	73	27

Table 111. Comparison table for fire type under No Action and Alternative 3 (years 2015, 2021, and 2065)

No Action	**Fire Type**

(% of Area)	Moderate 2015		Moderate 2021		Moderate 2065	
	Surface	Passive	Surface	Passive	Surface	Passive
	57	43	57	43	88	12*
	Severe 2015		Severe 2021		Severe 2065	
	Surface	Passive	Surface	Passive	Surface	Passive
	48	52	52	48	85	15
	Fire Type					
	Moderate 2015		Moderate 2021		Moderate 2065	
	Surface	Passive	Surface	Passive	Surface	Passive
	56	44	84	16	88	12*
Alternative	Severe 2015		Severe 2021		Severe 2065	
3	Surface	Passive	Surface	Passive	Surface	Passive
(% of Area)	47	53	66	34	88	12*

*12%=non-forest; grass/shrub overstory

Cumulative Effects

Past actions, including fire suppression, grazing, timber harvest, tree planting, and noncommercial thinning, helped create existing conditions in the planning area. Proposed activities associated with alternative 3 are designed to address the project's purpose and need by helping to move species composition, forest structure, and stand density back within their historical ranges of variability. Moving these ecosystem components back within their historical ranges is expected to improve forest health, vegetation vigor, and ecosystem resilience to fire, insects, and disease.

Present (ongoing) actions of fire suppression and grazing would continue to effect the Kahler environment. In addition, noncommercial thinning and prescribed fire activities authorized by categorical exclusions in 2009 (District NCT and Long Prairie Fuels Reduction), will reduce stand density, modify forest structure, and shift species composition in the areas being treated. Vertical and horizontal fuels will be impacted in these areas and help to shift the area nearer to a FRCC 1. A reduction in fuel loading and improved likelihood of surface fires is anticipated with the implementation of prescribed fire. The noncommercial thinning specifications for the District-wide noncommercial thinning CE were designed in such a way as to address similar issues and concerns as those influencing the Kahler Dry Forest Restoration project. Therefore, they represent incremental actions (beyond the proposed actions) that are also responsive to the Kahler project's purpose and need.

No reasonably foreseeable future actions are anticipated for the Kahler planning area over the next five years, as based on a review of the Umatilla National Forest's schedule of proposed actions (SOPA).

When considering direct and indirect effects of the project's proposed activities on species composition, forest structure, stand density, change in FRCC, fuel loads, and predicted fire behavior and when evaluating how direct and indirect effects of past actions, present (ongoing) actions, proposed actions, and reasonably foreseeable future actions overlap in both space and time, the cumulative effects for alternative 3 are considered to be mostly positive (because present/ongoing actions also utilize design criteria similar to those for alternative 3's proposed activities).

The estimated cumulative effects for alternative 3 are considered to be positive when compared with the estimated cumulative effects for alternative 1, and they are considered to be slightly less positive than the estimated cumulative effects for alternative 2.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Discuss how well or whether each alternative complies with relevant laws, regulations, policies or the Forest Plan.

All alternatives comply with the following:

Umatilla National Forest Land and Resource Management Plan (1990)
The Forest Plan guides all natural resource management activities and establishes management standards and guidelines for the Umatilla National Forest. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management.

The fire management program supports accomplishment of many of the land and resource objectives. A high level of cost-effective fire protection will be employed to protect resource values and investments. An appropriate suppression response of confine, contain, or control will be made on all wildfires commensurate with the objectives and standards and guidelines identified for each management area. Wildfire suppression, use of fire, and fuel treatments will require coordination with resource managers in order for all programs to be successfully accomplished. Within the scope of the Forest Plan, a fire management plan will be developed to provide additional program detail and direction.

Prescribed fire will be used as a management tool to reduce fire hazards created by management activities and naturally occurring fuels, to prepare sites for reforestation and to maintain and improve other resources such as range and wildlife. Prescribed burning will be the principal program and technique used for winter range habitat maintenance, for forage enhancement, and to assist in keeping big game animals on the Forest during the winter.

Management Areas Standards and Guidelines
Actions for proposed fuel treatment in the project area are within Management Areas: A4 Viewshed 2, A6 Developed Recreation, C1 Dedicated Old Growth, C3 Big Game Winter Range, C5 Riparian,D2-Research Natural Area and E1 Timber and Forage.

A4 Viewshed 2

FIRE
For moderate to high intensity wildfires, the appropriate suppression response will emphasize control and/or contain strategies. Wildfire suppression efforts should utilize low impact methods. Use of heavy equipment may require restoration efforts to mitigate visual impacts.

FUELS
Prescribed low intensity fire with minimal scorch is acceptable in the partial retention area. In the partial retention area a 1 year or less recovery period is most desirable, if conditions are suitable.

Fuel treatments in foreground areas should be planned, timed, and implemented to avoid being highly visible and to minimize adverse visual effects. In the immediate foreground (within 200- 300 feet of observers) handpiling, hauling material away, utilizing it for fuelwood, etc., are methods preferable to machine piling and crushing. Treatment should be completed prior to the next high human-use period. In foreground areas, slash and damaged unmerchantable trees will be treated to a higher standard than in the middleground and background. Fuel loadings meeting reforestation and wildlife standards in middleground and background areas will normally be compatible with the visual objectives.

A6 Developed Recreation

FIRE
For all wildfires, the appropriate suppression response is control. Emphasis will be on protecting life and facilities. Low impact wildfire suppression methods should be used except where high intensity fire situations may exist. Fire prevention activities should be emphasized at developed sites. Public contract and a signing program are encouraged.

FUELS
Slash resulting from hazard tree removal will be made available for firewood to campground users.

C1 Dedicated Old Growth

FIRE
For moderate to high intensity wildfires, the appropriate suppression response should emphasize control strategies. Low impact suppression methods should be favored. Use of mechanical equipment to suppress wildfires is acceptable within the objective of minimizing the impact of the suppression effort on the old growth values.

FUELS
Natural fuel treatments are permitted to maintain or enhance old growth habitat characteristics or reduce the potential for a high number of and/or severely burned acres.

Natural fuels should not exceed an average of about 12 tons per acre in the 0 to 3-inch size class and an average residue depth of 6 inches, as depicted in the Photo Series for Quantifying Natural Forest Residues (Technical Report PNW 105) (USDA Forest Service 1980):
2-PP&ASSOC-4; 3-LP-3; 2-MC-3; 6-PP-4

Prescribed burning is the preferred method of fuel treatment.

C3 Big Game Winter Range

FIRE
For moderate to high intensity wildfires (average flame lengths over 2 ft.), all wildfire suppression strategies may be emphasized. Under appropriate fire prediction conditions, wildfires may be permitted to play a natural role on the winter ranges to meet big game habitat objectives.

FUELS
Fuels should not exceed an average of 9 tons per acre in the 0 to 3-inch size class and an average residue depth of 6 inches.

All types of prescribed fire may be used including broadcast burning, underburning, or range burning.

C5 Riparian (Fish and Wildlife)

FIRE
The appropriate wildfire suppression response should emphasize control and/or contain strategies. Wildfire suppression efforts should utilize low-impact methods. Use of heavy equipment may require restoration and/or mitigation to maintain riparian values.

FUELS
Fuels management activities will be designed and executed to maintain or enhance the anadromous fish and wildlife habitat within the constraints of 10 percent exposed mineral soils and 80 percent stream surface shading.

Fuels should not exceed an average of 9 tons per acre in the 0 to 3-inch size class and an average residue depth of 6 inches.

Prescribed fire may be used, consistent with riparian objectives.

D2 Research Natural Area

No treatments are proposed for this area.

E1 Timber and Forage

FIRE
For all wildfires in the management area, all suppression strategies (appropriate responses) may be used. Suppression practices should be designed to protect investments in managed tree stands and prevent losses of large acreages to wildfire. Wildfire prevention activities should be emphasized.

FUELS
Fuels should not exceed an average of 9 tons per acre in the 0 to 3-inch size class and an average residue depth of 6 inches.

All methods of fuel treatment are appropriate. Utilization of wood residues should be encouraged in order to reduce fuel loadings. When treatment is needed to meet resource objectives, prescribed fire is preferred in fire-dependent ecosystems. In ecosystems where fire is not a useful tool, direct fuel treatment methods should be used in reducing fuel accumulations to meet resource management objectives.

Prescribed burning may be used to accomplish a variety of timber and forage production objectives. Care will be used when using prescribed fire due to high resource values and risk of escape fire.

Fire Management Direction (2010)

Fire Management Units 7 & 9

Guidelines (4-87-88)

- 1. Wildfires that threaten life, property, public safety, improvements, or investments will receive aggressive suppression action using an appropriate suppression strategy.
- 2. All wildfires will require a timely suppression response with appropriate forces and strategy of either one, or a combination of the alternatives of confinement, containment, or control. Inform public about philosophy of fire management policy. In most cases when wildfires do not threaten to exceed the acceptable sizes and intensities of the management area, the lowest cost suppression option is appropriate.
- 3. Wildfires that escape initial action and threaten to exceed established limits will require that an “escaped fire situation analysis” be prepared. This analysis weighs the cost of suppression against the potential change in resources. Suppression actions should be appropriate for the values threatened.

- 4. If more than 5 percent of a subwatershed has sustained high intensity burns during the preceding 3 years, or visibly accelerated erosion is occurring within a subwatershed due to past burns, emphasize a control strategy on all wildfire in the remainder of the subwatershed to minimize further damage.
- 5. Use of prescribed fire is permitted outside the riparian influence zone where needed to improve watershed conditions or reduce significant risk of watershed damaging wildfire. Prescribed burns are designed, located and scheduled to minimize risk of short term degradation of water quality. (4-193)

Goals

The fire management program supports accomplishment of many of the land and resource objectives. A high level of cost-effective fire protection will be employed to protect resource values and investments. An appropriate suppression response of confine, contain, or control will be made on all wildfires commensurate with the objectives and standards and guidelines identified for each management area. Wildfire suppression, use of fire and fuel treatments will require coordination with resource managers in order for all programs to be successfully accomplished. Within the scope of the Forest Plan, a fire management plan will be developed to provide additional program detail and direction. (4-45)

Standards

Provide and execute a fire protection and fire use program that is cost efficient and responsive to land and resource management goals and objectives. (4-2)

National Fire Plan

The National Fire Plan (USDI and USDA 2000) provides national direction for hazardous fuels reduction, restoration, rehabilitation, monitoring, applied research, technology transfer; and established the framework for a 10-Year Comprehensive Strategy (USDI and USDA 2002). The four principle goals and implementation outcomes of the 10-Year Comprehensive Strategy pertaining to the National Fire Plan include:

- Improve Fire Prevention and Suppression—Losses of life are eliminated, and firefighter injuries and damage to communities and the environment from severe, unplanned, and unwanted wildland fire are reduced.
- Reduce Hazardous Fuels—Hazardous fuels are treated, using appropriate tools, to reduce the risk of unplanned and unwanted wildland fire to communities and to the environment.
- Restore Fire-Adapted Ecosystems—Fire-adapted ecosystems are restored, rehabilitated and maintained, using appropriate tools, in a manner that will provide sustainable environmental, social, and economical benefits.
- Promote Community Assistance—Communities at risk have increased capacity to prevent losses from wildfire and the potential to seek economic opportunities resulting from treatments and services.

Federal Policy

The following guiding principles and policy statements are excerpted from the *Review and Update of the 1995 Federal Wildland Fire Management Policy (January 2001).* These remain the foundational principles for Federal Wildland Fire Management Policy (2009).

Guiding Principles:

1. Firefighter and public safety is the first priority in every fire management activity.

2. The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the planning process. Federal agency land and resource management plans set the objectives for the use and desired future condition of the various public lands.

3. Fire Management Plans, programs, and activities support land and resource management plans and their implementation.

4. Sound risk management is a foundation for all fire management activities. Risks and uncertainties relating to fire management activities must be understood, analyzed, communicated, and managed as they relate to the cost of either doing or not doing an activity. Net gains to the public benefit will be an important component of decisions.

Cohesive Strategy

The National Cohesive Wildland Fire Management Strategy (2014) lists the federal laws and regulations used to guide National Forest management, including the Federal Land Assistance, Management, and Enhancement Act (FLAME Act), Endangered Species Act, the Clean Water Act, the Clean Air Act, and the National Forest Management Act which together provide the legal basis for maintaining sustainability of ecosystems.

The primary, national goals identified as necessary to achieving the vision of the Cohesive Wildland Fire Management Strategy are:

- **Restore and maintain landscapes**: Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.
- **Fire-adapted communities**: Human populations and infrastructure can withstand a wildfire without loss of life and property.
- **Wildfire response**: All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

The Healthy Forest Restoration Act (2003) directs agency personnel to improve forest conditions though fuels reduction activities. The Healthy Forest Initiative (2002) provides administrative reform to aid in accomplishing this task.

Monitoring Recommendations

It is recommended that photo plots and stand exams are used to further document the Kahler project area.

References

Agee, J. K. 1993. Fire ecology of Pacific Northwest forests. Washington, D.C. Island Press. 493p.

Agee, J.K. 1996. Fire in the Blue Mountains: a history, ecology, and research agenda. In: Jaindl, R.G.; Quigley, T.M., eds. Search for a solution: sustaining the land, people, and economy of the Blue Mountains. Washington, DC: American Forests in cooperation with the Blue Mountains Natural Resources Institute: 119-145.

Agee, J.K., 2002. The fallacy of passive management: managing for firesafe forest reserves. Conserv. Biol. Practice 3 (1), 18–25.

Agee, James K.; Skinner, Carl N. 2005. Basic principles of forest fuel reduction treatments. Forest Ecology and Management, Vol. 211: 83-96.

Anderson, Hal E. 1982. Aids to determining fuel models for estimating fire behavior. Gen. Tech. Rep. INT-122. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 22 p. http://www.treesearch.fs.fed.us/pubs/6447

Andrews, Patricia L. 1986. BEHAVE: fire behavior prediction and fuel modeling system-BURN Subsystem, part 1. General Technical Report INT-194. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 130 p.

Aplet, G., Keeton, W.S., 1999. Application of historical range of variability concepts to biodiversity conservation. In: Baydack, R.K., Campa, H., Haufler, J.B. (Eds.), Practical Approaches to the Conservation of Biological Diversity. Island Press, NY, New York, pp. 71–86.

Barrett, S.; Havlina, D.; Jones, J.; Hann, W.; Frame, C.; Hamilton, D.; Schon, K.; Demeo, T.; Hutter, L.; and Menakis, J. 2010. Interagency Fire Regime Condition Class Guidebook. Ver-sion 3.0 [Homepage of the Interagency Fire Regime Condition Class website, USDA Forest Service, US Department of the Interior, and The Nature Conservancy]. [Online], Availa-ble: **www.frcc.gov.**

Brown, J. K.; Oberheu, R. D.; Johnston, C. M. 1982. Handbook for inventorying surface fuels and biomass in the Interior West. Gen. Tech. Rep. INT-129. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 48 p.

Department of the Interior; USDA Forest Service. 2014. The National Strategy, The Final Phase in the Development of the National Cohesive Wildland Fire Management Strategy (National Strategy): 1: 1-5.

Department of the Interior; USDA Forest Service. 2002. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan.

Hall, F.C. 1976. Fire and vegetation in the Blue Mountains – implications for land managers. In: Komarek, E.V. Sr., chair. Proceedings of the annual Tall Timbers fire ecology conference No. 15. Tallahassee, FL: Tall Timbers Research Station: 155-170. 3

Hann, W. J., & Brunnel, L. 2001. Fire and land management planning and implementation across multiple scales. International Journal of Wildland Fire. 10: 389-401

Hessburg, P.F., Agee, J.K., 2003. An environmental narrative of inland Northwest US forests, 1800–

2000. For. Ecol. Manage. 178, 23–59.

Hessburg, Paul F.; Agee, James K.; Franklin, Jerry F.; 2005. Dry forests and wildland fires of the inland Northwest USA: contrasting the landscape ecology of the pre-settlement and modern eras. Forest Ecology and Management. 211: 117-139

Heyerdahl, E.K. 1997**.** Spatial and temporal variation in historical fire regimes of the Blue Moun-tains, Oregon and Washington: the influence of climate. Ph.D. dissertation. Seattle, WA: Uni-versity of Washington, College of Forest Resources. 224 p.

Heyerdahl, E.K.; Agee, J.K. 1996. Historical fire regimes of four sites in the Blue Mountains, Ore-gon and Washington. Final Rep. Seattle, WA: University of Washington, College of Forest Re-sources. 173 p.

Jerome, I. K. Lead Author. 2013. Grant County, Oregon, Community Wildfire Protection Plan. Jerome Natural Resource Consultants, Inc., John Day, OR August 2013 60 p.

Johnson, C.G. 1993 (August 9). Ecosystem screens; file designation 2060 memorandum to Wal-lowa-Whitman, Umatilla, and Malheur Forest Supervisors. Baker City, OR: USDA Forest Ser-vice, Pacific Northwest Region, Wallowa-Whitman National Forest. 4 p (and 6 exhibits). On file with: Umatilla National Forest, 2517 SW Hailey Avenue, Pendleton, OR 97801.

Justice, Don C. 2014. Forest vegetation modeling & database creation-process document-Kahler dry forest restoration project. Forest Vegetation Modeling & Miscellaneous Datasets. Umatilla National Forest, Heppner Ranger District.

Keeley, J.E.; Aplet, G.H.; Christensen, N.L.; Conard, S.G.; Johnson, E.A.; Omi, P.N.; Peter-son, D.L.; Swetnam, T.W. 2009. Ecological foundations for fire management in North Ameri-can forest and shrubland ecosystems. Gen. Tech. Rep. PNW-GTR-779. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 92 p.

Keane, Robert E.; Hessburg, Paul F.; Landres, Peter B.; Swanson, Fred J. 2009. The use of historical range and variability (HRV) in landscape management. Forest Ecology and Management. 258: 1025-1037.

Maruoka, K.R. 1994. Fire history of *Pseudotsuga menziesii* and *Abies grandis* stands in the Blue Mountains of Oregon and Washington. M.S. thesis. Seattle, WA: University of Washington. 73 p.

McIver, James D.; Stephens, Scott L.; Agee, James K.; Barbour, Jamie; Boerner, Ralph E. J.; Edminster, Carl B.; Erickson, Karen L.; Farris, Kerry L.; Fettig, Christopher J.; Fiedler, Carl E.; Haase, Sally; Hart, Stephen C.; Keeley, Jon E.; Knapp, Eric E.; Lehmkuhl, John F.; Moghaddas, Jason J.; Otrosina, William; Outcalt, Kenneth W.; Schwilk, Dylan W.; Skinner, Carl N.; Waldrop, Thomas A.; Weatherspoon, C. Phillip; Yaussy, Daniel A.; Youngblood, Andrew; Zack, Steve. 2012. Ecological effects of alternative fuel-reduction treatments: highlights of the National Fire and Fire Surrogate study (FFS). Journal of Wildland Fire. 21: 894-904

Mutch, Robert W.; Arno, Stephen F.; Brown, James K. [and others]. 1993. Forest health in the Blue Mountains: a management strategy for fire-adapted ecosystems. General Technical Report PNW-GTR-310. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 14 p.

O'Hara, K.L.; Latham, P.A.; Hessburg, P.; Smith, B.G. 1996. A structural classification for inland Northwest forest vegetation. Western Journal of Applied Forestry. 11(3): 97-102.

Oliver, Chadwick D.; Larson, Bruce C. 1996. Forest stand dynamics. Update edition. New York: John Wiley. 520 p.

Perry, Davis A.; Hessburg, Paul F.; Skinner, Carl N.; Spies, Thomas A.; Stephens, Scott L.; Taylor, Alan Henry; Franklin, Jerry F.; McComb, Breda; Riegel, Greg. 2011. The ecology of mixed severity fire regimes in Washington, Oregon, and Northern California. Forest and Ecology Management 262; 703-717.

Powell, David C. 2004. Fire regime condition class queries. Unpublished report. Pendleton, OR: Unites States Department of Agriculture, Forest Service, Pacific Northwest Region, Umatilla National forest. 8p.

Powell, D.C. 2010. Range of variation recommendations for dry, moist, and cold forests. Unpub. Rep. Pendleton, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Umatilla National Forest. 35 p. RV White Paper

Powell, David C. 2011. Fire regimes of the Blue Mountains. White Paper F14-SO-WP-Silv-06. Pendleton, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Umatilla National Forest. 28 p.

Powell, David C. 2013. Active Management of Dry Forests in the Blue Mountains: Silvicultural Considerations. White Paper F14-SO-WP-Silv-04. Pendleton, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Umatilla National Forest. 56 p.

Powell, David C. 2014. Silviculture Specialist Report; Forest Vegetation: Kahler Dry Forest Restoration Project. U.S. Department of Agriculture, Forest Service, Umatilla National Forest, Heppner Ranger District.

Rebain, Stephanie A. comp. 2010 (revised October 29, 2013). The Fire and Fuels Extension to the Forest Vegetation Simulator: Updated Model Documentation. Internal Rep. Fort Collins, CO: U. S. Department of Agriculture, Forest Service, Forest Management Service Center. ch 2; 408p.

Rorig, M. L., and S. A. Ferguson. 1999. Characteristics of lightning and wildland fire ignition in the Pacific Northwest. Journal of Applied Meteorology 38:1565-1575.

Rothermel, Richard C. 1983. How to predict the spread and intensity of forest and range fires. Gen. Tech. Rep. INT-143. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 161 p. http://www.treesearch.fs.fed.us/pubs/24635

Schmidt, K. M., Menakis, J. P., Hardy C. C., Hann, W. J., & Bunnell, D. L. 2002. Development of coarse scale spatial data for wildland fire and fuel management. General Technical Report RMRS-GTR-87. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 41p.

Scott, Joe H.; Reinhardt, Elizabeth D. 2001. Assessing crown fire potential by linking models of surface and crown fire behavior. Res. Pap. RMRS-RP-29. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 59 p.

Spies, T. 1997. Forest stand structure, composition, and function. In: Kohm, K.A.; Franklin, J.F., eds. Creating a forestry for the 21st century: the science of ecosystem management. Washington, DC: Island Press: 11-30. isbn:1-55963-399-9

USDA Forest Service. 1990. Umatilla National Forest Land and Resource Management Plan. Umatilla NF Region 6. P. 3-5; p. 4-146.

USDA Forest Service; DOI Bureau of Land Management. 2004. Healthy Forest Initiative and Healthy Forest Restoration Act Interim Field Guide. FS-799.

USDA Forest Service; DOI Bureau of Land Management. 2009. Guidance for Implementation of Federal Wildland Fire Management Policy.

USDA Forest Service. 2010. Umatilla Fire Management Plan and Reference Guide. Umatilla NF Region 6. 3.2[7] Fire Management Considerations for Specific Management Units. 2010-FMU-7.

Van Wagner, C. E. 1977. Conditions for the start and spread of crown fire. Canadian Journal of Forest Research. 7: 23–34.

Weaver, Harold. 1943. Fire As An Ecological and Silvicultural Factor in the Ponderosa Pine Region of the Pacific Slope. Journal of Forestry. 11 p.

Wheeler County. 2006. Wheeler County, Oregon, Community Wildfire Protection Plan Appendices.. 25p.

Wryn, M. S. June 2014. First-hand account of the Wheeler Point fire, 1996. Personal interview.

Youngblood, Andrew; Grace, James B.; McIver, James D. 2009. Delayed conifer mortality after fuel reduction treatments: interactive effects of fuel, fire intensity, and bark beetles. Ecological Applications.19(2):321-337.

Youngblood, A. 2010. Thinning and burning in dry coniferous forests of the Western United States: effectiveness in altering diameter distributions. Forest Science. 56(1): 46-59.

Appendix E

Air Quality Report

Kahler Dry Forest Restoration Project

Air Quality Report

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June 24, 2014

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Introduction

The Kahler Dry Forest Restoration Project is designed to restore dry forest conditions to a resilient, fire adapted landscape by moving the project area towards its historic range of variability in forest structure, tree density, species composition and Fire Regime Condition Class.

There is a need to address the following conditions:

- Reestablish the character of a frequent fire regime to the landscape to aid in maintaining open stand conditions and fire-tolerant species, improve big game forage, and reduce conifer encroachment.
- Reduce the risk of loss from wildfire by improving fire sighting capabilities from Tamarack Lookout.
- Restore and promote open stands of old forest dominated by ponderosa pine, thereby moving the area toward its historical range in structure, density, and species composition.
- Maintain and promote old trees (>150 years old) throughout the project area.

This specialist report describes the environmental consequences of implementing landscape underburning within the Kahler planning area as it pertains to air quality.

Summary of Effects

Under Alternatives 2 and 3, direct and indirect effects from landscape underburning in the Kahler analysis area are determined to be of short duration (2-3 days) and will occur over the course of 10 years following the proposed silvicultural treatments.

Affected Environment

Analyses described in this report pertain to National Forest System lands occurring in the following subwatersheds: Alder Creek (170702040108), Lower Kahler Creek (170702040104), Upper Kahler Creek (170702040103), Haystack Creek (170702040105), and Bologna Canyon (170702040101). This planning (analysis) area contains approximately 32,840 acres. The majority (approximately 19,913 acres) of the planning area is located in Wheeler County; approximately 12,927 acres are located within Grant County (see Figure 1).

Forest Plan management areas that are unsuitable for prescribed fire (D2 Research Natural Area, 84 acres) are not included in the affected environment for the fire and fuels analyses. Private land within and adjacent to the planning area were also not included in the affected environment. Fire occurrence and fuels information on private property was not available and therefore not included in this analysis.

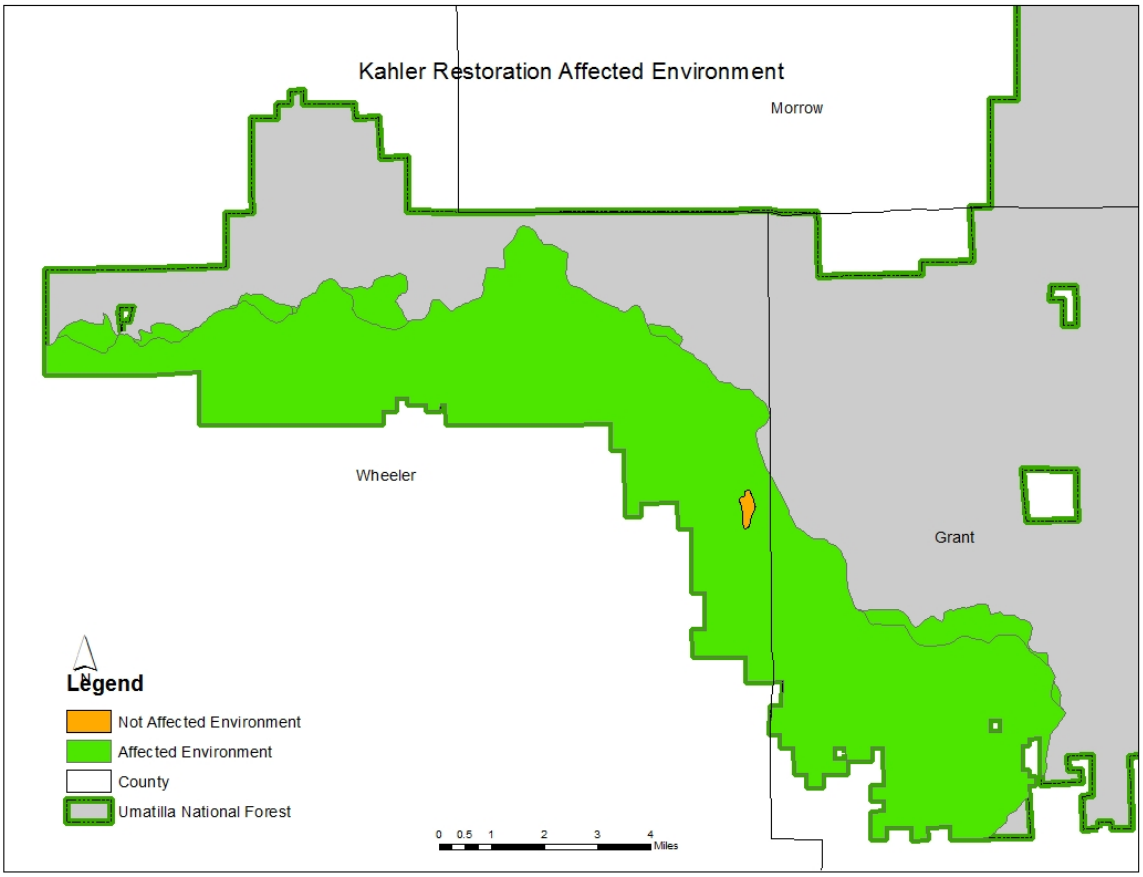


Figure 8 – Affected environment for forest vegetation analyses. The orange areas show locations of Forest Plan management areas that are unsuitable for prescribed fire (D2 Research Natural Area); they are not included in the affected environment for the fire and fuels analyses. Private land within and adjacent to the planning area were also not included in the affected environment.

There are no anticipated air quality impacts to Class I areas or "designated" or nonattainment areas. The analysis area for air quality impacts includes sensitive areas that may be affected by smoke intrusion from prescribed burning activities in the Kahler Dry Forest Restoration Planning Area. These areas may include:

- Sensitive area--Winlock two miles southwest of Kahler planning area
- Sensitive area--Spray (population 160) five miles southwest of Kahler planning area
- Sensitive area--Monument (population 125) five miles southeast of Kahler planning area
- A4 Viewshed 2 (900 acres within the Kahler project area) along State Highway 207
- A6 Developed Recreation (Fairview Campground; Tamarack Rental Cabin)

The areas designated as sensitive are listed due to their proximity to the project area and/or location in alignment of general wind patterns in the area.

The communities of Winlock (see Figure 2) and Monument (see Figure 3) are identified as Communities at Risk within the County Wildfire Protection Plan (CWPP) identified boundaries of the Wildland Urban Interface (WUI) adjacent to the Kahler project area. The communities are primarily defined as an Intermix Community where structures are scattered throughout a wildland area; they can either be clustered close together or spread out to one structure per 40 acres.

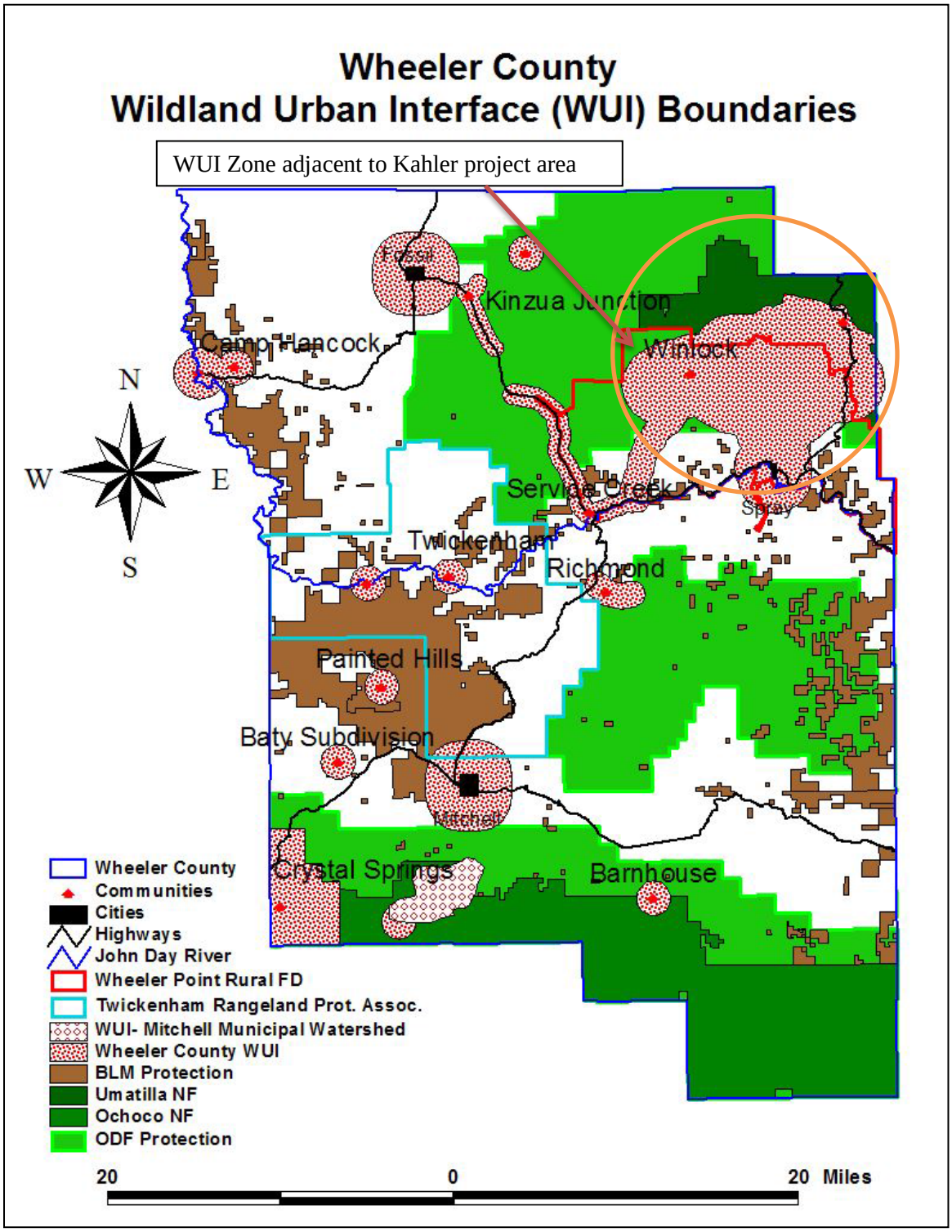


Figure 9. Wildland Urban Interface Zones in Wheeler County (Wheeler Co. 2006)

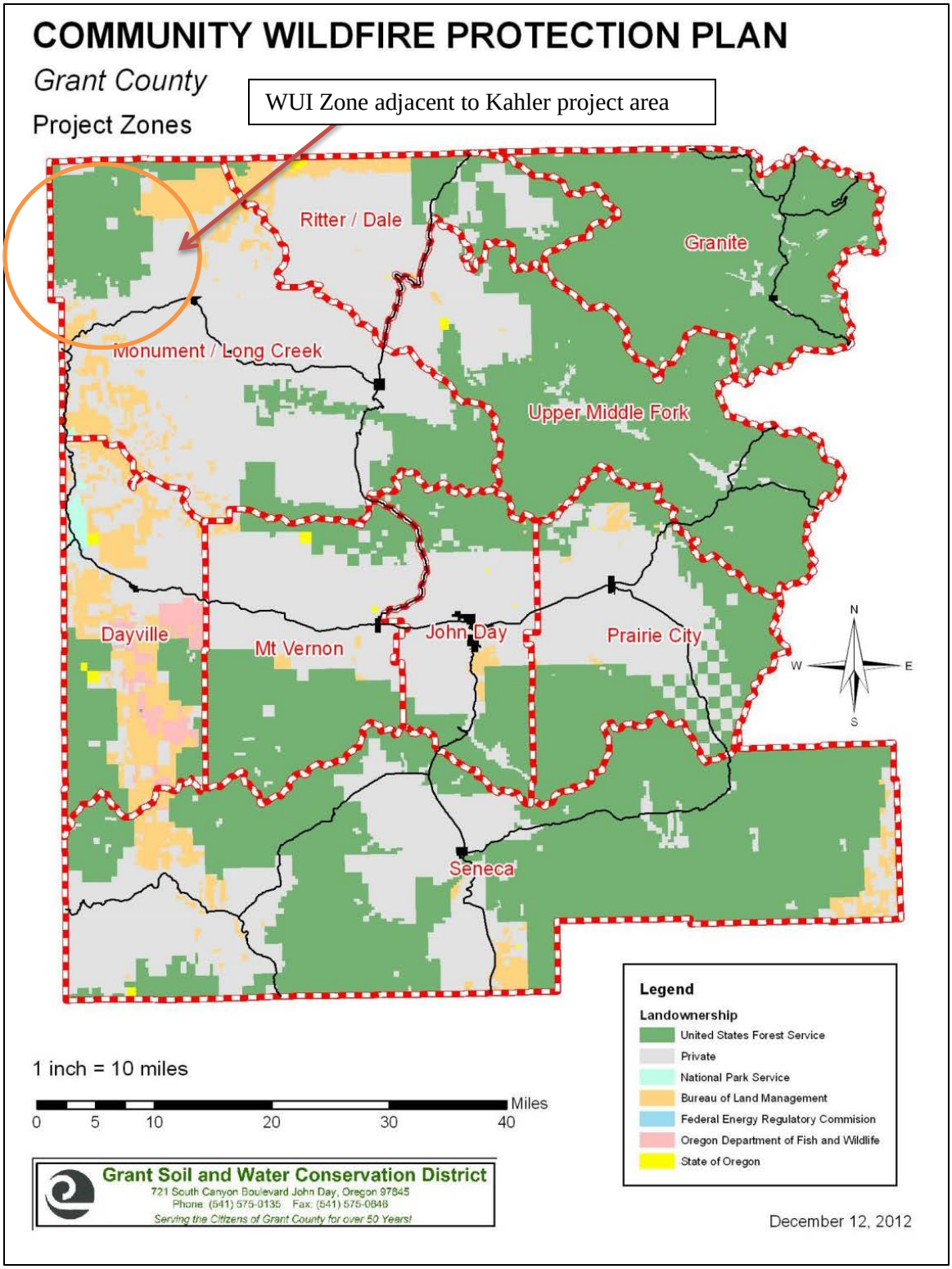


Figure 3. Grant County Wildland Urban Interface Project Zones (Jerome 2013).

Existing Condition

Prior to Euro-American settlement, dry ponderosa pine and mixed conifer forests were burned by frequent low- or mixed-severity fires. These mostly surface fires maintained low and variable tree densities, light and patchy ground fuels, simplified forest structure, and favored fire-tolerant trees, such as ponderosa pine, and a low and patchy cover of associated fire-tolerant shrubs and herbs (Hessburg, P; Agee, J; Franklin, J 2005). The Kahler area has seen an interruption in the natural fire disturbance regime in which it evolved. This has created changes in species composition, stand structure, density and fuel loads. As a result, the existing levels of fire severity (low, moderate, stand replacement) are out of their historic proportion to each other. Fewer acres are burning at low intensities and more acres have burned, or are projected to burn, at moderate to high intensities (greater than four foot flame lengths).

Desired Condition

The desired future condition of the Kahler Dry Forest Restoration Project is to restore vegetation conditions and disturbance regimes where species composition and structure are functioning within their historical range. The Land and Resource Management Plan for the Umatilla National Forest (the Forest Plan) describes the acceptable fuel loading in tons/acre for each management area in the Kahler planning area. Air quality protection will be achieved by complying with Forest-wide Standards and Guidelines. The Forest will comply with state and local regulations and guidelines directed at preventing and controlling air pollution. For further information on fire and fuels goals as they pertain to the Forest Plan refer to the Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans section in this report.

Environmental Consequences

Issues Addressed and Indicators for Assessing Effects

Indicators used in this analysis are Air Quality Index, which is used to indicate the air pollution level, and estimated production of National Ambient Air Quality Standards (NAAQS) criteria pollutants $PM_{2.5}$. $PM_{2.5}$ is being utilized as an indicator because they are pollutants emitted in smoke, considered criteria pollutants, deemed harmful to public health and welfare and can be effectively monitored (Hardy et al, 2001). Particle pollution comes from many different types of sources. Sources for fine particles (2.5 micrometers in diameter and smaller) include power plants, industrial processes, vehicle tailpipes, woodstoves, and wildfires.

Air Quality Index (AQI) is divided into six categories (airnow.gov 2014):

Each category corresponds to a different level of health concern. The six levels of health concern and what they mean are:

- "Good" AQI is 0 - 50. Air quality is considered satisfactory, and air pollution poses little or no risk.
- "Moderate" AQI is 51 - 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
- "Unhealthy for Sensitive Groups" AQI is 101 - 150. Although general public is not likely to be affected at this AQI range, people with lung disease, older adults and children are at a greater risk

from exposure to ozone, whereas persons with heart and lung disease, older adults and children are at greater risk from the presence of particles in the air. .

- "Unhealthy" AQI is 151 - 200. Everyone may begin to experience some adverse health effects, and members of the sensitive groups may experience more serious effects. .
- "Very Unhealthy" AQI is 201 - 300. This would trigger a health alert signifying that everyone may experience more serious health effects.
- "Hazardous" AQI greater than 300. This would trigger health warnings of emergency conditions. The entire population is more likely to be affected.

Methodology

The Kahler forest vegetation analyses utilized a variety of information sources. Some of the vegetation characterizations were derived by using complicated processes such as MSN imputation procedures and FVS post processors. For this reason, the methodologies, modeling, and procedures employed during creation of forest vegetation databases are described in a separate specialist report (Justice 2014). The area was modeled for commercial thinning (2015), piling, burning piles, and landscape underburning (2020). It was not modeled for underburn treatments every 10-15 years after treatment (beginning 2035), as recommended by this report because that would be beyond the scope of the project.

Tupper Remote Automated Weather Station and BlueSky Playground 2.0 beta, a smoke emission and dispersion modeling tool were used to determine predicted pm 2.5 outputs and dispersion for a modeled prescribed fire. BlueSky utilizes the following datasets:

- FCCS – Fuels Characteristic Classification System, *U.S. Forest Service FERA Team, esp. Dr. Don McKenzie*
- LANDFIRE – *U.S. Forest Service Missoula Fire Lab*
- CONSUME – *U.S. Forest Service FERA Team, esp. Drs. Roger Ottmar, Susan Prichart, and Clint Wright also many thanks to MTRI and Prof. Nancy French.*
- FEPS – *U.S. Forest Service FERA Team, esp. Dr. Sam Sandberg*
- HYSPLIT – *NOAA Air Resources Laboratory, esp. Dr. Roland Draxlar*
- VSMOKE-GIS – *U.S. Forest Service Southern Research Station,* esp. Dr. Scott Goodrick
- Meteorological Forecasts
- National 12-km Forecast – from the National Weather Service NAM forecast model
- PNW 4-km Forecast – *from the Northwest Regional Modeling Consortium, lead Prof. Cliff Mass, University of Washington*
- California / Nevada 2-km Forecast – *from the California / Nevada Smoke and Air Consortium (CANSAC), led by Prof. Tim Brown, Desert Research Institute*

Spatial and Temporal Context for Effects Analysis

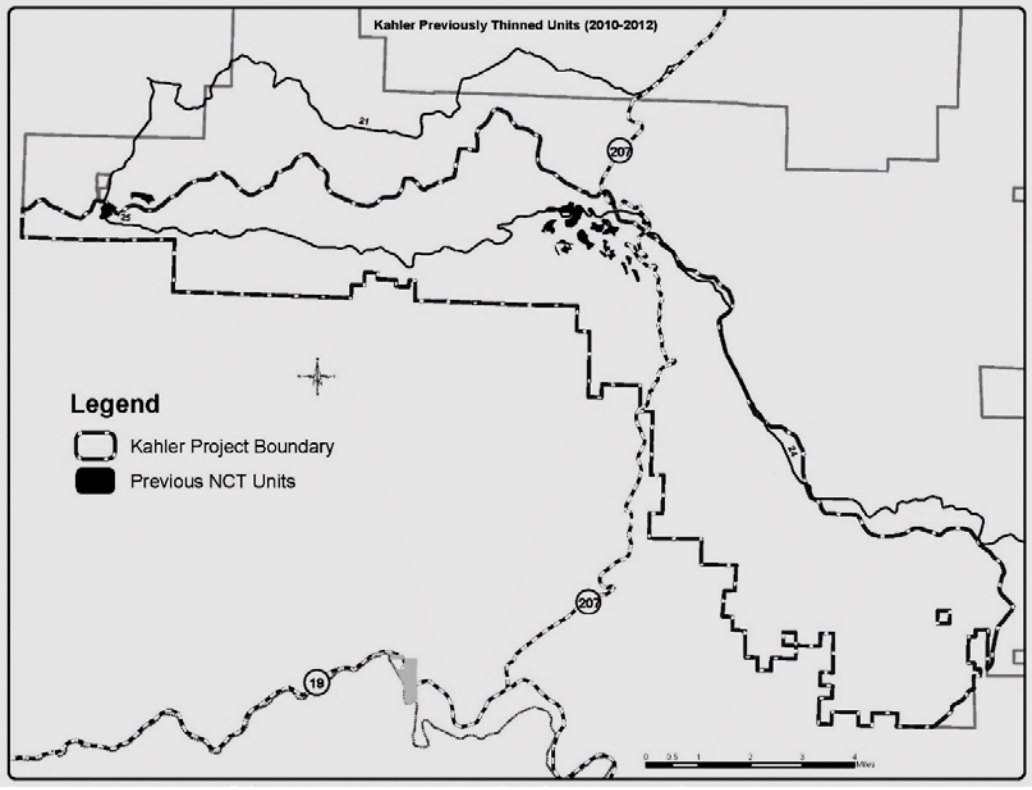
Upon implementation, silvicultural activities included in alternative 2 would directly affect approximately 12,220 acres of the affected environment; fuels activities would affect approximately 31,020 acres for

landscape burning (Figure 1). It is estimated that 50-70% of the acres proposed in the landscape underburn will have direct effects from prescribed fire.

Upon implementation, silvicultural activities included in alternative 3 would directly affect approximately 11,540 acres of the affected environment; fuels activities would affect approximately 31,020 acres for landscape burning (Figure 1). It is estimated that 50-70% of the acres proposed in the landscape underburn will have direct effects from prescribed fire.

Prescribed fire under the two action alternatives is projected to occur 5-10 years following silviculture treatment. Prescribed fire will occur in blocks ranging from 100 acres to 5,000 acres, depending on conditions. Typical conditions for burning consist of 2-3 days of ignition where smoke intrusion is the most prevalent. Following ignition is 2-3 days of residual smoke, which is typically light and variable.

Two present actions could directly effect forest vegetation conditions in the Kahler planning area: (1) a District-wide noncommercial thinning project authorized by categorical exclusion (Decision Memo) in 2009, and (2) the Long Prairie Fuels Reduction project (Figure 4). Both of the ongoing actions involve noncommercial thinning activities designed to increase residual tree vigor, address dwarf-mistletoe and other insect or disease issues, and reduce ladder fuels. The cumulative effects analysis also explicitly considers direct and indirect effects expected from implementation of silvicultural activities included in Kahler alternatives 2 or 3.



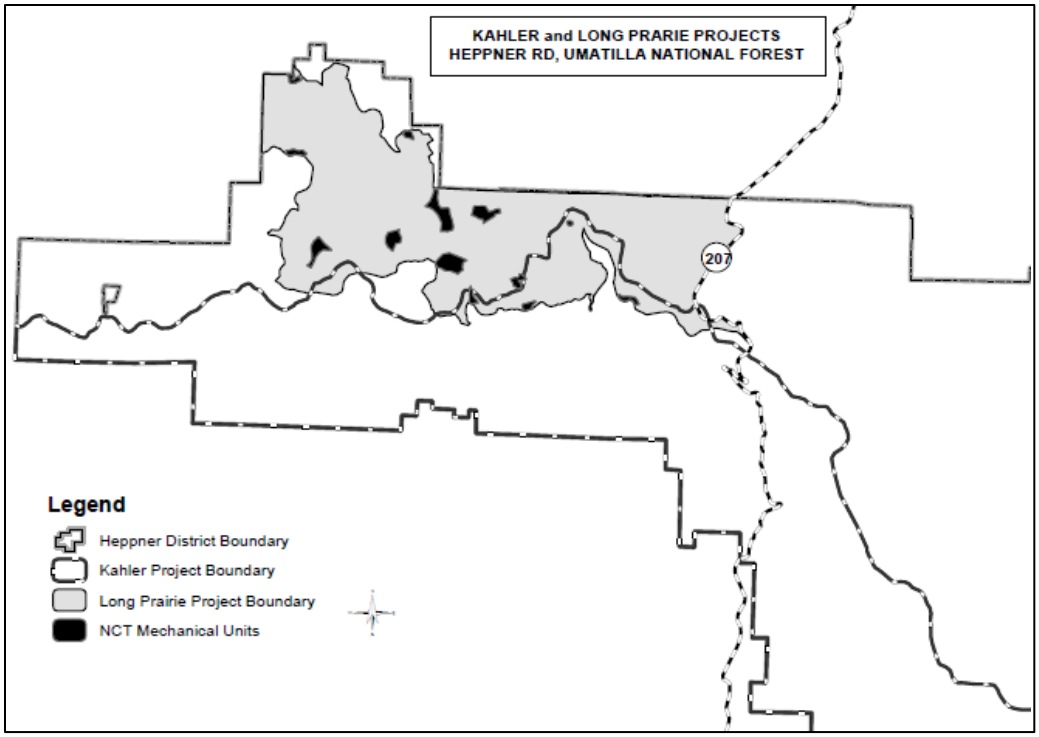


Figure 4. Present (on going) actions in the Kahler planning area- non-commercial thinning authorized by 2009 categorical exclusion (CE) (top) and the Long Prairie fuels reduction project authorized by CE in 2010 (bottom).

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

For the purpose of evaluating environmental effects, this report considers past, present, and reasonably foreseeable actions in the Kahler planning area, as described below. Future vegetation conditions incorporate direct and indirect effects from three sources: (1) implementation of proposed activities included in Kahler action alternatives (alternatives 2 and 3); (2) present (ongoing) activities; and (3) implementation of reasonably foreseeable actions. The timeframe for cumulative effects analysis is a 50-year period because this period adequately reflects the response of species composition, forest structure, and stand density to silvicultural and fuels manipulations. (Powell 2014)

Past actions influenced existing conditions in the planning area. A database was developed by using Most Similar Neighbor imputation procedures to characterize existing vegetation conditions (Justice 2014). Existing conditions are current as of 2012, reflecting stand exams completed during 2010 and 2011, compilation of a vegetation database in late 2011 (by using MSN), and field validation of vegetation information during 2011 and 2012. Existing conditions reflect the historical influence of wildfire, insect and disease activity, timber harvest, noncommercial thinning, tree planning, grazing, and other non-silviculture changes.

Present (ongoing) actions were considered when evaluating cumulative effects. Two present actions could potentially affect forest vegetation conditions in the Kahler planning area: (1) a District-wide noncommercial thinning project authorized by categorical exclusion (Decision Memo) in 2009, and (2) the Long Prairie Fuels Reduction project (Figure 4). Both of the ongoing actions involve noncommercial thinning activities designed to increase residual tree vigor, address dwarf-mistletoe and other insect or disease issues, and reduce ladder fuels. The cumulative effects analysis also explicitly considers direct and indirect effects expected from implementation of activities included in Kahler alternatives 2 or 3. The

noncommercial thinning and prescribed fire treatments authorized by CE represent incremental actions that, in my judgment, are fully responsive to the Kahler project's purpose and need.

Fire suppression and grazing are on-going activities in the Kahler area. Grazing temporarily reduces fine fuel loads in palatable grasses. Fire suppression allows fine dead fuel loading to increase slightly over time, until they decay naturally or are consumed by fire. Both fire suppression and grazing affect condition class by allowing fire intolerant species to establish, increase stand density, increase canopy bulk density, and lower canopy base height. This, in turn, increases fire intensity which has a direct effect of fire suppression capabilities and resistance to control.

Reasonably foreseeable actions were considered for the cumulative effects analysis. Actions are considered to be reasonably foreseeable if Forest Service planning activities (scoping, etc.) have been initiated for them. Based on a review of the Forest's schedule of proposed actions (SOPA), no reasonably foreseeable actions potentially affecting vegetation conditions in the Kahler planning area are anticipated over the next 5 years.

Alternative 1 – No Action

Direct and Indirect Effects

There are no direct effects of choosing the no action alternative.

Cumulative Effects

There are no direct or indirect effects in choosing the no action alternative, therefore, are no cumulative effects.

Alternative 2 – Proposed Action

Design Features and Mitigation Measures

Design Features and Mitigation Measures pertaining to fuels treatments are discussed in a separate document which contains design features for all resource areas. Items specific to fuels treatments are described under the section Fire, Fuels and Air Quality.

Direct and Indirect Effects

Direct effects are anticipated to occur only on the portion of the forest vegetation affected environment included in alternative 2. The affected environment includes 10,861 acres of commercial thinning and 5,394 acres of non-commercial thinning. These treatments will temporarily increase surface fuels throughout the units (2-4 years). To reduce the harvest created fuel load, units will be mechanically thinned and/or prescribed burned.

In addition, this alternative proposes 31,019 acres of low intensity prescribed fire to be accomplished in increments of a few hundred to a few thousand acres 5 to 10 years post thinning treatments. Prescribed fire is anticipated to directly effect 50 to 70% of the proposed landscape burn acres in Kahler (approximately 21,713 acres burned). It is recommended that maintenance burning be implemented every 10-15 years following treatment. Table 1 summarizes the proposed activities for all alternatives.

Table 1. Proposed silviculture and fuels activities for No Action, Alternative 2, and Alternative 3

Proposed Activity	No Action Alternative	Alternative 2 (Acres)	Alternative 3 (Acres)

Upland forest commercial thinning	0	9,435	8,629
Noncommercial thinning outside of harvest units	0	638	638
Noncommercial thinning in harvest units	0	4,718*	4,315*
Juniper thinning and shrub/steppe enhancement	0	1,426	1,426
Juniper noncommercial thinning	0	0	153
Shrub/steppe noncommerical thinning	0	38	38
Dry forest Riparian Treatment (Class 4 Buffers)	0	682*	657*
Aspen restoration	0	10*	10*
Reforestation in VDT gaps	0	1,000*	920*
Reforestation in Wheeler Point fire	0	5,000	5,000
Mechanical Line (miles)	0	6.1	6.1
Handline (miles)	0	2.0	2.0
Activity fuels treatment (mechanical)	0	1,770*	1,678*
Activity fuels treatment (burning)	0	6,605*	6,040*
Landscape underburning	0	31,019	31,019

* These acreages are double-counted because they represent additional treatments applied to acreage already affected by another activity (such as noncommercial thinning occurring after the upland forest commercial thinning activity has been completed). Acreages without asterisks are associated with the primary activities; acreages with asterisks are secondary or follow-up treatments occurring after a primary activity has been completed.

Prescribed fire under alternative 2 is projected to occur over a 5-10 year period following silviculture treatment. Prescribed fire will occur in blocks ranging from 100 acres to 5,000 acres depending on conditions. To reduce the impacts of smoke emissions multiple smoke management techniques will be applied to the Kahler landscape burn. A combination of the following will occur (Ottmar et. al., 2001):

11. Reduce the area burned by burning concentrations of fuel (jackpots), isolate fuels from burning, mosaic burning (30-50% of the Kahler landscape will remain unburned).
12. Reduce fuel load via mechanical removal, mechanical processing, firewood sale, biomass utilization, ungulate grazing
13. Reduce fuel consumed by burning under moist conditions, prior to precipitation, or prior to the curing of large fuels.
14. Burn prior to spring green-up or in the fall
15. Increase combustion efficiency by burning piles, utilizing a backing fire, burning under dry conditions, rapid mop-up, or aerial/mass ignition (shortens the duration of the smoldering phase of a fire)
16. Burn when dispersion is good
17. Share the airshed
18. Avoid sensitive areas
19. Burn smaller units over multiple days
20. Burn more frequently to reduce fuel accumulation

A 4,000 acre prescribed burn was modeled for the Kahler area with two days of ignition and two days of residual smoke. Modeled emissions showed a total of 346 tons of $PM_{2.5}$ were released over a four day period.

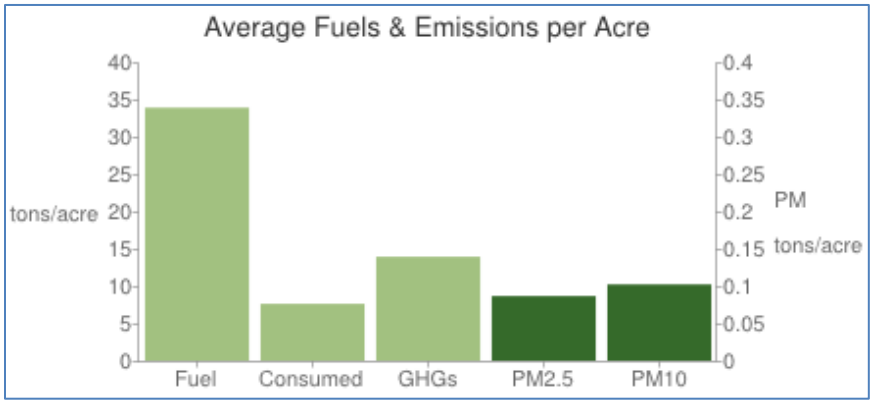


Figure 5 shows the average fuels and emissions per acre for the predicted 4,000 acre prescribed fire. Green House Gasses (GHGs), $PM_{2.5}$ and PM_{10} are predicted to be less than 0.15 tons/acre.

Figure 5 displays the average fuels and emissions per acre for the modeled 4,000 acre landscape burn. $PM_{2.5}$ emissions were predicted to be less than 0.1 tons/acre. Figure 6 shows the typical smoke dispersion pattern for the Kahler project area. Heavy particulate matter is shown at the site of the burn; the dispersion model shows light particulate matter is dispersed primarily to the southwest. Most of the smoke is measured as $PM_{2.5}$ values less than 20 µg/m3 which rates as a moderate to good on the AQI scale. Under the AQI scale, moderate air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.

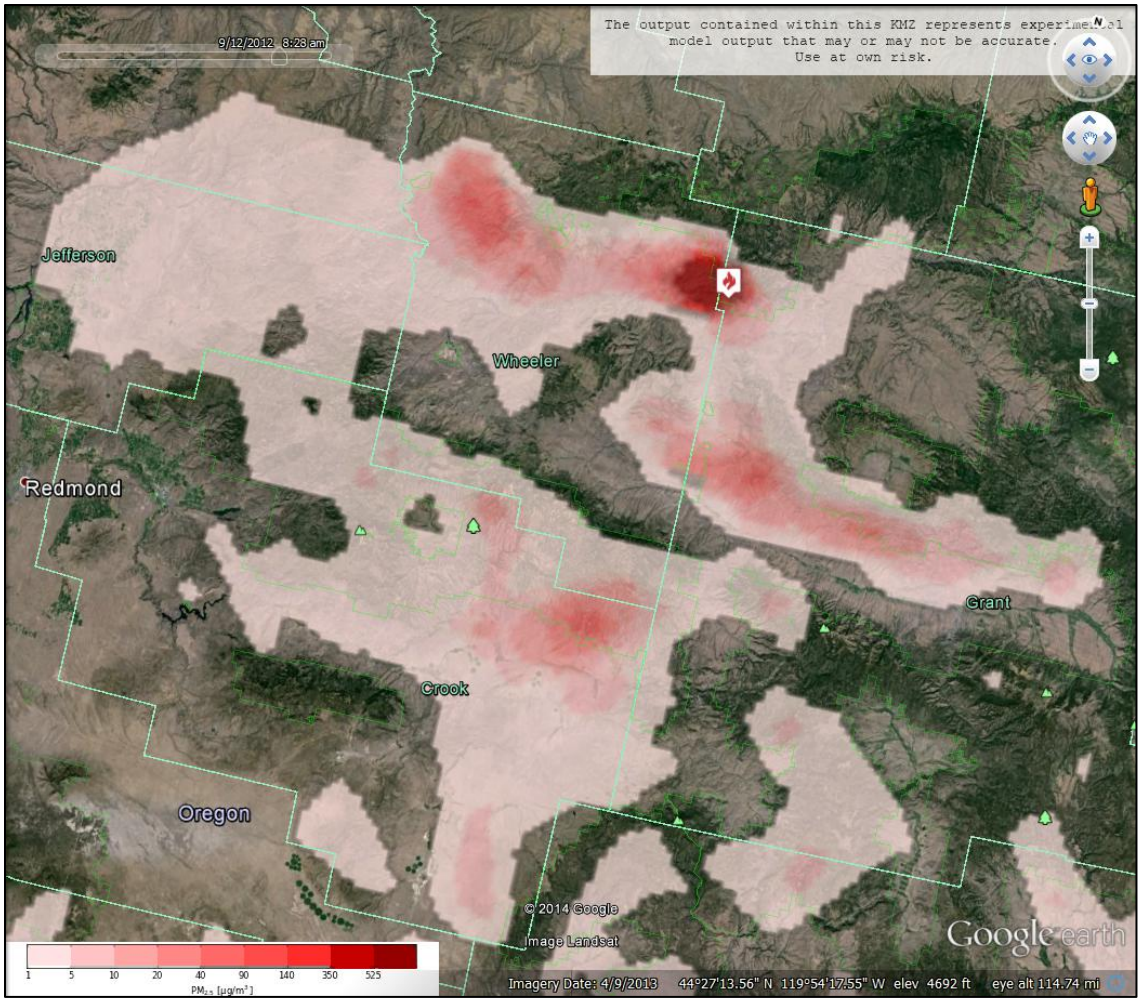


Figure 6. Smoke dispersion scenario under typical fall burn conditions for a 4,000 acre prescribed fire. Heavy smoke is displayed in dark red at the ignition source and moves south into the John Day river valley. Smoke impacts to communities will be of short duration (2-3 days).

Some intrusion will occur in the A4 Viewshed 2 (900 acres within the Kahler project area) along State Highway 207 and to the recreation sites of Fairview Campground and Tamarack rental cabin. Smoke will be of short duration and likely not impact the quality of the aesthetics beyond one or two days' time.

Cumulative Effects

Any burning under the Long Prairie CE will be complementary to the landscape burning in Kahler and of short duration. It is not anticipated that there would be any negative effect to Air Quality. The Oregon Department of Forestry Smoke Management Plan permits burning only when atmospheric stability allows for good smoke dispersion. They also regulate the daily amount of burning to reduce impacts and negative effects of smoke. Prescribed burning can compete with other burning in an airshed. The Oregon Department of Forestry is responsible for managing all burn activities on a given day. The Forest Service is responsible for establishing burn priorities for its actions. If air quality is predicted to exceed thresholds when proposed activities are scheduled to occur, implementing any of these alternatives may result in some delays in burning.

Alternative 3 – Proposed Action

Design Features and Mitigation Measures

Design Features and Mitigation Measures pertaining to fuels treatments are discussed in a separate document which contains design features for all resource areas. Items specific to fuels treatments are described under the section Fire, Fuels and Air Quality.

Direct and Indirect Effects

Direct effects are anticipated to occur only on the portion of the forest vegetation affected environment included in alternative 3. The affected environment includes 10,055 acres of commercial thinning and 5,144 acres of non-commercial thinning. These treatments will temporarily increase surface fuels throughout the units (2-4 years). To reduce the harvest created fuel load, units will be mechanically thinned and/or prescribed burned.

In addition, this alternative proposes 31,020 acres of low intensity prescribed fire to be accomplished in increments of a few hundred to a few thousand acres 5 to 10 years post thinning treatments. Prescribed fire is anticipated to directly effect 50 to 70% of the proposed landscape burn acres in Kahler (approximately 21,713 acres burned). It is recommended that maintenance burning be implemented every 10-15 years following treatment. Table 1 summarizes the proposed activities for all alternatives.

Direct and indirect effects to air quality will be the same in alternative 3 as described in alternative 2.

Cumulative Effects

Any burning under the Long Prairie CE will be complementary to the landscape burning in Kahler and of short duration. It is not anticipated that there would be any negative effect to Air Quality. The Oregon Department of Forestry Smoke Management Plan permits burning only when atmospheric stability allows for good smoke dispersion. They also regulate the daily amount of burning to reduce impacts and negative effects of smoke. Prescribed burning can compete with other burning in an airshed. The Oregon Department of Forestry is responsible for managing all burn activities on a given day. The Forest Service is responsible for establishing burn priorities for its actions. If air quality is predicted to exceed thresholds when proposed activities are scheduled to occur, implementing any of these alternatives may result in some delays in burning.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

All alternatives comply with the following:

Umatilla National Forest Land and Resource Management Plan (1990)
The Forest Plan guides all natural resource management activities and establishes management standards and guidelines for the Umatilla National Forest. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management.

Management Areas Standards and Guidelines
Actions for proposed fuel treatment in the project area are within Management Areas: A4 Viewshed 2, A6 Developed Recreation, C1 Dedicated Old Growth, C3 Big Game Winter Range, C5 Riparian,D2-Research Natural Area and E1 Timber and Forage.

A4 Viewshed 2

FIRE
For moderate to high intensity wildfires, the appropriate suppression response will emphasize control and/or contain strategies. Wildfire suppression efforts should utilize low impact methods. Use of heavy equipment may require restoration efforts to mitigate visual impacts.

FUELS
Prescribed low intensity fire with minimal scorch is acceptable in the partial retention area. In the partial retention area a 1 year or less recovery period is most desirable, if conditions are suitable.

Fuel treatments in foreground areas should be planned, timed, and implemented to avoid being highly visible and to minimize adverse visual effects. In the immediate foreground (within 200- 300 feet of observers) handpiling, hauling material away, utilizing it for fuelwood, etc., are methods preferable to machine piling and crushing. Treatment should be completed prior to the next high human-use period. In foreground areas, slash and damaged unmerchantable trees will be treated to a higher standard than in the middleground and background. Fuel loadings meeting reforestation and wildlife standards in middleground and background areas will normally be compatible with the visual objectives.

A6 Developed Recreation

FIRE
For all wildfires, the appropriate suppression response is control. Emphasis will be on protecting life and facilities. Low impact wildfire suppression methods should be used except where high intensity fire situations may exist. Fire prevention activities should be emphasized at developed sites. Public contract and a signing program are encouraged.

FUELS
Slash resulting from hazard tree removal will be made available for firewood to campground users.

C1 Dedicated Old Growth

FIRE

For moderate to high intensity wildfires, the appropriate suppression response should emphasize control strategies. Low impact suppression methods should be favored. Use of mechanical equipment to suppress wildfires is acceptable within the objective of minimizing the impact of the suppression effort on the old growth values.

FUELS
Natural fuel treatments are permitted to maintain or enhance old growth habitat characteristics or reduce the potential for a high number of and/or severely burned acres.

Natural fuels should not exceed an average of about 12 tons per acre in the 0 to 3-inch size class and an average residue depth of 6 inches, as depicted in the Photo Series for Quantifying Natural Forest Residues (Technical Report PNW 105) (USDA Forest Service 1980):
2-PP&ASSOC-4; 3-LP-3; 2-MC-3; 6-PP-4

Prescribed burning is the preferred method of fuel treatment.

C3 Big Game Winter Range

FIRE
For moderate to high intensity wildfires (average flame lengths over 2 ft.), all wildfire suppression strategies may be emphasized. Under appropriate fire prediction conditions, wildfires may be permitted to play a natural role on the winter ranges to meet big game habitat objectives.

FUELS
Fuels should not exceed an average of 9 tons per acre in the 0 to 3-inch size class and an average residue depth of 6 inches.

All types of prescribed fire may be used including broadcast burning, underburning, or range burning.

C5 Riparian (Fish and Wildlife)

FIRE
The appropriate wildfire suppression response should emphasize control and/or contain strategies. Wildfire suppression efforts should utilize low-impact methods. Use of heavy equipment may require restoration and/or mitigation to maintain riparian values.

FUELS
Fuels management activities will be designed and executed to maintain or enhance the anadromous fish and wildlife habitat within the constraints of 10 percent exposed mineral soils and 80 percent stream surface shading.

Fuels should not exceed an average of 9 tons per acre in the 0 to 3-inch size class and an average residue depth of 6 inches.

Prescribed fire may be used, consistent with riparian objectives.

D2 Research Natural Area

No treatments are proposed for this area.

E1 Timber and Forage

FIRE
For all wildfires in the management area, all suppression strategies (appropriate responses) may be used. Suppression practices should be designed to protect investments in managed tree stands and prevent losses of large acreages to wildfire. Wildfire prevention activities should be emphasized.

FUELS
Fuels should not exceed an average of 9 tons per acre in the 0 to 3-inch size class and an average residue depth of 6 inches.

All methods of fuel treatment are appropriate. Utilization of wood residues should be encouraged in order to reduce fuel loadings. When treatment is needed to meet resource objectives, prescribed fire is preferred in fire-dependent ecosystems. In ecosystems where fire is not a useful tool, direct fuel treatment methods should be used in reducing fuel accumulations to meet resource management objectives.

Prescribed burning may be used to accomplish a variety of timber and forage production objectives. Care will be used when using prescribed fire due to high resource values and risk of escape fire.

Fire Management Direction (2010)

Fire Management Units 7 & 9

Guidelines (4-87-88)

- 1. Wildfires that threaten life, property, public safety, improvements, or investments will receive aggressive suppression action using an appropriate suppression strategy.
- 2. All wildfires will require a timely suppression response with appropriate forces and strategy of either one, or a combination of the alternatives of confinement, containment, or control. Inform public about philosophy of fire management policy. In most cases when wildfires do not threaten to exceed the acceptable sizes and intensities of the management area, the lowest cost suppression option is appropriate.
- 3. Wildfires that escape initial action and threaten to exceed established limits will require that an “escaped fire situation analysis” be prepared. This analysis weighs the cost of suppression against the potential change in resources. Suppression actions should be appropriate for the values threatened.
- 4. If more than 5 percent of a subwatershed has sustained high intensity burns during the preceding 3 years, or visibly accelerated erosion is occurring within a subwatershed due to past burns, emphasize a control strategy on all wildfire in the remainder of the subwatershed to minimize further damage.
- 5. Use of prescribed fire is permitted outside the riparian influence zone where needed to improve watershed conditions or reduce significant risk of watershed damaging wildfire. Prescribed burns are designed, located and scheduled to minimize risk of short term degradation of water quality. (4-193)

Goals

The fire management program supports accomplishment of many of the land and resource objectives. A high level of cost-effective fire protection will be employed to protect resource values and investments. An appropriate suppression response of confine, contain, or control

will be made on all wildfires commensurate with the objectives and standards and guidelines identified for each management area. Wildfire suppression, use of fire and fuel treatments will require coordination with resource managers in order for all programs to be successfully accomplished. Within the scope of the Forest Plan, a fire management plan will be developed to provide additional program detail and direction. (4-45)

Standards

Provide and execute a fire protection and fire use program that is cost efficient and responsive to land and resource management goals and objectives. (4-2)

National Fire Plan

The National Fire Plan (USDI and USDA 2000) provides national direction for hazardous fuels reduction, restoration, rehabilitation, monitoring, applied research, technology transfer; and established the framework for a 10-Year Comprehensive Strategy (USDI and USDA 2002). The four principle goals and implementation outcomes of the 10-Year Comprehensive Strategy pertaining to the National Fire Plan include:

- Improve Fire Prevention and Suppression—Losses of life are eliminated, and firefighter injuries and damage to communities and the environment from severe, unplanned, and unwanted wildland fire are reduced.
- Reduce Hazardous Fuels—Hazardous fuels are treated, using appropriate tools, to reduce the risk of unplanned and unwanted wildland fire to communities and to the environment.
- Restore Fire-Adapted Ecosystems—Fire-adapted ecosystems are restored, rehabilitated and maintained, using appropriate tools, in a manner that will provide sustainable environmental, social, and economical benefits.
- Promote Community Assistance—Communities at risk have increased capacity to prevent losses from wildfire and the potential to seek economic opportunities resulting from treatments and services.

Federal Policy

The following guiding principles and policy statements are excerpted from the *Review and Update of the 1995 Federal Wildland Fire Management Policy (January 2001).* These remain the foundational principles for Federal Wildland Fire Management Policy (2009).

Guiding Principles:

1. Firefighter and public safety is the first priority in every fire management activity.

2. The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the planning process. Federal agency land and resource management plans set the objectives for the use and desired future condition of the various public lands.

3. Fire Management Plans, programs, and activities support land and resource management plans and their implementation.

4. Sound risk management is a foundation for all fire management activities. Risks and uncertainties relating to fire management activities must be understood, analyzed, communicated,

and managed as they relate to the cost of either doing or not doing an activity. Net gains to the public benefit will be an important component of decisions.

Cohesive Strategy

The National Cohesive Wildland Fire Management Strategy (2014) lists the federal laws and regulations used to guide National Forest management, including the Federal Land Assistance, Management, and Enhancement Act (FLAME Act), Endangered Species Act, the Clean Water Act, the Clean Air Act, and the National Forest Management Act which together provide the legal basis for maintaining sustainability of ecosystems.

The primary, national goals identified as necessary to achieving the vision of the Cohesive Wildland Fire Management Strategy are:

- **Restore and maintain landscapes**: Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.
- **Fire-adapted communities**: Human populations and infrastructure can withstand a wildfire without loss of life and property.
- **Wildfire response**: All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

The Healthy Forest Restoration Act (2003) directs agency personnel to improve forest conditions though fuels reduction activities. The Healthy Forest Initiative (2002) provides administrative reform to aid in accomplishing this task.

Environmental Protection Agency's Interim Air Quality Policy on Wildland and Prescribed Fires (U.S. EPA 1998)

1. Allow fire to function as nearly as possible in its natural role in maintaining healthy wildland ecosystems

2. Protect public health and welfare by mitigating the impacts of air pollutant emissions on air quality and visibility

Monitoring Recommendations

Monitoring smoke should be completed with each landscape burn through the Oregon Department of Forestry Smoke Management Program, predicted smoke modeling, photographs, and nephelometers located in Pendleton and John Day, Oregon.

References

Department of the Interior; USDA Forest Service. 2014. The National Strategy, The Final Phase in the Development of the National Cohesive Wildland Fire Management Strategy (National Strategy): 1: 1-5.

Department of the Interior; USDA Forest Service. 2002. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan.

Hardy, C.; Hermann, S.; Core, J.. 2001. The Smoke Management Imperative. 2001 Smoke Management Guide. chpt. 2.2.

Hessburg, Paul F.; Agee, James K.; Franklin, Jerry F.; 2005. Dry forests and wildland fires of the inland Northwest USA: contrasting the landscape ecology of the pre-settlement and modern eras. Forest Ecology and Management. 211: 117-139

Jerome, I. K. Lead Author. 2013. Grant County, Oregon, Community Wildfire Protection Plan. Jerome Natural Resource Consultants, Inc., John Day, OR August 2013 60 p.

Justice, Don C. 2014. Forest vegetation modeling & database creation-process document-Kahler dry forest restoration project. Forest Vegetation Modeling & Miscellaneous Datasets. Umatilla National Forest, Heppner Ranger District.

Ottmar, R., Peterson, J., Leenhouts, B., Core, J., 2001.Smoke Management: Techniques to Reduce or Redistribute Emissions. 2001 Smoke Management Guide chpt 8.0.

Powell, David C. 2014. Silviculture Specialist Report; Forest Vegetation: Kahler Dry Forest Restoration Project. U.S. Department of Agriculture, Forest Service, Umatilla National Forest, Heppner Ranger District.

USDA Forest Service. 1990. Umatilla National Forest Land and Resource Management Plan. Umatilla NF Region 6. P. 3-5; p. 4-146.

USDA Forest Service; DOI Bureau of Land Management. 2004. Healthy Forest Initiative and Healthy Forest Restoration Act Interim Field Guide. FS-799.

USDA Forest Service; DOI Bureau of Land Management. 2009. Guidance for Implementation of Federal Wildland Fire Management Policy.

USDA Forest Service. 2010. Umatilla Fire Management Plan and Reference Guide. Umatilla NF Region 6. 3.2[7] Fire Management Considerations for Specific Management Units. 2010-FMU-7.

U.S. Environmental Protection Agency. 1998. Interim air quality policy on wildland and prescribed fires. Final report. U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration, National Park Service. 2014. http://airnow.gov July 2014.

Wheeler County. 2006. Wheeler County, Oregon, Community Wildfire Protection Plan Appendices.. 25p.

Appendix F

Hydrology Report

Kahler Dry Forest Restoration Project

Final Hydrology Report

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Umatilla National Forest

8/10/2014

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Introduction

This Hydrology Report for the Kahler Project will disclose current impairments to water quality, and effects of historical management before and after the National Forest was created. It will disclose the expected effects of this project, and whether they are likely to accumulate with the past effects. Attachments include a bibliography, a Hydrologic Prescription for the different logging systems, and a photographic appendix.

The Kahler Project includes commercial thinning within Riparian Habitat Conservation Areas. The work is proposed along intermittent Class 4 streams. Surveys were conducted during field season 2013 to determine stream status, (flowing, intermittent, or ephemeral). The surveys found 8 additional miles of Class 3 streams, 45 fewer miles of Class 4, and 41 additional miles of ephemeral streams. The acres of RHCAs with 300' buffers decreased by 68 acres, 150' buffers decreased by 35 acres, and 100' buffers decreased by 1456 acres. The 150' buffers generally decreased because they had previously either been not mapped or mapped as Class 4, and the riparian areas surrounding them were dropped from units. The 100' buffers generally decreased because their status changed from Class 4 to ephemeral. Ephemeral streams do not have RHCAs, but are protected by Best Management Practices. The surveys also more than doubled the number of mapped springs in the Project Area. A number of the springs appear to have perennial flows, and are the head waters of Class 3 stream segments. In some cases, they also support wetlands. All of these water bodies would be protected from project activities by Best Management Practices (see Appendix A Prescriptions).

Since the Class 4 streams stop flowing during the critical high temperature period each summer, treatments that affect shade are not expected to affect temperatures downstream. Project activities have the potential to affect stream sedimentation. Extensive modeling was done to determine the best way to protect streams from sedimentation, while accomplishing the project. The modeling results are discussed in the Effects Analysis section.

Clean Water Act of 1972

The Clean Water Act of 1972 and amendments require the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. All of the activities proposed in this project were designed to be consistent with the Clean Water Act.

Beneficial Uses

In Oregon, surface and ground water are public resources whose use is regulated by the state. In order for a person, business, or agency to use the public water, it must be put to a beneficial use. The beneficial uses designated by the State of Oregon for the John Day River Basin are listed in Table 1.

Table 1. Beneficial uses in the John Day River Basin.

Public Domestic Water Supply	Private Domestic Water Supply
Industrial Water Supply	Irrigation
Livestock Watering	Fish and Aquatic Life
Wildlife and Hunting	Fishing
Boating	Water Contact Recreation
Aesthetic Quality	

The beneficial use which may be affected by timber harvest, non-commercial thinning, mechanical fuel treatments, road work, and prescribed burning is Fish and Aquatic Life, which includes anadromous fish passage, salmonid fish rearing and migration, salmonid fish spawning, and resident fish and aquatic life.

Summary of Effects

The rationale for treatments in Class 4 RHCAs is described. The fact that the Class 4 streams dry up during the July to October period is stated. Effects to stream temperature, biological criteria, and dissolved oxygen are expected to be limited by Design Elements and Best Management Practices. Effects of severe wildfires like the 1996 Wheeler Point Fire to the 3 indicators are described. Measurable effects to the indicators are unlikely.

Effects to sedimentation are expected to be limited by Design Elements and Best Management Practices. Effects will be analyzed by comparing the effects of natural background sedimentation, existing RHCA road system, proposed miles of RHCA log haul, thinning and mechanical fuel treatments in RHCAs, activity fuel treatments in RHCA, and landscape prescribed burning with the effects of a fire similar to eht 1996 Wheeler Point Fire. Measurable effects to sedimentation at the reach scale from the Kahler Project are unlikely.

Affected Environment

Existing Condition

Water Quality Standards

The Department of Environmental Quality (DEQ) has identified water quality limited streams throughout the Oregon as required by the Clean Water Act, Section 303(d). On December 14, 2012, the Environmental Protection Agency (EPA) added 870 listings to the 2010 303 (d) list (EPA, 2012) . The new listings for the Kahler Project area resulted from data gathered between 1999 and 2002. The implications of the listings are discussed in the Cumulative Effects section. The 2010 DEQ Water Quality Assessment Database may be viewed at the DEQ web site:

(http://www.deq.state.or.us/wq/assessment/rpt2010/search.asp).

Biological criteria for macro invertebrate communities, numeric criteria for dissolved oxygen and temperature, and narrative criteria for sediment have been developed as standards. The standards are used to protect different periods of the life histories of salmon and trout and their habitats such as spawning, rearing, migration, resident fish and aquatic life.

The biological criteria standard uses biological community (macro invertebrate) assessments as an indicator for aquatic life beneficial use support. DEQ's protocol is based on biological assemblage information for freshwater macro invertebrates collected by DEQ at reference sites throughout Oregon. DEQ identifies sites in a given region that are least disturbed by anthropogenic activities and uses these as reference sites. One sample result is sufficient to evaluate for the assessment using the benchmarks developed from the PREDATOR model (DEQ, 2010). See Table 2.

Table 2. Kahler Project area streams not meeting Biological Criteria standard.

Water Body	River Mile	Season of Use	Use and Criteria	Status
E Bologna Cyn	0 to 6.7	Year Around	Aquatic Life - see definition*	303 (d), TMDL needed

John Day River	0 - 278.3	Year Around	Aquatic Life - see definition*	303 (d), TMDL needed

*Biological Criteria: Waters of the state must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

The dissolved oxygen standard uses minimum concentrations of oxygen dissolved in water or minimum oxygen saturation levels for standards. The spawning standard is in effect from spawning through fry emergence from the gravel. The cool water aquatic life standard is in effect year around. A minimum of 5 representative data points per site is required for listing. The data must be collected on separate days per applicable time period. The daily mean of continuous dissolved oxygen data is calculated and represents one data point. Any combination of 5 days of continuous or grab sample data in the time period is acceptable (DEQ, 2010). See Table 3.

Table 3. Kahler Project area streams not meeting Dissolved Oxygen standard.

Water Body	River Mile	Season of Use	Use and Criteria	Status
Kahler Creek	0 - 12.2	Year Around	Cool water, see definition*	303 (d), TMDL needed
Kahler Creek	10.6 - 13.8	Jan 1 to May 15	Spawning, see definition*	303 (d), TMDL needed
Tamarack Creek	0 - 1.3	Year Around	Spawning, see definition*	303 (d), TMDL needed

*Dissolved Oxygen Criteria: Spawning: Not less than 11.0 mg/L or 95% saturation. Cool Water Aquatic Life: Not less than 6.5 mg/L.

The temperature standard sets a maximum average 7 day temperature for passage and rearing. Values greater than the standard are considered to limit the beneficial uses of anadromous fish during the summer time period. Continuous temperature data collected since 2003 for the time period of interest is required for listing. “Grab” temperature readings will not be evaluated. Current DEQ policy is to calculate the seven-day-average maximum temperature for the seven days following a sampling date, and apply the criteria in effect for the first of the seven days (DEQ, 2010). See Table 4.

Table 4. Kahler Project area streams not meeting Temperature standard.

Water Body	River Mile	Season of Use	Use and Criteria	Status
Henry Creek	0-7.1	Summer	Passage, rearing 17.8 C (64° F)	WQ limited, TMDL approved
John Day River	0.4 to 182	Year Around	Migration 20.0 C (68° F)	WQ limited, TMDL approved

The sediment standard uses a narrative (see Criteria below). DEQ’s water quality assessment methodologies (Listing Criteria for Oregon’s 1998 303(d) List of Water Quality Limited Water Bodies) have used stream specific documentation that showed excessive sedimentation was a significant limitation to fish or other aquatic life. This included information indicating beneficial uses impairment (aquatic community status, bio monitoring reference sites, or fishery data) and measurement data for benchmarks such as cobble embeddedness or percent fines (DEQ, 2010). DEQ is currently reviewing approaches to apply a numeric benchmark based on measurements of stream conditions to implement the narrative criteria (DEQ, 2010). See Table 5.

Table 5. Kahler Project area streams not meeting Sediment standard.

Water Body	River Mile	Season of Use	Use and Criteria	Status
E Bologna Cyn	0 to 6.7	year around	rearing, spawning, aquatic life, see definition*	303 (d), TMDL needed

*Criteria: The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed.

The John Day River downstream of the Kahler Project area is also listed for biological criteria and temperature.

The beneficial uses which may be affected by the Kahler Project activities are fish and aquatic life. The practices that the Forest Service uses to insure there would be no degradation to streams from the activities are detailed in the Best Management Practices section.

Total Maximum Daily Load (TMDL) is the process used to address the issues of water-quality limited streams. The temperature TMDL for the John Day Basin was completed in 2010. Biological criteria, dissolved oxygen, and sediment TMDLs are still needed for the John Day Basin.

The Forest Service has an understanding with the DEQ to cooperate in meeting State and Federal water quality rules and regulations (Oregon DEQ and U.S. Forest Service Pacific Northwest Region Water Quality MOU, 2014). This understanding assigns responsibility for consistency with the TMDL to the Forest Service as the "designated management agency" on Forest Service lands. This responsibility obligates the Forest Service to participate in the TMDL process. The Umatilla National Forest participated in the 2010 John Day Basin TMDLs. Water Quality Restoration Plans (WQRPs) for Forest Service System lands will be written by the respective forests and approved by the Oregon Department of Environmental Quality as part of the TMDL process.

WQRPs for the John Day Basin will contain existing Forest Service guidance, procedures, policies, and directions, such as the Watershed Condition Framework (USDA, 2011), Region 6 Aquatic and Riparian Conservation Strategy (USDA, 2008), PACFISH (USDA, 1995), regulatory agency Biological Opinions (USDC, 2007), the Umatilla National Forest Plan (USDA, 1990), Clean Water Act (1972), and Best Management Practices (USDA, 2012s).

The proposed project contains riparian management areas, Kahler Creek is not a key watershed, a Watershed Analysis has not been completed for Kahler Creek, the proposed project includes active and passive restoration elements, and project monitoring.

Best Management Practices

The general practices that the Forest Service uses to maintain water quality are called Best Management Practices (BMPs). The Forest Plan requires that projects meet "state requirements in accordance with the Clean Water Act ...through planning, application, and monitoring of BMPs ..." BMPs are practices designed to reduce or eliminate nonpoint sources of water pollution. The goal of BMP use is to avoid, minimize, or mitigate impacts to meet water quality objectives.

Project planning and application BMPs are found in National Best Management Practices for Water Quality Management on Nation Forest System Lands (USDA 2012). Planning BMPs are implemented during the NEPA planning process. Specific BMPs chosen for the Kahler Project include:

Plan-1 Forest and Grassland Planning

Plan-2 Project Planning and Analysis

Plan-3 Aquatic Management Zone Planning

Fire-2 Use of Prescribed Fire

Road-1 Travel Management Planning and Analysis

Road-3 Road Construction and Reconstruction

Road-4 Road Operations and Maintenance

Road-5 Temporary Roads

Road-6 Road Storage and Decommissioning

Road-7 Stream Crossings

Road-8 Snow Removal and Storage

Road-10 Equipment Refueling and Servicing

Veg-1 Vegetation Management Planning

Veg-2 Erosion Prevention and Control

Veg-3 Streamside Management Zones

Veg-4 Ground-Based Skidding and Yarding Operations

Veg-6 Landings

Veg-7 Winter Logging

Veg-8 Mechanical Site Treatment

These BMPs are reviewed as part of the NEPA Interdisciplinary process, . Based on the review, and local conditions, site specific BMP prescriptions were developed for the specific needs of the Kahler Project. The BMP prescriptions are contained in one or more of the following: Kahler Project Design Elements (see Chapter 2, Table 2-6), Kahler Timber Sale Advertisement, Kahler Timber Sale Contract, and the Forest Plan. They are implemented as part of the timber sale or stewardship contract administration or as part of road uses, fuels treatments, or AOP projects.

BMP Effectiveness

Forest management in the past, including logging, road construction and maintenance, grazing, and fuel treatments have caused reductions in stream shade, alterations of stream banks and channels, and increases in stream sedimentation. This past management reduced water quality in the project area and downstream. In order to halt the decline and ultimately to improve water quality, the 1990 Forest Plan and later amendments require the use and monitoring of BMPs to insure that water quality objectives are met.

Past monitoring which is relevant to this project includes the 2005 Harvest and Road Forest Plan Monitoring for the South Zone, Umatilla National Forest (Farren 2006a). It found that prescribed underburning in 3 large units caused a 3 percent (12/383 points on 3 units) increase in detrimental soil effects. It also found that 75 percent of the units were either not burned, or were burned to a low level of disturbance. That study of underburning was designed to sample hot parts of burns and riparian/lowland areas, so the results are exaggerated toward higher disturbance effects compared to a random survey. The monitoring report also found that PACFISH riparian buffers were implemented at 100 percent of the sample of 10 harvest units, and that they were 100 percent effective at preventing overland movement of sediment to streams.

In 2011, the Umatilla NF produced an Action Plan which included developing a structured approach for assuring mitigation measures and design features are carried through to project implementation. Because of this plan, it is expected that implementation of BMP prescriptions would be more consistent in the future.

Monitoring and Evaluation

Background Temperature Monitoring

Temperature monitoring would continue in the Kahler Watershed until a background range is established. Existing data on seven day maximum moving average stream temperatures is shown in Table 6.

Table 6. Seven day maximum moving average stream temperatures in degrees Fahrenheit for Kahler Area

Year	HENRY CR	KAHLER CR	WHEELER CR
93	74	59	m*
94	72	m	m
95	73	m	m
96	72	m	m
97	71	64	73
98	75	64	78
99	72	63	78
00	69	66	77
01	70	65	78
02	72	64	77
03	72	63	78
04	73	61	72
05	69	61	75
06	73	61	73
07	70	60	p*
08	70	58	69
09	71	61	75
10	69	P	69
11	m	57	71
12	66	57	73
13	71	59	71

*notes: m means missing data, p means partial data.

ANALYSIS AREA SOIL AND WATER QUALITY EVALUATION

Soil evaluations of units found that in the past, conditions were present that could lead to sedimentation. However, none of the recent observations showed Effective Ground Cover low enough to promote sedimentation.

Project roads, crossings, temporary road sites, units, and streams were screened for aquatic concerns and opportunities. This information was used by the Interdisciplinary Team to design the Wilkins Project.

HANKIN-REEVES STREAM SURVEYS

Stream surveys (based on Hankin-Reeves, 1988) have been completed and updated for the major streams in the Project Area. The surveys were conducted to document stream conditions and establish a baseline. See Table 7.

Table 7. Hankin-Reeves Stream Surveys for the Kahler Project Area.

STREAM NAME	SURVEY YEAR
Alder Creek and tributaries	1992 ,2007, 2013
2 unnamed tributaries	1994, 2013
Henry Creek	1992, 1994,2007, 2013
Candis Creek (tributary to Henry)	1992, 2013
Davis Creek (tributary to Henry)	1992
Kahler Creek	1992, 2013
Tamarack Creek	1991, 2013
Whiskey Creek (tributary to Tamarack)	1994
Wheeler Creek	1992, 2007

Riparian Area Health-Stream Temperature, Biological Criteria, Dissolved Oxygen, Sedimentation

Current Condition

The Analysis Area is located in the Blue Mountains of northeast Oregon, which is part of the Columbia River Basin of the Pacific Northwest region of the United States. The Kahler Project is also located in the John Day/Clarno Highlands Eco-region (Thorson and others, 2003) of the Northern Blue Mountains of Oregon. It consists of forest land with annual precipitation ranging from approximately 15 to 25 inches. The area has an interior, continental climate with cold winters and warm summers. Most precipitation falls during the November through May period. While a modest snow pack usually develops in the winter, rain is possible during all months of the year. This is because the topography allows the incursion of relatively warm, moist marine air from the Pacific Ocean into the area (Ferguson, 2000). The area is in the transitional rain on snow zone.

The hydrologic regime is flashy, with peak flows occurring relatively early in the spring after snow melt or rain storms, when the soil is saturated. Low precipitation in the warm season results in decreasing stream flows through summer and early fall. Seasonal low flows or base flows derive from groundwater which is stored in shallow aquifers during the wet season. The groundwater is released through springs and directly into streams. The springs form the headwaters of the principle streams and their tributaries. The temperature of groundwater when it is released at the surface is generally in the mid 50º F. range, approximating the mean annual air temperature. However, because of low stream flows and high air temperatures, stream temperatures tend to increase in the summer, with the highest 7 day maximum moving average temperatures occurring in July and August (Table 6).

The headwater streams in the Kahler Project area that are proposed for harvest are intermittent. They stop flowing between approximately July 1 and November 1 each year, and do not contribute to elevated temperatures downstream. Within a few hundred feet of certain springs in or near some streams, there is perennially flowing water. These isolated segments of perennial flow are not included in harvest units, and also do not contribute to temperatures downstream.

Localized convective storms occur in the summers. These storms are capable of producing short periods of high intensity rainfall, and which can cause erosion if the soil is exposed. However, the storms are highly localized, and account for a relatively small portion of the total precipitation.

Loss of canopy and ground cover increases raindrop impact on exposed soil surfaces with various effects that increase risk of surface runoff and soil erosion. Steep terrain and soil erodibility contribute to increased erosion potential. Precipitation patterns and intensity would largely determine the magnitude of erosion and sedimentation. Erosion tends to increase with the first rains following a disturbance, and decline rapidly as watersheds revegetate. Stream bank erosion is likely to increase in locations with shallow rooted plants which lack woody material (Photo ??).

Eroded sediments on hillslopes may take years or decades to reach stream systems and much of the mobilized sediment will be deposited in headwater channels and smaller tributaries (Elliot, 2005). Stream and valley gradient and morphology are important factors influencing the fate of sediment delivered to channels. Instream storage, routing, and transport are controlled in part by high flows, instream wood, and riparian vegetation. In general, higher gradient channels lacking large wood will be zones of transport, compared to lower gradient channels with abundant instream wood, which will be sediment storage zones.

The Kahler Project Area contains streams of first through fifth order. Many of the first order streams are ephemeral, and the second and third order streams are intermittent. Ephemeral streams are those which form in depressions in the landscape, flow after precipitation or snowmelt, but lack evidence of annual scour and deposition. Ephemeral streams are sometimes referred to as Class 5 streams. Intermittent streams have well defined channels and evidence of annual scour and deposition. Intermittent streams are Class 4 and Category 4. However, intermittent streams which have fish when they are wet are Class 1 or 2, and Category 1.

In the Pacific Northwest, low-order (e.g. first- and second-order) stream segments represent >70% of the cumulative channel length in typical mountain watersheds. Hence low-order channels are the primary conduits for water, sediment, and vegetative material routed from hillslopes to higher-order rivers (Naiman, 1992).

Because the low order streams form so much of the stream network, and are the primary conduits for water, sediment, and vegetative material, they are protected by the Clean Water Act, the Forest Plan, PACFISH, and Best Management Practices under all Alternatives. There are 110 miles of intermittent streams in the part of the Watershed managed by the Forest Service.

The stream channels appear to be gravel/silt bottomed with pool/riffle morphology. Many channels are wide and shallow, with some deeper, more incised channels. The incised channels generally have unstable banks. Most reaches appear to be zones of transportation. The few zones of deposition appear to be associated with woody materials in the channel and floodplain. The riparian canopy in the units is almost exclusively conifers, and varies between open and dense (Photo ??).

Table 8 Existing road densities in miles per square mile and number of road crossings.

Existing perm road density	3.4
Existing RHCA road density	4.6
Existing crossings	239

There are approximately 168 miles of roads in the Project Area. The road density is 3.4 miles of road per square mile of Project Area. There are 31 miles of roads in riparian areas, and the riparian road density is 4.6 miles per square mile. The total road density is equivalent to the average density for the Umatilla National Forest, which is 3.4 miles per square mile (USDA, 1990).

Forest roads are more likely to erode than forest soil because they contain large continuous areas of bare soil. Because of the lack of vegetative cover, they provide efficient locations for collecting and channeling rain water and snow melt water. In addition, because road surfaces are compacted, they have much less capacity to infiltrate surface water than uncompacted forest soil. Reduced infiltration increases the volume of water that can channel on the road surface. "Surface erosion from road surfaces, cut banks, and ditches represents a significant and, in some landscapes, the dominant source of road-related sediment input to streams" (Gucinski et al. 2001).

Road crossings of streams are often the places where eroded soil enters the water. Eroded soil is mobilized by rain and snow melt. "Most road problems during floods result from improper or inadequate engineering and design, particularly at road-stream crossings..."(Gucinski et al. 2001). There are approximately 239 road crossings of streams in the Kahler Project Area.

Early Riparian Impacts

There are few records of pre-settlement riparian conditions for the John Day country. Beavers were once plentiful in North America, in almost every locality where trees and bushes bordered streams and lakes. Their populations were estimated at between 60 and 400 million, with a density of 10 per square mile (Svejcar, 1997). It is likely that beavers lived on what is now the Heppner Ranger District.

Beavers were in great demand by the European clothing industry. Trappers began working the Pacific Northwest by the early 1820s (Svejcar, 1997). John Day Basin scale records describe greatly reduced beaver populations by the 1840s (McAllister, 2008). Many beavers had been removed from North America by the end of the 19th century (Svejcar, 1997), and it is likely that this also affected the Kahler Project Area.

Beaver dams tend to slow the velocity of water, which causes sediment and debris carried by the stream to be deposited behind the dams (Svejcar, 1997). When beaver dams back up water, the water table is locally increased (Johnson and Naiman, 1987, reported in Svejcar, 1997), which in turn creates wetlands that provide habitat for sedges and riparian hardwoods.

Beaver and their activity are rarely seen on the Heppner Ranger District. Beaver trapping is regulated by the State of Oregon under the “Fur Bearer” rules. Trapping is permitted by the State on the Umatilla National Forest. Demmer and Beschta (2008) observed that “riparian plant communities generally … increased numbers of woody species, height growth, and stem densities” when beaver trapping was stopped and grazing was greatly reduced at a site in Central Oregon over 17 years.

A historical reconstruction of riparian conditions in the John Day/Clarno Highland Ecoregion used data from sources between 1826 and 1910. It states that the following riparian conditions were reported in the primary data sources (McAllister, 2008):

- Lines of willow and/or alder shrubs along stream banks,
- Well-watered landscape: wet meadows and terraces, springs, marshes, swampy bottom lands, seeps,
- Riparian shrubs other than willow and alder, often dense and in various associations: current, mahogany, rose, myrtle, hawthorn, serviceberry, laurel, cherry, bitterbrush, ceanothus, and young cottonwood and aspen.

There are currently lines of reproducing monecious hardwoods such as alder along many streams in the Kahler Area, and individual to small groups of current, rose, hawthorn, serviceberry, and cherry. There are also acres of upland bitterbrush, mountain mahogany, and ceanothus. Diecious hardwoods are much less common. There are a few isolated riparian willows. There are a few known lines of alder, willow, and cottonwood along streams, which were planted after the 1996 Wheeler Point Fire. Also, there are a

number of aspen stands, ranging in size from a few trees to 5 acres. Several stands north of Unit 98 appear to have sprouted in response to the fire, and are dense. Outside the plantations and fire-sprouted aspens, none of the diecious trees could be described as dense. Including the plantations and aspen stands, there are very few young trees or seedlings. It is likely that this lack of reproduction is a result of heavy herbivore use, imbalance between sexes in planted trees, and fire suppression. Because of these observations, it is assumed that the composition of riparian shrub communities has been severely altered since the reports between 1826 and 1910.

Livestock traveled on the Oregon Trail (approximately 50 miles north of the Kahler Project) from approximately 1840 to 1870. The discovery of gold in the Blue Mountains in 1861 resulted in a market for mutton and beef, and livestock grazing began in earnest (King et al, 1992). Livestock use was not managed on the National Forest until the early 1900s, and use records started in 1915.

H D Langille visited the proposed Heppner Forest Reserve in 1903 and reported his observations (Langille, 1903). His examination of approximately 261,000 acres found that livestock drives from the low lands began about May 15. The livestock were driven through the Heppner Reserve to the Blue Mountain Reserve (approximately the North Fork John Day Ranger District and eastward). He states about the Heppner Forest Reserve "This spur (of the Blue Mountains) affords an excellent driveway across public lands over which sheep may be driven and ranged in transit, without encroaching upon private lands, and affords earlier range than that of the Blue Mountains proper." Livestock return to the low lands during October. The stocking rate was equivalent to approximately 3.6 acres per cow unit per month. Langille's observation of the impacts of these animals is "The number is at all times greatly in excess of the capacity of the range which, as a result of this unrestricted, persistent grazing and trailing of band after band, presents a deplorable condition of impaired natural vitality."

Langille 1903 also described riparian grazing practices:

Along some of the streams there are strips of valuable forage. These strips vary from 10 to 80 yards in width, and are sometimes more than a mile in length. The soil is a fertile loam, well sodded, and produces such rapid growth that bands of sheep have been carried through the summer season by simply trailing them back and forth repeatedly over such an area (a band contained 2000 ewes and lambs).

Langille, 1903 described soil erosion:

… the soil is subjected to destructive washing and erosion, particularly during the terrific downpours which accompany the electrical storms …. The scab lands referred to are startling illustrations of this erosion. At one time these areas were covered with soil to a depth of from one to two feet, and sufficient soil binding vegetation grew upon it to resist the destructive elements- wind and water- but persistent overgrazing destroyed this cover, and, there being no tree growth to protect the soil, it rapidly disappeared, leaving nothing but a bed of exposed rocks, upon which almost nothing grows.

Demmer and Beschta, 2008, state that:

With the loss of beaver and their dams along streams in the American west, in conjunction with increasing levels of herbivory from livestock, channel incision and widening often occurred causing drastic reductions in subsurface water storage along floodplains and loss of wetland habitats associated with riparian ecosystems.

Marshall and others, 2013 found that:

In Yellowstone Park, over a 10 year period, excluding ungulate browsing alone and raising the water table with simulated beaver dams alone was not sufficient to allow willows to recover to the threshold height.

However, when both treatments were simultaneously implemented, willows were able to recover above the threshold.

It is assumed that the local reduction of beavers greatly reduced the habitat for riparian hardwoods in the Kahler Area. And it is assumed that as long as trapping is permitted, it is unlikely the potential beaver population would be restored. Without beaver, or some other mechanism for raising the water table, it is unlikely that riparian hardwoods would be able to recover to the levels reported by McAllister, 2008. It is also assumed that the sheep and cattle stocking rates, riparian grazing practices, and soil erosion described by Langille, 1903, reduced both the numbers of individual hardwoods and their diversity throughout the Area.

Wildlife

Rocky Mountain Elk have been present in the Blue Mountains for at least the last 10,000 years (Irwin and others, 1994). They were relatively common in the 1840s, but were nearly extirpated by unregulated subsistence and market hunting by the 1880s. Hunting elk was mostly banned from the late 1880s until the 1930s. Elk were translocated from Wyoming and Yellowstone Park to the Blue Mountains during this period. Elk prospered and hunting was resumed in the 1930s.

Elk and deer populations on the National Forests are actively managed by the ODFW. ODFW establishes management objectives, regulates hunting seasons, maintains and improves habitat, and monitors harvest and populations. For example, cougars were trapped near Heppner during the 2000s in order to benefit deer and elk populations.

Elk and deer habitat on the National Forests is managed by the Forest Service, according to the 1990 Forest Plan. The Forest Plan allots 45 percent of each year's growth of forage to wildlife and livestock. However, wildlife has first priority to each year's forage.

Wolves were extirpated in Oregon by 1946 (ODFW, 2005). Wolves were reintroduced into Yellowstone National Park and Central Idaho in 1995, and have since dispersed into Montana, Idaho, and Wyoming (Fritts, 1997). At the end of 2013, there were approximately 64 wolves in 4 packs, 4 breeding pairs, and 4 individual animals in NE Oregon (ODFW, 2014). The Walla Walla and Umatilla River packs spend part of their time on the North Zone of the Umatilla National Forest.

It is assumed that the increased elk population and extirpation of wolves have contributed to the reduced numbers of individual hardwoods, their reduced diversity, and their altered community composition.

Modern Grazing

From the 1980s to the present, cattle have been grazed at a rate of 13.5 to 23 acres per AUM on the Kahler Allotments. Management has focused on excluding cattle from occupied anadromous fish habitat by fencing and pasture management. Pasture management includes grazing time limits, keeping cattle off pastures that are too wet, rotating cattle through the pastures, upland water developments and salt supplements, herding, and browse and stubble height monitoring. Photo monitoring indicates that these practices have improved riparian vegetation and bank stability over time, and result in consistency with the Forest Plan.

Shade

Shade is the shadow of solid objects which block sunlight from reaching stream surfaces. By reducing the amount of sunlight reaching stream surfaces, shade reduces the increase of temperatures caused by sunlight. Most shade is cast by the riparian canopy, while a lesser amount is cast by topographic features. The canopy consists of the interlocking limbs of trees. Conifer forest casts most of the shade in riparian

areas. In suitable locations, hardwoods and shrubs may form a primary canopy or a secondary riparian canopy inside the conifer canopy. In meadows, grass, sedge, and stream banks cast shade. These sites require soil, a moderate slope, and a relatively shallow water table. Reduced shade from reduced vegetation may cause stream temperatures to increase more than they would if the vegetation were not reduced (Meehan et al, 1977).

Existing Condition Summary

- Low precipitation and stream flows coincide with high air temperatures in summer, which tends to increase stream temperatures. Many streams dry up in summer.
- Beaver reductions by the end of the 19th century and their current scarcity are believed to have greatly reduced habitat for riparian hardwoods in the Kahler Area.
- Early European settlement records describe “Lines of willow and/or alder shrubs along stream banks; well-watered landscape: wet meadows and terraces, springs, marshes, swampy bottom lands, seeps; riparian shrubs other than willow and alder, often dense and in various associations: current, mahogany, rose, myrtle, hawthorn, serviceberry, laurel, cherry, bitterbrush, ceanothus, and young cottonwood and aspen.” The hardwood community appears to have been severely altered at this time.
- Langille, 1903 reported cattle and sheep stocking rates, riparian grazing practices, and the resulting soil erosion that is likely to have reduced the numbers of individual hardwoods and their diversity throughout the Project Area.
- Current livestock stocking has changed from 1.2 acres per sheep head month (approximately equivalent to 3.6 acres per cow head month) in 1916 to between 13.5 and 23 acres per cow head month from the 1980s to the present time.
- Wolves were extirpated in the 1940s, and began to re-populate NE Oregon in 2011.
- Since there are approximately 185 miles of streams in the Project Area, and approximately 239 road crossings of streams, the road system has increased the drainage density by approximately 5 percent.

Desired Condition

The Desired Future Condition in the 1990 Forest Plan for stream temperature is “water temperature regimes will improve due to measures taken to promote recovery or enhancement of riparian vegetation” (Forest Plan, p. 4-9).

The Desired Condition in the Region Six Aquatic Restoration and Conservation Strategy (USDA, 2008) is “DC-10. The species composition and structural diversity of native plant communities in riparian management areas including wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris and fine particulate organic matter sufficient to sustain physical complexity and stability."

The Desired Future Condition includes decreased sediment production and stream channel stability maintained (Forest Plan, p. 4-8).
The Forest Service guidance for reaching the Desired Conditions is elaborated in the Aquatic and Riparian Conservation Strategy (USDA 2008). It is comprised of five elements: riparian management areas, key watersheds, watershed analysis, watershed restoration, and monitoring. The proposed project contains riparian management areas, is not within a key watershed or the area of a Watershed Analysis, includes active and passive restoration elements, and project monitoring.

The Desired Future Condition in the 1990 Forest Plan states "Timing of low and high flows and average annual water yields will remain about the same for the variety of users (Forest Plan, p. 4-10)." The

Desired Condition in the Region Six Aquatic Restoration and Conservation Strategy (USDA, 2008) is "DC-7. In-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows are retained. Watershed scale for both Forest planning and project planning."

Environmental Consequences

Issues Addressed and Indicators for Assessing Effects

The Umatilla NF LRMP requires the use of Best Management Practices to attain consistency with the Clean Water Act. In addition, Region 6 has a MOU with Oregon DEQ which requires confirmation and project analysis of impaired water bodies (USDA, 2014).

Riparian Area Health is the Resource Element: Effects to stream temperature, biological criteria, and dissolved oxygen will be analyzed using changes to stream canopy. Effects to sedimentation will be analyzed using effects of natural background sedimentation, existing RHCA road system, proposed miles of RHCA log haul, thinning and mechanical fuel treatments in RHCAs, activity fuel treatments in RHCA, landscape prescribed burning, and high severity wildfire. See Table 9.

Time frames of 10 years or less are referred to as short term. Time frames of 10 to 100 years are referred to as long term.

Table 9. Resource Indicators and measures for assessing effects.

Resource Element	Resource Indicator	Measure	Addresses	Source
Riparian Area Health	Stream Temperature	Effects to stream canopy	Key Issue 1, watershed integrity	LRMP, FSM, BMP, MOU with DEQ, 303(d)
	Biological Criteria			
	Dissolved Oxygen			
	Stream Sedimentation	Effects of natural background sedimentation, existing RHCA road system, proposed miles of RHCA log haul, thinning and mechanical fuel treatments in RHCAs, activity fuel treatments in RHCA, landscape prescribed burning, and high severity wildfire.		

Methodology

The Hydrology Report for the Kahler Project will disclose current impairments to water quality, and effects of historical management before and after the National Forest was created. It will incorporate multiple lines of evidence and use best available science to estimate the effects of the project, and the likelihood they will accumulate with the past effects. Attachments include a bibliography and a photographic appendix.

The Kahler Project area is the 32,840 acres which are under National Forest management and surround the proposed projects. Project area, unit sizes, road and stream lengths, past activities, etc. are derived

from Geographic Information System (GIS) databases which are maintained by the Forest Service. See the Kahler Project Vicinity and other Maps for spatial relationships.

Background historic, climatic, geologic, and hydrologic information may be found in Forest Service and other agency documents and surveys, and scientific literature. References are listed in the Bibliography. Road information is from the Kahler Road Report. Monitoring resources are described in the BMP Effectiveness, and Monitoring and Evaluation Sections above. Information for activities and conditions on lands managed by other parties and organizations are generally known, but specific acreages, road miles, and years of treatment are not integrated into the GIS system. Analysis of cumulative effects will include Forest Service activities with the potential to influence watershed conditions.

Analysis tools used to summarize past, present, and future conditions include drainage density. This is a calculation to estimate the increased drainage efficiency (rate of runoff) from roads compared to the unroaded condition. Rain water and snow melt run off more rapidly along low infiltration rate road surfaces and into streams at crossings, compared to the rate of infiltration into forest soil. Drainage density accounts for the increased runoff by adding 200' for each road crossing to the lengths of the streams. Increases in road crossings of streams can increase watershed efficiency, which in turn can influence bank stability and sedimentation.

Another tool is the Water Erosion Prediction Project (WEPP) Model, and its Forest Service Interfaces. The WEPP Model (Flanagan and Livingston, 1995) is a physically-based soil erosion model that can provide estimates of soil erosion and sediment yield by considering the specific soil, climate, ground cover, topographic condition, and management activity.

Actual conditions and activities are more complex than those used to make model estimates. For example, the WEPP model assumes that project activities would take place in one year, when actually they would take approximately 5 to 10 years. However, the assumptions and simplifications provide a reasonable analysis and estimation of project effects for purposes of comparing relative differences with and without activities and between alternatives.

Models necessarily reduce the complexity of activities to make them more tractable and synthesize diverse sources of information. It may be helpful at times for readers to understand the high dimension of complexity sacrificed in order to obtain the synthesis and the reasons for reducing the complexity in a particular manner (Luce et al, 2005). With any model, assumptions for model runs and applicability of results need to be documented and explicit. Modeling assumptions are summarized in this report and documented in the Kahler Project files (Heppner Ranger District, Heppner, Oregon). Model results should be considered relative values only (not absolute predictions) for purposes of comparing background and activity effects.

Watershed Complexity

There are many problems with linking downstream sediment yields to upstream rates of erosion, including the extent and location of sediment sources, relief and slope characteristics, soil type, and vegetation cover (Walling 1988). Sources of sediment include roads, landslides and channel erosion. Sediment storage in the analysis area includes colluvial deposits on hillslopes and in upland meadows, ephemeral channels, tributary and main valleys, and channel storage. Roads are the dominant source of on-going accelerated erosion and sedimentation in the watershed. Wildfires are the dominant source of periodic sedimentation. Over the very long term, tectonic related erosion is tremendous. Sediment mobilized from roads may be stored on hillslopes for years or delivered into a stream within a season. Suspended sediment yield, measured in the Skookum Barometer Watershed (approximately 18 miles to the northeast of the Kahler Project) for ten years, showed high interannual variability over a ten year

period (Harris and others, 2007). The yield ranged from 0.4 tons per square mile to 22.8 tons per square mile per year. The average annual sediment yield was 5.35 tons per square mile (0.008 tons per acre). This is the assumed background (hillslope and stream bank) sediment yield for the Kahler Project. Modeled sediment yields are likewise presented as averages. But with averages, it is important to keep in mind that the ranges can be rather wide.

Scope of the Analysis

The Kahler Dry Forest Restoration Project is proposed in the headwaters of the Kahler Watershed (HUC 1707020401) in Grant and Wheeler Counties, Oregon. The Project proposes timber harvest, non-commercial thinning, mechanical fuel treatments, road use, construction, and maintenance, and prescribed burning. The Kahler Watershed is part of the Lower John Day River Sub-basin and the John Day River Basin, a tributary to the Mid-Columbia River. The watershed area is approximately 197,999 acres, of which 32,893 acres (17 percent) are managed by the US Forest Service (USFS). See Table 10.

Table 10. Management of the Kahler Watershed.

Manager	Acres	Percent
US Forest Service	32,893	17%
Other	165,106	83%
total	197,999	100%

Assumptions

- It is assumed that reductions of beavers at the end of the 19th century and their local scarcity has greatly reduced the habitat for riparian hardwoods in the Kahler Area. It is also assumed that as long as trapping is permitted, beavers are unlikely to achieve their potential population in the area.
- It is assumed that the composition of riparian shrub communities have been severely altered since the reports between 1826 and 1910 (McAllister, 2008).
- It is assumed that the sheep and cattle stocking rates, riparian grazing practices, and soil erosion described by Langille, 1903, reduced both the numbers of individual hardwoods and their diversity throughout the Project Area.
- It is assumed that livestock grazing before the 1980s, increased elk population, and extirpation of wolves contributed to the reduced numbers of individual hardwoods, their reduced diversity, and their altered community composition.
- It is assumed that these past impacts also contributed to recent 303 (d) listings for biological criteria, and dissolved oxygen. In addition biological criteria and dissolved oxygen levels may be affected by the groundwater contribution to base stream flows.

Spatial and Temporal Context for Effects Analysis

Sec Methodology and Scope of Analysis Sections. Direct and indirect effects of project activities are expected to take place over approximately 10 years. Cumulative effects of European-Americans have impacted the area for approximately 200 years.

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

See Assumptions above for past impacts. Proposed, on-going, and future are included in Cumulative Effects.

Alternative 1 – No Action

Direct and Indirect Effects

The relevant part of the Purpose and Need for Kahler proposes "to restore dry forest conditions to a resilient, fire adapted landscape … (by reducing) encroachment of western juniper and conifers … to improve … the diversity and productivity of riparian plant communities, and water availability for native vegetation."

The forest vegetation along streams in the Kahler Project Area ranges from heavy forest to grassy meadows and scab land. In the units, it is predominantly dense forest. As the trees grow, ground fuels accumulate, and ladder fuels expand the connection between ground fuels and the canopy. This process contributes to the risk of wildfire and to the risk that ground fire would spread to the forest canopy.

Fire effects may be beneficial or detrimental, depending on fire severity. Beneficial effects of low severity fires include killing small conifers and the occasional adult conifer, which fall on the floodplain as woody material and retain sediment, expand floodplains, and increase the capacity of the shallow aquifer. Western juniper is a native fire intolerant tree. Because of fire suppression, the number of junipers and other fire intolerant conifers has greatly increased above their historic range of variability. Low severity fire would kill smaller juniper and conifers, which would reduce their use of water. Conifer density and abundance may result in a diminuition of water that could be used by other plants and animals. Killing smaller conifers with low severity fire on a periodic basis would prevent future forest density issues.

In addition, low severity fire may reduce conifer encroachment on streams and springs, thereby increasing hardwood habitat and productivity. Killing the small conifers may open up sites for hardwoods to grow, either from plants suppressed by conifers, from hardwood sprouting, or from seeding. Hardwood leaf litter is more productive in the fish food chain than conifer litter. Hardwoods tend to increase bio-diversity. They also tend to grow faster than conifers, so the lost shade is replaced quickly.

Low severity fires may locally burn off grass and sedge thatch, which results in vigorous resprouting and growth, and quickly stabilizes the soil. Locally eroded soil may be deposited in channels and floodplains and provide hardwood habitat.

Detrimental effects of high severity fire include reductions in stream shade on a large enough scale to affect stream temperature, and exposure of sufficient soil so that eroded material interferes with fish habitat. High severity fire interferes with the productivity of the soil, so vegetative regrowth is not optimal.

All of these processes would continue under this Alternative.

Sedimentation from road use would remain at the on-going levels under this alternative.

Cumulative Effects

Background Assumptions

- It is assumed that reductions of beavers at the end of the 19th century and their local scarcity has greatly reduced the habitat for riparian hardwoods in the Kahler Area. It is also assumed that as long as trapping is permitted, beavers are unlikely to achieve their potential population in the area.
- It is assumed that the composition of riparian shrub communities have been severely altered since the reports between 1826 and 1910 (McAllister, 2008).

- It is assumed that the sheep and cattle stocking rates, riparian grazing practices, and soil erosion described by Langille, 1903, reduced both the numbers of individual hardwoods and their diversity throughout the Project Area.
- It is assumed that livestock grazing before the 1980s, increased elk population, and extirpation of wolves contributed to the reduced numbers of individual hardwoods, their reduced diversity, and their altered community composition.
- It is assumed that these past impacts also contributed to recent 303 (d) listings for biological criteria, and dissolved oxygen. In addition biological criteria and dissolved oxygen levels may be affected by the groundwater contribution to base stream flows.

The physical attributes and processes of riparian areas would continue under this Alternative. However, because of 100+ years of fire suppression, the biological components (wood, vegetation, fish, and wildlife) are increasingly threatened by the risk of uncharacteristically severe wildfire. This risk would continue under this Alternative. In the Project Area, approximately 1135 acres (20 percent) have burned out of approximately 5687 acres of riparian areas since 1944.

Table 11 1996 Wheeler Point Fire

1996 Wheeler Point Fire			
Source	tons/mi^2	area mi^2	area tons
Whl Pt Fire[3]	3.90	51.30	200.20
sum	3.90		200
WP Fire percent above background			71.5%

3. WEPP Disturbed Model.

By far the largest recorded fire was the 1996 Wheeler Point Fire. There are burn severity records for the 1996 Wheeler Point Fire (Table 11). It burned a total of 22,727 acres, including 6950 acres on the UNF. Of the 826 acres of riparian areas that burned, approximately 660 burned with high severity. All of the canopy was killed in these areas, and shade was reduced to near zero. The reduction in shade is very likely to have increased stream temperatures, and possibly affected biological criteria and dissolved oxygen. The likely sedimentation increase was modeled at 3.9 tons per square mile (Table 11), a 71.5 percent increase over background sedimentation.

Table 12 Existing Condition Background Sedimentation rate in tons per square mile per year.

Alternative 1 Background Sedimentation			
Source	tons/mi^2	area mi^2	area tons
slope, banks[1]	5.35	51.30	274.46
ex. grav rds[2]	0.0134	51.30	0.69
ex nat rds[2]	0.0650	51.30	3.34
ex paved[2]	0.0103	51.30	0.53
sum	5.44		280

Notes: 1. Harris and others, 2007. 2. WEPP Road Model.

The natural background sedimentation is estimated to be approximately 5.35 tons per square mile per year (see Watershed Complexity section above). The background sedimentation from existing roads was modeled at approximately 0.09 tons per square mile. No other existing sediment sources are believed to be relevant. The background sediment yield figures would remain the same under this alternative.

It is expected that a high severity wildfire would have the impacts described above under Indirect Effects, and that they would be similar to the 1996 Wheeler Point Fire.

Action Alternatives

Design Features and Mitigation Measures

DRAFT HYDROLOGY BEST MANAGEMENT PRACTICES, FOREST PLAN STANDARDS AND GUIDES, PROJECT DESIGN CRITERIA

The following list (Table 13) is a combination of Forest Plan Standards and Guides[8] and Best Management Practices (BMP's)[9] that were chosen to apply to the proposed action and action alternative. This list also includes Kahler Project design criteria[10] that have been specifically developed for the Kahler Proposed Action and action alternatives. Table 13 displays whether or not a measure will be implemented under a contractual stipulation; if the measure is a Forest Plan Standard and Guide, or if it was developed based on those Forest Plan Standard and Guides; if the measure is taken from the National Best Management Practices for Water Quality Management on National Forest System Lands (2012); and how and if the measure was refined as a project design criteria specifically for the Kahler Project.

Measures listed here are intended to address concerns for water quality, hydrology, fish and fish habitat, wildlife and wildlife habitat, noxious weeds, soils, and recreation. In general, these measures were designed to reduce potential effects of the action on the environment, and to meet existing laws, regulations and policy. Measures are grouped here under the action that they are related to, or if more general, under a heading for specific resources.

WQ - Water quality, hydrology and fisheries concerns[11]
SL- Soils

[8] See Forest Plan pages 4-47 to 4-97 for complete description of Standards and Guides. Forest-wide Standards and Guides are applicable to all areas of the Forest unless specifically stated under the Management Area Standards and Guides. Management Areas addressed in this table are A4- Viewshed 2 (p. 4-106), E2- Timber and Big Game, (p. 4-182) and C1- Dedicated Old Growth (p. 4-144).

[9] Best Management Practices are taken from the National Best Management Practices for Water Quality Management on National Forest System Lands, 2012. This document is available to the public on the web: http://www.fs.fed.us/biology/resources/pubs/watershed/FS_National_Core_BMPs_April2012.pdf

[10] Design criteria are measures applied to the development of the proposed action and alternatives, which are based on IDT specialist expertise.

[11] Water quality measures will comply with the Clean Water Act, Executive Orders 11990 and 11988, and the Umatilla National Forest Plan as amended by PacFish.

Table 13. Proposed measures for Kahler Project design and implementation.

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
Mechanical Vegetation Management Activities Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that my result from mechanical vegetation treatment activities. Includes measures for protection of Riparian Habitat Management Areas (RHCA's), minimization measures for ground-based skidding and yarding operations, erosion prevention and control measures, and mitigations for winter harvest and mechanical site treatment.					
WQ1	Harvest unit design should ensure favorable conditions of water flow, water quality and fish habitat.	N/A	Forest Plan p. 4-77, General SG's for Water	Veg-1, p. 128	N/A
WQ2	Prevent downstream water quality degradation by the timely identification of areas with high erosion potential and adjustment of harvest unit design.	Yes	Forest Plan p. 4-59, Class IV Streams SG's for Riparian/Fish Habitat	Veg-1, p. 128	N/A
WQ3	Delineate the location of protection areas and available water sources as a guide for both the purchaser and the sale administrator, and to ensure their recognition and proper consideration and protection on the ground.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-1, p. 128	N/A
WQ4/ WQ49/ PF2	Equipment staging, parking and refueling will be outside of RHCAs and in areas designated by the sale administrator that have previous soil disturbance. This includes prescribed fire activities.	Yes	PACFISH RA-4, p. C-17. General Riparian Area Management SG's	Veg-2, p. 131; Road-10, p. 123	N/A
WQ5	Landings, skid trails, and slash piles would be chosen to avoid, minimize or mitigate potential for erosion and sediment delivery to nearby waterbodies. Sale administrator would work with contractor to locate these areas on the ground wherever possible. See Table 14 below.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-1, p. 128; Veg-4, p. 134;Veg-6; 136	IDT discussed locations of landings, skid trails and slash piles in project planning.
WQ6	Erosion control and sediment plans will cover all disturbed areas including skid trails and roads, landings, cable corridors, temporary road fills, water source sites, borrow sites or other areas disturbed during mechanical vegetation treatments.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-1, p.128; Veg 2, p.131.	N/A
WQ8	Install sediment and stormwater controls prior to initiating surface disturbing activities to the extent practicable.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-1, p.128; Veg 2, p.131.	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ9	Avoid ground equipment operations on unstable, wet or easily compacted soils and steep slopes as described per FS Plan.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-1, p.128; Veg 2, p.131.	N/A
WQ10/ SL1	Use of ground based harvest equipment will not be permitted when soils reach field capacity (heightened moisture content), to limit the potential of long-term detrimental soil conditions, as described in the Forest Plan, or if ruts greater than 2-4 inches occur. Log haul will only be permitted on dry or frozen roads.	Yes	Forest Plan p. 4-77, General SG's for Water; Forest Plan p. 4-80, SG's for Soil Productivity; PACFISH RF-2, C5, p. C11	Veg-4, p. 134	N/A
WQ11	Implement mechanical treatments on the contour on sloping ground to avoid or minimize water concentration and subsequent accelerated erosion.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-2, p. 131	N/A
WQ12	Required skid trails will be reviewed by a soils specialist the extent practicable.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-3, p. 132	N/A
WQ13	Specify RHCA layout, maintenance, and operating requirements in contracts, design plans and other necessary project documentation.	Yes	Forest Plan p. 4-77, General SG's for Water	Plan-2, p. 14; Plan-3, p. 17; Veg-3, p. 132	N/A
WQ14	Use mechanical vegetation treatments in the RHCAs only when suitable to achieve long-term desired conditions and management objectives.	N/A	Forest Plan p. 4-77, General SG's for Water	Plan-3, p. 17; Veg-3, p. 132	See comm. thinning and non-comm. thinning under alt. descriptions.
WQ15	Modify mechanical vegetation treatment prescription and operations in the RHCAs as needed to maintain ecosystem structure, function and process.	N/A	Forest Plan p. 4-77, General SG's for Water	Plan-3, p. 17; Veg-3, p. 132.	N/A
WQ16	Utilize yarding mechanisms or mechanical treatments that avoid or minimize disturbance to the ground and vegetation consistent with project objectives.	Yes	Forest Plan p. 4-77, General SG's for Water	Plan-3, p. 17; Veg-3, p. 132.	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ17	Avoid felling trees into streams or waterbodies, except as planned to create habitat features. Leave all trees on stream banks. See Table 15 below for possible near stream falling pattern.	Yes	Forest Plan p. 4-77, General SG's for Water	Veg-3, p. 132	Retain trees as necessary for canopy cover and shading, bank stabilization and as a source of large woody debris within the RHCA.
WQ18	Trees may be felled in RHCAs when they pose a safety risk. If possible, keep felled trees on site meet woody material objectives. Also, safety risk trees along roads within RHCAs or within 100 feet of stream crossings which are cut must be left on site. When feasible, fall safety risk trees toward streams.	Yes	PACFISH RA-2, p. C-17	N/A	If safety risk trees are within the outer 50' of an RHCA in units 3 and 27, and are within the silvicultural prescription, they may be removed. If they are not within the silvicultural prescription, they must remain on site.
WQ19	Locate transportation facilities for mechanical vegetation treatments, including roads, landings and main skid trails, outside of the RHCA to the extent practicable.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RF-2, p. C-10	Veg-3, p. 132	N/A
WQ20	Do not use drainage bottoms as turn-around areas for equipment during mechanical vegetation treatments.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RF-2, p. C-10	Veg-3, p. 132	N/A
WQ21	Use suitable measures to disperse concentrated flows of water from road surface drainage features to avoid or minimize erosion, gully formation and mass failure in the RHCA and sediment transport to the waterbody.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RF-2, p. C-10	Veg-3, p. 132	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ22	Aquatics specialists would monitor the RHCA during whenever possible during mechanical operations to evaluate compliance with prescription and mitigation requirements.	N/A	Forest Plan p. 4-77, General SG's for Water; PACFISH p. C-22	Plan-3, p. 17. Also, Veg 3.	N/A
WQ23	The source location, quantity, and timing of water use for dust abatement will be approved by the FS before sale, in order to protect water resources during low flows. Pond sources may be available and the pump must be screened. Pump screens are required by Endangered Species Act, and administered by Oregon Department of Fish and Wildlife.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RA-5, p. C-17	Road 4, WatUses 3.	No more than 10 percent of a stream's flow will be pumped for dust abatement.
WQ24	All skid trails, forwarder trails, and landings which are within Riparian Habitat Conservation Areas will be stabilized as necessary to reduce soil erosion and compaction. This may include planting, seeding, protection of plants, earthwork, and cultivation practices. Stabilization work will be done each year in October. Planting, seeding, protection of plants and shallow cultivation (chain harrowing) will generally be done by the Forest Service as funds are available.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH, RF-2, RF-3, p. C-10, C-11	Veg 3, Veg 4, Veg 6	Any seeding will use native seed provided by the FS. If the FS is unable to provide native seed, non-persistent exotic species may be used if approved by Forest Botanist. Hay and straw used for mulch or erosion control will also be provided by the FS.
WQ25	Activities would be mitigated by operating in dry or frozen conditions. Outside of these exceptions, heavy equipment will not operate off roads within the RHCAs.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH, RF-2, RF-3, p. C-10, C-11	Veg 3, Veg 4, Veg 6	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ26	Wetland areas less than an acre will have a 100 ft. buffer. Wetlands and the area to the outer edges of riparian vegetation if less than one acre are protected under PACFISH Category 4 strategies/buffers. Ponds less than one acre are not protected. Wetlands and ponds greater than 1 acre are protected under PACFISH Category 3 strategies/buffers, with a 150' buffer from the edge of the wetland	N/A	Forest Plan p. 4-77, General SG's for Water; PACFISH, Standard Widths Defining RHCAs, p. C-8	Plan 2, Plan 3, Veg 3	N/A
WQ27	Design and locate skid trails and skidding operations to minimize soil disturbance to the extent practicable.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH, RF-2, RF-3, p. C-10, C-11	Veg 3, Veg 4, Veg 6	N/A
WQ28	Equipment crossing ephemeral draws that do not classify as Class IV will be confined to designated crossings. There will be minimum 100 foot spacing between designated stream crossings. Skidding up and down ephemeral draws will be prohibited. Equipment crossing swales that do not classify as Class IV channels will be confined to crossings approved by the FS, and may not otherwise operate within the swale, in order to minimize soil disturbance and sedimentation. Debris may be placed into the crossings to reduce soil disturbance, compaction, and erosion. However, the debris must be removed before the unit is closed out. Trees within these swales may be cut and dragged or lifted out. Skidding up and down the swales will be prohibited. If crossing swales during runoff is anticipated, culverts, bridges, and/or rock/earth work will be used to stabilize and armor channel banks and bottoms and prevent erosion .	Yes	Forest Plan p. 4-77, General SG's for Water PACFISH, RF-2, RF-3, p. C-10, C-11	Veg 3, Veg 4, Veg 6	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ29	Directionally fell trees to facilitate efficient removal along pre-designated yarding patterns with the least number of passes and least amount of disturbed area.	Yes	Forest Plan p. 4-77, General SG's for Water; also Forest Plan p.4-59 #2.	Veg 4	Where conditions and safety permit, trees will be felled away from residual conifers, large broken or hollow top snags, dispersed campsites, fences, landlines, research plots and improvements (i.e. fences, stock ponds, section corner monuments, etc).
WQ30	Use suitable measures to stabilize and restore skid trails when needed. This may include seeding, protection of plants, earthwork, and cultivation practices. Reshape the surface to promote dispersed drainage and install suitable drainage features.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RA-5, p. C-17.	N/A	N/A
WQ31	Skid trails, forwarder trails, and other log transportation routes will be controlled by the Forest Service to meet the Best Management Practices and applicable management requirements during timber sale contract administration.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RA-5, p. C-17	N/A	N/A
WQ32	Landing locations are selected for least amount of excavation and erosion potential, where sidecast will neither enter drainages nor damage other sensitive areas.	Yes	Forest Plan p. 4-77, General SG's for Water; PACFISH RA-5, p. C-17	N/A	N/A
WQ33	Locate landings outside of the RHCAs and avoid locating landings on steep slopes or highly erodible soil.	Yes	PACFISH RA-2, p. C-17	N/A	N/A
WQ34	Design roads and trail approaches to minimize overland flow entering the landing.	Yes	PACFISH RA-2, p. C-17	N/A	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ35	Existing landings will be used where possible.	Yes	PACFISH RA-2, p. C-17	N/A	N/A
WQ36	Use suitable measures as needed and/or restore and stabilize the landing after use.	Yes	PACFISH RA-2, p. C-17	N/A	N/A
WQ37	Winter harvest will be considered in areas with sensitive riparian conditions or other potentially significant soil erosion and compaction hazards.	Yes	Forest Plan p. 4-77, General SG's for Water	Road 4, Veg 7	N/A
WQ38	Ensure culverts do not become plugged from logging activities and thereby do not affect the functionality of the roads	Yes	Forest Plan p. 4-77, General SG's for Water	Road 4	N/A
WQ39	Avoid locating skid trails on steep areas (> 35% slope) where frozen skid trails may be subject to soil erosion the next spring.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Veg 4	N/A
WQ40	Install and maintain suitable erosion control on skid trails prior to spring runoff.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Veg 4.	N/A
SL2	Within commercial harvest units, no harvest or heavy equipment will leave designated roads or trails, to limit the potential of detrimental soil disturbance. The exception to equipment leaving designated trails will be specific to harvester/forwarder operations. In the event that harvester/forwarder is used, they will be required to have no less than 1 foot of slash (depth) under both equipment tracks. This slash load should buffer the weight of equipment when operating on other than designated trails.	N/A	N/A	N/A	Yes
SL3	If Grapple piling is used for fuels reduction, equipment will be required to travel over $\geq$1 foot of slash, and utilize designated trails.	N/A	N/A	N/A	Yes

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
	Once the equipment reaches a starting point it will back out of the unit riding on material being piled.				
SL4	All temporary roads (legacy or new) that are used for this project would be rehabilitated. These roads will be either scarified or subsoiled where possible depending upon the soil depth and slash will be placed over the surface. See subsoiling prescription below.	N/A	Forest Plan p. 4-86 Transportation Goal	N/A	See subsoiling prescription in Soils Report Appendix C.
Road Management Activities Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and instream riparian resources that may result from road management activities.					
WQ41	Road blading would be done only when necessary. Ditches would not be routinely bladed, and exposed soil areas on road prisms, ditches, cuts, and fills would be seeded with plants non-palatable to wildlife if funds are available. To minimize the need for blading, haul roads would not be used when detrimental rutting occurred because of wet weather.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water;	Road 4	N/A
WQ42	Newly created roads would favor lower slope routes when consistent with other environmental protections. They would be located outside of RHCAs	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water;	Road 4	N/A
WQ43	Temporary roads will be located to minimize or mitigate adverse effects to soil, water quality and riparian resources.	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 4	N/A
WQ44	Maintain the natural drainage pattern of the area wherever practical, apply soil protective cover on disturbed areas.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 2, Veg 2. Apply soil cover is in Veg 2, Veg 4, Veg 6	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ45	Temporary roads will be inspected to verify that erosion and stormwater controls are implemented and functioning and are appropriately maintained.	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 1, Road 5	N/A
WQ46	There will be measures to close and/or physically block re-opened closed roads and temporary road entrances so that unauthorized motorized vehicles cannot access the road after project implementation.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 6	N/A
WQ47	Implement suitable measures to re-establish stable slope contours, and surface and subsurface hydrologic pathways on temporary roads where necessary and to the extent practicable to avoid or minimize adverse effects to soil, water quality and riparian resources.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 6	N/A
WQ48	Implement measures to promote infiltration of runoff and intercepted flow and/or desired vegetation growth on the road prism and other compacted areas.	Yes	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water	Road 6	N/A
Wild land/Prescribed Fire Activity Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and instream riparian resources that may result from wild land/prescribed fire activities.					

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
WQ47	Alter prescribed fire prescriptions and control actions in the RHCA's as needed to maintain ecosystem structure, function and processes.	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water; Also, PACFISH FM-1, p. C-15	Fire 2- Use of Prescribed Fire	N/A
WQ50	Slash piles will be placed 50 ft. from the stream or lopped and scattered within the 50 ft. buffer.	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water; Also, PACFISH FM-1, p. C-15	Fire 2, Veg 2.	N/A
WQ51	Lighting during prescribed burning will take place in RHCAs. This will be done to improve the effectiveness of existing roads and trails as fire breaks. Lighting in RHCAs eliminates the need for constructed fire lines. Burning of course would be done during dry conditions	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water; PACFISH FM-4, p. C-16	Fire 1, Fire 2	N/A
WQ52	An aquatics specialist will be present with ignition in the RHCAs	N/A	Forest Plan p. 4-80, SG's for Soil Productivity; Forest Plan p. 4-77, General SG's for Water;	Fire 1, Fire 2	N/A

Label	Measure	Timber Sale Contract?	Forest Plan Standards and Guides, PACFISH Standards and Guides, or Eastside Screens?	BMP-National Core Technical Guide (2012)?	Project Design Criteria?
			PACFISH FM-4, p. C-16		
Protection of Native Plants and Shrubs Objective: To preserve habitat and minimize disturbance to native plants and shrubs.					
WQ53	Do not cut or drive over shrubs, hardwoods, or trees unnecessarily in RHCA's.	Yes	N/A	N/A	N/A

Table 14. Skid Trail Location Detail

Average Buffer Slope %				Allowed Activity
First 100' from stream edge = 0-20% slope	Yes	Last 100' to 700' with slope < 35%	Yes	Skid trails between 100' and 700' from stream
	Yes	Last 100' to 700' with slope > 35%	No	No ground disturbance except fire
	No			No ground disturbance except fire
First 75' from stream edge = 21% to 40% slope	Yes	Last 75' to 300' with slope < 35%	Yes	Skid trails between 75' and 300' from stream
	Yes	75' to 300' with slope > 35%	No	No ground disturbance except fire
	No			No ground disturbance except fire
First 75' = 40% slope or more	Yes			No ground disturbance except fire

Table 15. Possible near stream falling pattern.

K P K P K P K P K P K P K

K P K P K P K P K P K P K

K C K C K C K C K C K C K

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K C K C K C K C K C K C K

K P K P K P K P K P K P K

K P K P K P K P K P K P K

Trees marked K would be leave trees in PCT, trees marked C would be cut toward the stream, trees marked P would be piled and burned or lopped and scattered.

Direct and Indirect Effects

For Hydrological purposes, there is virtually no difference between Alternative 2 and Alternative 3. For this reason, they will both be analyzed simultaneously under the Action Alternatives section.

The relevant part of the Purpose and Need for Kahler proposes “to restore dry forest conditions to a resilient, fire adapted landscape … (by reducing) encroachment of western juniper and conifers … to improve … the diversity and productivity of riparian plant communities, and water availability for native vegetation.”
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PACFISH

The rationale for treating in Class 4 RHCAs is that the vegetation in them most closely resembles the adjacent upland vegetation, i.e. "Dry Forest," rather than the presumed potential "riparian" (i.e., stream dependent) vegetation. Kahler is a Dry Forest restoration project. Restoring the dry forest in the Kahler Area involves reducing the stand density, creating a "patchy" forest, favoring dry forest species, managing for Old Forest Single Stratum, and reducing the ground fuels and ladder fuels. This type of restoration is consistent with PACFISH Standard and Guideline TM-1b, "Apply silvicultural practices … to acquire desired vegetation characteristics where needed to attain Riparian Management Objectives (RMOs). Apply silvicultural practices in a manner that does not retard attainment of RMOs and that avoids adverse effects on listed anadromous fish."

Specific treatments were developed to move toward attainment of RMOs. The relevant RMOs are pool frequency, water temperature, large woody debris, and width/depth ratio. Pool frequency and width/depth ratio would directly benefit over the long term from Kahler's plan to fall NCT size wood directly into streams. Pool frequency and large woody material would indirectly benefit over the long term from Kahler's plan to prescribe burn in RHCAs, because a few large trees would be killed and fall into streams. Water temperature would directly benefit from NCT and commercial thinning in the short term by removing ladder fuels, thereby reducing the risk of crown fires. Stream shade and stream temperatures would be maintained in the short and long terms. Water temperature may indirectly benefit in the long term from wood fallen into streams, because it would retain sediment, rebuild the floodplain, and improve aquifer capacity. Water temperature may indirectly benefit over the long term from CT and NCT reducing stand density in riparian areas, because more light would reach the forest floor, and possibly stimulate suppressed hardwood vegetation (over longish term).

Specific design elements were developed in order to avoid retarding the attainment of RMOs. These are included in the Harvest System Soil and Water Prescriptions for Water Bodies, (8/6/2014, ECF), and described below.

Action Items

Descriptions of the proposed silvicultural, mechanical fuel, and prescribed burning treatments in the Kahler Project are located in the Forest Vegetation Report (FVR), Page 2 and Table 1, and in the Fire and Fuels Report. The treatments which would have a direct effect on riparian areas are described on Page 9 of the FVR.

These Alternatives (see Alternative Comparison Tables in Chapter 2 of the Environmental Assessment) propose commercial thinning harvest, non-commercial thinning and possibly biomass harvest, and mechanical fuel treatments in the same units. Harvest systems would be ground based, helicopter, skyline/ground based, skyline/helicopter, and skyline only. All harvest systems would include falling and bunching heavy equipment which would operate outside of heavy equipment exclusion zones along streams. The harvest and possible follow-up mechanical fuel treatments would be done with up to 3 passes of heavy equipment. The potential increase in sedimentation would be mitigated by several Design Criteria, including WQ10, heavy equipment use will be suspended when the soil is too wet.

The activity fuels in the thinning units would be burned or mechanically treated after harvest. After the activity fuel treatments in units, there would be landscape scale burning. Actions connected to the harvest and burning include log haul on existing roads including in RHCAs, road maintenance, re-opening, and re-commissioning, new temporary road construction, use of existing skid trails as roads, decommissioning, and closing of open roads. After the harvest activities and prescribed burning, skid trails, landings, and sites with disturbed soil would be treated to reduce erosion and compaction. A subset of temporary roads and trails would be identified for subsoiling and advanced rehabilitation. In addition,

this project proposes to retrofit the crossing of Tamarack Creek by Highway 207 to make it more fish friendly. The lower crossing of Tamarack Creek and the crossing of the no-name creek that flows north of Unit 57 would be improved for the passage of all aquatic organisms. The retrofitting and passage improvements would be similar to road construction, and the effects would have similar mitigations.

These activities have the potential to impact stream temperatures and canopy, biological criteria, dissolved oxygen, and sedimentation. However, there are limitations on where the treatments would be implemented. There would be no silvicultural treatments or lighting in RHCAs of Class 1, 2, or 3 streams. Because there would be no treatments in these RHCAs, the main effect of the project would be a reduction in the risk of fire spreading into the Class 1, 2, and 3 RHCAs.

The Alternatives propose activities within RHCAs. Alternative 2 proposes 682 acres of commercial and/or non-commercial thinning, mechanical fuel treatments, and shrub/steppe treatments in the RHCAs (FVR, Table 1). Alternative 2 proposes 657 acres of the same treatments. Thinning treatments will use a variable-width, no-mechanical-equipment zone adjacent to the stream channels (see Hydrology Appendix A Prescription). The no-mechanical equipment zone width would vary depending on topography and stream type. Trees within the no-mechanical zone would be cut by heavy equipment from outside the zone, or by hand equipment from inside the zone. Within selected portions of the no mechanical equipment zone, hand thinning of small-diameter trees (those less than or equal to 7 inches in diameter) may occur. Certain trees may be felled along channels and left there to contribute to channel function by providing down wood to retain sediment, expand floodplains, and increase the capacity of the shallow aquifer. The non-commercial thinning would be accomplished by hand methods, and the slash would be lopped and scattered or piled and burned. Commercial sized trees may be cut and felled in skyline units to mitigate for skyline corridors (see Appendix A Prescriptions). Inside the no-mechanical-equipment zone, there would also be lighting of activity fuel and landscape prescribed burning. Within the prisms of existing roads, there would be normal maintenance, brushing, and re-opening activities. The Highway 207 retrofitting and passage improvements would take place within existing road prisms.

Outside the no-mechanical-zone, there would be similar treatments, but they would be mechanized.

The Class 4 intermittent streams dry up between approximately the July and October. For this reason, it is unlikely that the silvicultural treatments and burning would have an effect on stream temperature, biological criteria, or dissolved oxygen, either in the Project Area or downstream. The Project contains BMPs which are designed to prevent impacts to groundwater and stream sedimentation.

There would be log hauling on existing roads in all RHCAs. Re-opening closed roads, road maintenance, road reconstruction, Highway 207 retrofitting, and passage improvement projects would cut small trees and shrubs growing in the rights-of-way. This would slow the passive recovery of vegetation in riparian areas. However, the reduction in vegetation is so small that it is unlikely to measurably change the existing canopy cover, which in turn would be unlikely to measurably affect stream temperature, biological criteria, dissolved oxygen, groundwater, or sedimentation.

The commercial and non-commercial thinning, mechanical fuel treatments, and prescribed burning activities are expected to result in a more open canopy with a single stratum of mature trees. Certain BMPs would act to limit the loss of shade, such as WQ-17, Leave all trees on stream banks. However, the reduction in riparian canopy and stream shade is not expected to contribute to stream temperatures during the critical hot weather/low flow period of creeks downstream of the project area, because the Class 4 intermittent streams in the Kahler Project area stop flowing between approximately July and October.

The harvest combined with the fuel treatments are expected to make the riparian canopy more resilient to wildfire by reducing or removing intermediate and ladder fuels, and ground fuels.

These Alternatives propose to prescribe burn the units with activity fuels, followed by landscape underburning of most of the project area. The landscape burning would be divided into 19 burn blocks, totaling approximately 31,019 acres. Included in this total are 1189 acres in the Wall Creek Watershed and 1139 acres in the Upper Rock Creek Watershed. The burning will extend beyond the Kahler Watershed so that existing roads can be used for fire lines. It is possible that a modest amount of fireline would need to be constructed to keep prescribed fire off of private lands. No other fire lines are expected to be built, unless there is a resource need that is currently unknown.

Alternative 2 contains approximately 682 acres of Class 4 RHCAs which would contain activity fuels and would be burned as a unit, and later underburned as part of a burn block. Alternative 3 contains approximately 657 acres of Class 4 RHCAs with the same activities. There are additional 1912 acres of Class 4 RHCAs in the Kahler project area which would be underburned in Alternative 2 and 1937 acres in Alternative 3. Since these acres are not in units, they are not dense, dry forest stands. Many are range land with a few trees. Some are wetlands. There would be no lighting of fire in Class 1, 2, and 3 RHCAS, but it would be allowed to back into them. The backing fire is not expected to reach shade casting vegetation and trees, because the burn prescription would call for low intensity burning. Also, fuels along flowing streams tend to have higher moistures than upland fuels, and so are less likely to burn.

Ignition would also occur in RHCAs adjacent to private land boundaries, to ensure that prescribed fire would not cross the boundaries. The areas ignited would be limited to approximately 100’ along the boundary, so no more than 0.5 acres would be ignited in each RHCA. This burning may affect shade casting vegetation and trees. However, because of the low fire intensity, trees larger than 12 inches are not likely to be affected (see BMP Effectiveness section above). Grass, forb, and hardwood vegetation is expected to resprout after burning. Trees smaller than 12 inches may be affected, but because of the low fire intensity, low coverage of fire area (see below), and because the streams dry up in summer, it is not expected that there would be a measurable increase in stream temperatures downstream or a measurable increase in sedimentation.

During prescribed burning "windows," riparian areas usually have higher fuel moistures than adjacent upland areas, and would be expected to burn at lower intensities than the uplands. Also, prescribed fire personnel have the ability to locally manipulate burn intensities by varying the rate and location of ignition. This ability increases the likelihood that burn intensities would be kept low in riparian areas, thus protecting shade casting trees and reducing the likelihood of erosion and sedimentation.

Monitoring of three prescribed burn units in 2005 found that 7 percent of green trees 12 inches dbh and larger were killed by the burns. Nineteen of the 22 dead trees were in a unit which was burned at a higher intensity in order to reduce juniper encroachment. The other two units had less than 1 percent mortality to 12 inch and larger trees (Farren, 2006A). The monitoring was done 12 to 24 months after the burning. Observations made after 2005 indicated that there had been more mortality after the original monitoring. Because of this monitoring and observations, it is expected that 1 to 3 percent of shade casting trees would be killed by prescribed burning which reached into riparian areas. It is possible that tree mortality at these levels would measurably affect shade and temperature, but unlikely during the critical period in July and August as streams are typically not flowing.

The prescribed burn monitoring in 2005 also found that 75 percent of the areas had not burned or had low burn severity after burning, 22 percent had moderate burn severity, and 3 percent had high burn severity. The high severity areas were indicated by consumption of the duff layer, root crowns and surface roots of grasses. However, the high severity areas were not continuous, but part of a mosaic of burn severities, including unburned (Farren 2006a). The areas of high severity burns contained exposed mineral soil, and would be expected to erode during high intensity precipitation or run-off. However, because the high severity areas were not continuous, and were interspersed with areas of intact duff and vegetation, surface

flow of water did not carry a measurable amount of sediment into streams. Similarly, it is unlikely that the prescribed burning proposed by Alternative 2 would cause measurable increases in stream sedimentation.

Safety risk tree falling may cut some large, green, merchantable sized trees. Any trees or snags cut in RHCAs would be left where they fall, unless they were within the silvicultural prescription or if the stream met PACFISH standards for current and future large woody material. It is possible that some of the danger trees cast shade on streams. However, safety risk trees tend to be relatively scarce. When safety risk trees were cut along 20 miles of Forest Road (FR) 10 in 2003, there were a total of 102 trees cut, an average of approximately 5 trees per mile. It was estimated in 2008 that 19 safety risk trees were growing in RHCAs on a total of 12.4 miles of FR 1003 and FR 1012. This equals approximately 1.5 safety risk trees in RHCAs per mile of road, which is a relatively low density of safety risk trees. The Action Alternatives propose to cut safety risk trees along 25 miles of haul routes in RHCAs. The assumption is that safety risk trees in the Kahler Project RHCAs are growing at similar densities to those along FR 1003 and 1012, so relatively few would be cut.

Safety risk trees are selected because they threaten to fall on a road or travelway, and because they have at least one defect. The defects suggest that these trees are likely to fall in the relatively near future, thus they tend to be shorter-lived than trees without defects. The defects may involve dead or fallen tops, which reduces their ability to cast shade. Because danger trees tend to be relatively scarce, short-lived, and may have dead or missing tops, it is unlikely that falling them for this project would measurably affect stream temperatures.

Sediment effects

The proposed activities would cause a limited amount of soil exposure with the possibility of erosion. Eroded soil has the potential to increase stream sedimentation. However, all of these activities have been designed to minimize effects to sedimentation. The designs include the use of Best Management Practices, Design Criteria, and Management Requirements from the Forest Plan. Design criteria include the use of PACFISH RHCAs. All the RHCAs are in place, but silvicultural treatments are proposed for some of them.

Heavy equipment trails have the potential to impact ephemeral streams by introducing fine sediment. The fine sediment may be carried downstream during rainfall and runoff flows. The trails may also capture the ephemeral flows, and begin to function as Class 4 streams. Ephemeral streams are protected from these impacts by Design Criteria. WQ 5: Sites would be chosen to avoid, minimize or mitigate potential for erosion and sediment delivery to nearby waterbodies. WQ20: Do not use drainage bottoms as turn-around areas for equipment during mechanical vegetation treatments. WQ27: Design and locate skid trails and skidding operations to minimize soil disturbance to the extent practicable. WQ28: Equipment crossing ephemeral draws that do not classify as Class IV will be confined to designated crossings. There will be a minimum 100 foot spacing between designated stream crossings. Skidding up and down ephemeral streams would be prohibited. Debris would be placed into the crossings to reduce soil disturbance, compaction, and erosion. However, the debris must be removed before the unit is closed out. Trees within these swales may be cut unless there are defined channel banks. If there are defined banks, the trees that support the banks would not be cut. Cut trees may be removed by dragging or lifting out, as long as equipment does not skid up and down the stream. If crossing swales during runoff is anticipated, culverts, bridges, and/or rock/earth work would be used to stabilize and armor channel banks and bottoms and prevent erosion (See Hydrology Appendix A Prescriptions).

There would be log haul on approximately 26 miles of existing roads within RHCAs. Belt et al. (1992) infers that "sediment produced within the buffer strip would enter the stream more readily than sediment from source areas more distant from the stream channel." Erosion on these roads would be more likely to

increase suspended sediment in streams than haul outside of RHCAs. The effects of these activities in riparian areas would be limited by the designs described above. They include Design Criteria WQ 8 and WQ 9, which stipulate installation of sediment control prior to ground disturbance and no activity during wet conditions. Because of these Design Criteria, it is not expected that the activities in RHCAs would cause measurable increases in sedimentation above the background levels.

Also, these Alternatives propose to use roads as shown in Chapter 2 of the Kahler Environmental Assessment. Re-opened closed roads would be re-closed with the same type closure device after completion of activities. See the Roads Report and Soils Report for specific road closures and decommissioning. A subset of temporary roads would be evaluated for decommissioning by the end of the project. As needed, some of the haul roads would be maintained by grading, rocking, cleaning the ditches and dips, and/or by digging out the culverts. Highway 207 retrofitting and the passage improvement projects have the potential for small scale, short term, localized sedimentation, but would have mitigations to reduce impacts to streams.

Swift (1984) found that newly constructed forest roads in North Carolina eroded from cut slopes, fill slopes and the road bed. Applying 8 inches of gravel and establishing grass on all non-graveled surfaces resulted in the lowest soil loss. Well grassed, outsloped roads with broad based dips which had 20-30 pick-up trips per month required little maintenance, except the outlet edges of the dips need to be cleaned of trapped sediment to eliminate mudholes and prevent the bypass of storm waters. This type of maintenance was needed at 2 to 10 year intervals. However, it was difficult with motor graders because the blade could not be maneuvered to clean the dip. Small bulldozers or front end loaders appeared to be more suitable for this type of maintenance (Swift, 1988). Reid and Dunne (1984) found that well graveled and maintained roads in western Washington with more than four log loads per day contributed sediment at 7.5 times the rate as the same roads on weekend days when they were not used for log haul. They attribute the reduction in sediment to the rapid formation of armoring of the road surface. Luce, 1997, found that saturated hydraulic conductivity increased after ripping and three rainfall treatments compared to before ripping. While the increased conductivities were modest compared to lightly disturbed forest soil, they "probably" represented significant gains for reducing runoff.

Luce and Black, 1999, found that gravel road segments in the Oregon coast range where vegetation was cleared from the cutslope and ditch produced 7 times as much sediment as segments where vegetation was retained. This indicated the importance of revegetation following construction and the potential impact of ditch cleaning during maintenance. Black and Luce, 1999, compared sediment production over 2 years on gravel roads in the Oregon coast range. Their study roads were graded and had bare cutslopes and ditches. Sediment production declined by 72 percent in the second year, even though precipitation and rainfall erosivity increased. They attribute the observed decline to a newly grown 10 percent vegetation cover in the ditches and armoring of the cutslopes and in the ditches. Luce and Black (2001a), observed in the Oregon coast range that either heavy traffic during rainfall or blading the road ditch would increase the erosion. Grading the ditch increased sediment yields more than heavy traffic on a road built in fine grain parent material with high quality basalt aggregate. Prohibiting wet weather haul is an increasingly common best management practice that is effective in reducing sediment production from existing roads. Reducing the amount of road with unnecessary ditch grading is unequivocally effective in reducing sediment production.

Luce and Black, 2001 (b), also from the Oregon coast range concluded that sediment production is greater where length is greater in proportion to the square of the slope of the road segment (equation 11), longer segments produce more sediment individually, but no more per unit length, and segments on more erodible soils produce more sediment. Also, erosion is greatest immediately after disturbance to roads, and there is a decline in erosion following initial disturbance that is exponential in shape. Recovery is

rapid; within 1 to 2 years most plots experienced at least a 50 percent reduction in erosion. On recently disturbed roads, there is more erosion in years with more precipitation and with higher single storm or total erosion index (EI) values. These rule sets and earlier findings on cutslopes suggest that roads that do not recover become the greatest contributors of sediment in the long run. We need to learn what road characteristics increase the risk of non-recovery.

Sugden and Woods, 2007, studied sediment yields from unsurfaced (native) roads in western Montana. They found that road slope, time since last grading, roadbed gravel content, and precipitation explained 68 percent of the variability in sediment yield. They continue with "Three of the four variables (slope, time since grading, and gravel content) are affected by forest management decisions. Road location is important. Sediment production can be reduced by aggregate surfacing, which may be particularly cost effective on road segments close to streams. Where drainage structures must be placed close to streams, supplemental filtration can be provided by catch basins, filter windrows, and other means (Burroughs and King 1989). The frequency of road grading is also something that forest managers have some discretion over. This study found that sediment production in the year following grading might exceed the cumulative sediment production in the subsequent 3 years. While grading is important for maintaining adequate surface drainage and a stable roadbed, and for removing ruts, sediment production can be dramatically reduced if this is done only when necessary. In addition, road management techniques that restrict vehicular access at times of the year when rutting is likely to occur can help extend the maintenance frequency and reduce sediment production" (Sugden and Woods 2007).

The study areas in the publications above differ from the Heppner Ranger District in total precipitation, geology, and soil texture, so the actual sediment yield results are not comparable. However, it is likely that the management responses they observed are also important here. The following recommendations are based on the published observations discussed above. The recommendations are included in the Design Criteria.

6. Newly constructed roads would be located on the lowest feasible slope and be located outside of RHCAs.

7. Grading (blading) should be done only when necessary.

8. Ditches should not be routinely bladed.

9. Exposed soil in steep areas would be seeded as needed.

10. To minimize the need for grading and to prevent rutting, roads should not be used for haul during wet weather.

The South Zone Umatilla Road Manager (Personal communication, 2010) reports that these recommendations are generally followed. She reports that placing aggregate at road approaches to streams would be considered on a case by case basis. However, stopping haul in wet weather would approximate the same effect.

During the life of this project, approximately 10 years, the preparation, use, closure, and decommissioning of the haul roads may expose soil and cause small scale, localized, increases in stream sediment, especially if there is precipitation before re-growth of ground cover. Sedimentation would be limited by the use of BMPs and Design Criteria, those stated above and the others in Chapter 2 of the Environmental Assessment. It is expected that any erosion or sedimentation resulting from the skid trails or burning would recover within a year or two because of re-growth of vegetation and shedding of forest litter (Elliot et al. 2000).

Road decommissioning (placing roads in storage for 20 or more years until they are needed again) may include gating or other closure devices, and stabilizing the road prism, cutslopes, and fill slopes by seeding. Scarification with four-wheeler drawn chain harrows may be used to support seeding success in rocky areas. The sites would be expected to be fully stabilized within 12 to 24 months.

Mechanical and combustion fuel treatment projects proposed in the Alternatives are expected to reduce the risk that wildfire would cause measurable sedimentation in the area's streams. In addition to project design, the re-establishment of vegetation and the shedding of forest litter are expected to quickly reduce the risk of erosion of exposed soil from project activities (Elliott et al. 2000). Because of project design, re-establishment of vegetation, and forest litter, it is expected that if eroded soil from these activities reached any stream, the resulting sedimentation would cause no more than small, localized, short duration effects at the reach scale.

Generally, measurable effects to temperature, biological criteria, dissolved oxygen, and sedimentation at the subwatershed scale are unlikely.

Cumulative Effects

Past Management

The background assumptions for these Alternatives are identical to the assumptions for Alternative 1.

According to Wohl, 2000, woody material in the form of logs and limbs is important to streams because it:

- exerts an important control on channel processes…
- increases boundary roughness and flow resistance
- produces a stepped channel profile
- creates sediment and organic material storage sites
- enhances substrate diversity

As stated above, beaver were decimated by the 1840s in the Pacific Northwest (p. 14). Beaver, by building dams, have the ability to manipulate the riparian landscape. The dams and ponds slow water velocity, provide a site for sediment and organic material storage, and create wetlands and hardwood habitat. The ponds locally increase the volume and capacity of shallow ground water aquifers. Widespread beaver trapping initiated changes in the hydrologic functioning of riparian areas and streams. Beaver ponds, which had effectively expanded flood plains, dissipated erosive power of floods, acted as deposition areas for sediment and nutrient rich organic matter, and locally increased groundwater were not maintained and eventually failed. As dams gave way, stream energy became confined to discrete channels, causing erosion and down-cutting (Elmore and Beschta, 1987).

The decimation of beaver also reduced habitat for riparian hardwoods. Livestock grazing practices before 1916 resulted in the reduction of the numbers of individual riparian hardwoods and their diversity. They also altered the composition of the riparian hardwood community. As head months of livestock have declined in the last 100 years, head months of wildlife have increased. The grazing by livestock and wildlife has been an important factor in the maintenance of low levels of riparian hardwoods.

Since 1981, approximately 10, 926 acres in the Project Area have had some type of commercial harvest which affected the timber canopy. There has also been an insect outbreak which affected 632 acres, a fire that affected 6950 acres, and existing roads which affect 419 acres of canopy. The harvest included overstory removal, regeneration, salvage, and commercial thinning. The harvests before 1995 included trees in riparian areas. The ECA for Alternative 2 is approximately 20 percent. The combination of the

decimation of beavers, livestock over-grazing in late 19th and early 20th centuries, declining livestock numbers coupled with increasing wildlife, fire suppression, and riparian timber harvest has resulted in the current riparian canopy which is predominantly conifers, and appears to be deficient in hardwoods. Also, several of the recently surveyed stream reaches are deficient in woody material.

Without beaver ponds and without optimal amounts of wood, sediment mobilized in the Kahler Project Area and the Kahler Watershed tends to leave the area, rather than being stored in ponds and behind log jams. In addition, channels are less stable, because of the lack of woody material functioning as roughness and flow resistance (Photo 3).

In the 1980s, concern about livestock grazing's impacts on fish habitat, including sedimentation, initiated changes in allotment management and the construction of range improvements in the Kahler Project Area. The 1990 Forest Plan relied on Best Management Practices to attain consistency with the Clean Water Act. In 1992, the Heppner Ranger District completed an Access and Travel Management Plan which closed approximately half of the roads on the District to the public. They may still be used by permit for management and administrative activities. The 1995 amendment to the Forest Plan called PACFISH (USDA, 1995) established stream buffers to protect fish habitat. Activities are only allowed in the buffers if they improve habitat. It was believed that without activities, passive restoration would occur, which would improve the habitat. In 2008, the Heppner Ranger District ended Off-road OHV use on the west end of the district, including in the Kahler Area. All of these actions have contributed to reducing long term stream sedimentation on the lands managed by the Forest Service in the Watershed.

Construction, use, and maintenance of the road system are past management activities which are affecting erosion and sedimentation at the present time. Past recreation generally does not affect erosion and sedimentation, except indirectly through road use.

At this time, it appears that active restoration of the forest in the riparian areas is necessary. Past fire suppression is believed to have disrupted the normal fire cycle, and created the conditions for uncharacteristically severe wildfires (Fire Report). Without actively reducing fuel loads and configurations, there is a risk that wildfire in riparian areas would be uncontrollable. It is further believed that if fuels are reduced in the uplands, but not in riparian areas, then wildfire would spread through the riparian areas to other parts of the forest where fuels were not treated. These are the reasons for implementing harvest and fuel reduction in the RHCAs.

Kahler Dry Forest Restoration Project

The Kahler Watershed is the Analysis Area for cumulative effects. It contains the Kahler Project Area.

The Forest Service portion of the Kahler Watershed contains approximately 168 miles of roads. The Kahler Project would use those existing roads and build 3.0 miles of temporary roads in upland locations on NFS land. Alternative 2 would use 1.2 miles of private road and Alternative 3 would use 1.6 miles of private road. The total road density is approximately 3.4 miles of roads per square mile of Watershed. This road density is equivalent to the 3.4 miles per square mile for the entire Umatilla NF (USDA, Final EIS, 1990). Approximately 109 miles would be used to haul logs.

Skid trails and a subset of new temporary roads would be assessed after project activities as candidates for subsoiling and advanced rehabilitation activities. None of the new temporary roads would be located in RHCAs, and there would be no new stream crossings. Alternative 2 would use 1.5 miles of existing temporary roads in RHCAs. Alternative 3 would use 0.5 miles of existing temporary roads in RHCAs. The addition of the new temporary roads would temporarily increase the total road density slightly, but

because of rounding, it would remain at 3.4 miles per square mile (see Roads Report). The road density would return to 3.4 when rehabilitation was completed after the project.

Because the new temporary roads are outside RHCAs, they are not expected to cause a change in total road erosion at the subwatershed scale. The use of skid trails in the RHCAs and the rehabilitation of the skid trails and new temporary roads are not expected to cause stream sedimentation because of the use of BMPs and project design criteria. Any effects would be localized and of limited duration.

Paved roads on the NFS lands generally receive annual maintenance. Unpaved roads generally do not. Maintenance schedules are not available for roads under other ownerships. Ditch cleaning of paved roads, and blading and ditch cleaning of gravel and native surface roads may cause localized sedimentation in the vicinity of culverts, dips, and road-stream crossings. This sedimentation would be most likely when precipitation and overland flow occurred after maintenance, but before vegetation and surface armoring were re-established.

Closing open roads does not necessarily affect the hydrologic impacts of roads. However, when closed roads are not used, they often develop a ground cover which may slow overland flow and reduce sediment which enters streams at road crossings. Rehabilitation activities accelerate this process. Advanced rehabilitation can also improve infiltration of water into the soil, and reduce constriction of streams. Establishing conifers and hardwoods maintains and increases soil porosity, which may eventually restore the pre-road capacity of the soil to hold water. When this occurs, the risk of erosion is greatly reduced.

It is always possible to have erosion and sedimentation following ground disturbing activities when there is intense precipitation. However, because the Kahler Project is designed to maintain existing water quality using BMPs, and because of the regrowth of vegetation and fall of forest litter, it is not likely to cause a measurable increase in stream sedimentation at the sub-watershed scale.

Table 12 shows the assumed hill slope and stream bank sedimentation of 5.35 tons per square mile per year for the Kahler Project. The existing road system is currently used by the Forest Service for management needs, by the public for recreation, and by permitted users for their specified purposes. This low level of use is modeled to contribute an additional 0.09 tons per year per square mile to steams. Table 11 shows the modeled sedimentation for the year after the Wheeler Point Fire, an additional 3.90 tons per square mile per year. The Kahler Project is designed to prevent a destructive fire like Wheeler Point.

Table 16. Action Alts Harvest Sedimentation in tons per square mile and tons per year.

Alternatives 2 and 3 Harvest			
Source	tons/mi^2	area mi^2	area tons
gravel haul^2	0.0296	51.30	1.52
native haul^2	0.1319	51.30	6.77
paved haul^2	0.0092	51.30	0.47
ct, nct, mcfuel^3	0.0670	51.30	3.40
sum	0.24		12
Alts 2 and 3 percent above background			4.3%

Notes: 2. WEPP Road Model. 3. WEPP Disturbed Model..

The harvest part of the Kahler Project, including log haul on gravel, native surface, and paved roads and commercial thinning, non-commercial thinning, and mechanical fuel treatments is modeled to increase sedimentation by approximately 0.24 tons per square mile per year (4.3 percent) over the first 5 years of the project (Table 16). This rate of sedimentation would end when harvesting activities ended.

Table 17. Action Alts Burning Sedimentation in tons per square mile and total tons per year.

Alternatives 2 and 3 Prescribed Burning			
Source	tons/mi^2	area mi^2	area tons
landscape[3]	0.2200	51.30	11.40
act fuel[3]	0.0670	51.30	3.40
sum	0.29		12
Alts 2 and 3 percent above background			4.3%

Notes: 3. WEPP Disturbed Model.

Table 17 shows the Action Alternatives burning sedimentation in tons per square mile and total tons of sedimentation in the Kahler Area. This increase would be approximately 0.29 tons per square mile, or approximately 4.3 percent above background. It would begin after the harvest was complete, and occur during the second approximately 5 years of the project.

Compare the 4.3 percent increase in tons per square mile per year of sedimentation for the Kahler Project with the 71.5 percent increase for the Wheeler Point Fire. The sedimentation modeled for the Kahler Project is limited to approximately 10 years, and is well below the background rate of sedimentation. It is unlikely to be measurable at the watershed scale. The modeled sedimentation from the 1996 Wheeler Point Fire would be likely to be measurable at the watershed scale.

The Kahler timber harvest, prescribed burning, non-commercial thinning, and connected road activities proposed inside and outside of RHCAs would be expected to immediately reduce existing fuel loads and reduce the risk of wildfire that could affect stream temperatures, biological criteria, dissolved oxygen, and sedimentation. After the project, the canopy is expected to be more open and have more of a single stratum of mature trees than without the project. This type of forest would be more resilient to wildfire, and would be more likely to tolerate prescribed low intensity maintenance underburning every 5 to 10 years.

Ongoing Activities

Most of the Kahler Watershed has on-going grazing by domestic livestock during the summer months. Time sequenced riparian photo point monitoring has shown that bank stability has increased and sedimentation has decreased in the Little Wall Allotment (photos 1 and 2), approximately 6 miles east of Kahler.

Ponds and watering troughs have been constructed to benefit cattle, wildlife, and fire protection in the Kahler Project Area. Cattle use these ponds during the June through September season. Wildlife use them all year around. They are used for fire suppression as needed during fire season. Because of this use, there are rims of exposed soil around each pond and trough (Photo 6). Cattle and wildlife also make trails along fences, at salt sites, and to access water. These trails are typically 1 foot wide. It is estimated that the cattle and wildlife related soil exposure equals approximately 14 acres in the analysis area. The amount of exposed soil caused by cattle and wildlife is not expected to change with the Kahler Project Action Alternatives. Also, it is not likely that the exposed soil measurably affects stream sedimentation, because many sites are located away from streams and a relatively small area is affected.

Fire suppression occurs on all public and private lands in the Analysis Area. The US Forest Service and the Oregon Department of Forestry are the primary agencies. Most fires are kept at less than 1 acre by suppression activities, and have little effect on sedimentation at the Sub-watershed scale. Large fires may result in a great deal of disturbance to vegetation, soil, and soil cover. As described above, this disturbance recovers within a few years. Fire suppression activities may also cause a great deal of

disturbance to vegetation, soil, and soil cover. On lands managed by the Forest Service, these activities are rehabilitated as soon as possible, usually during the first fall after the fire starts. Fire suppression disturbances also recover within a few years.

Recreation and minor forest products are not expected to affect stream sedimentation in the analysis area.

Lands managed by other entities in the Watershed are used for timber production, cattle grazing, agriculture, the urban areas of Spray and Winlock, and recreation.
Kahler, Tamarack, Alder, and Wheeler Creeks in the Project Area are used beneficially by anadromous fish.

Foreseeable Future Activities

There are no foreseeable future activities.

Climate Change

Luce and Holden (2009) published a study of trends in stream flow over a 58 year period. It noted that while increasing variability in annual stream flows had been recorded, the nature of the changes were largely unexplored. They tested for trends in the distribution of annual streamflow at 43 gages in the Pacific Northwest for water years 1948 to 2006. Seventy-two percent of the stations showed significant declines in the 25th percentile annual flow, with half of the stations exceeding a 29 percent decline. Fewer stations showed significant declines in either median or mean annual flow, and only five had a significant change in the 75th percentile. This demonstrated that increases in variance result primarily from a trend of increasing dryness in dry years.

Lawler et al. (2008), reports that the Blue Mountains of Oregon have gotten warmer and drier since 1970, based on existing weather records. Future climate is predicted to be warmer and wetter, especially in the eastern part of the state. Snow packs in the transitional rain on snow watersheds are expected to melt earlier, with earlier peak flows. Precipitation is expected to be greater in the winter and less in the summer, with an overall increasing trend. The rate of increase in precipitation is expected to accelerate over the next 100 years.

These findings imply reduced stream flows in dry years with the possibility of increasing flows during the winter and increasing, but earlier peak flows during wetter years. Reduced flows translate into reductions in the quality and quantity of aquatic habitat. The upper extent of perennial streams may decrease. In addition, flow has a strong control on stream temperatures and flow reduction would likely exacerbate stream temperature increases. Terrestrial ecology would also be affected by increased fire occurrence, increased forest mortality, and decreased tree growth. Regarding sedimentation, increasing dryness in dry years may translate into less risk of sedimentation after disturbance. Increasing winter flows in wet years may indicate greater sedimentation during those years.

Consistency with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Management Requirements from the Forest Plan

1. Meet or exceed state requirements in accordance with the Clean Water Act for protection of waters of the State of Oregon (OAR Chapter 340-341) through planning, application, and monitoring of Best Management Practices (BMPs) in conformance with the Clean Water Act, regulations, and Federal guidelines.
2. Meet the direction and processes for management of wetlands and floodplains in accordance with EO 11990 and EO 11988 and FSM 2527.

All of the Alternatives in the Kahler Project are consistent with the Forest Plan because they meets or exceed state requirements in accordance with the Clean Water Act for protection of waters of the State of Oregon (OAR Chapter 340-341) through planning, application, and monitoring of Best Management Practices (BMPs) in conformance with the Clean Water Act, regulations, and Federal guidelines. All of the activities proposed in this project were designed to be consistent with the Clean Water Act.

Floodplains, Executive Order 11988

Executive Order (EO) 11988 requires the Forest Service to avoid "to the extent possible the long and short term adverse impacts associated with the ... occupation ... or modification of floodplains..." The Kahler Project does not propose to occupy or modify any floodplain. For this reason, the Kahler Project is consistent with this EO.

Wetlands, Executive Order 11990

Executive Order (EO) 11990 requires the Forest Service to "avoid to the extent possible the long and short term adverse impacts associated with the ... destruction or modification of wetlands." The Kahler Project does not propose to destroy or modify any wetland. For this reason, the Kahler Project is consistent with this EO.

There are a number of wetlands in the Kahler Project Area. Some of these are shown in Photos ???. The wetlands are associated with streams and/or springs. There are a number of spring/wetland complexes in the Project Area, notably on the west forks and mainstem of Alder Creek, Wheeler Creek, Davis Creek, tributaries and main stem of Henry Creek, tributaries and main stem of Kahler Creek, tributaries and main stem of Tamarack Creek, Ives Creek, and tributaries and main stems of East and West Bologna Canyon. These complexes range from a few square feet to approximately 5 acres. The outer portions of the wetlands tend to dry up as summer progresses. The inner portions of the larger wetlands, and some of the smaller wetlands stay, green all year. In a number of cases, the wetlands straddle stream channels, and water flows perennially for a few hundred feet below them. The wetlands are vegetated with sedges and grasses and are very productive of forage. In the late summer/early fall, the wet lands are the main source of palatable forage available in the area. Grazing on them is monitored closely to maintain the minimum stubble heights.

There appears to have been more than one mechanism in the formation of wetlands, but it is believed that some type of obstacle blocked streams so that flow slowed and suspended sediment was deposited. The deposited sediment led to expanded floodplains which were capable of storing run off water during the dry season. Over time, this led to the scattering of wetlands in the area.

The mechanisms which created the wetlands appear to have been reversed, because most of the stream channels which run through them are incising and shortening (tending toward Rosgen Class C from possible Class E). As the streams incise and shorten, deposited sediment in floodplains erodes. As the floodplain erodes, there is less sediment to store run off, which results over time in a lowered water table.

Municipal Watersheds

There are no designated municipal watersheds in the Kahler Project area.

Safe Drinking Water Act

There are no Source Water Areas in the Kahler Project area.

Water Rights Summary for the Kahler Project Area

1/21/14, Kate Day

Background

A summary of certificated water rights in the Kahler project area was completed to establish a streamlined process to assess water rights at the project level toward the larger goal of water rights verification at the Forest scale. Based on lessons learned through water rights verification in the Upper Umatilla basin, verification of water rights in the Kahler project area relied on spatial correlation of known water developments (INFRA spatial data) located in close proximity to points of diversion from Oregon's spatial water rights shapefile.

A subset of developments on allotments across the Forest were visited in the late '90s and early '00s to assess site condition. Developments were assessed primarily on allotments on the NFJD and Walla Walla districts; allotments in the Kahler project area have not been recently systematically assessed. Tim Collins, Heppner District Range Manager was consulted to estimate use on livestock water developments across the project area. Tim assumed that 100% of water developments on the INFRA spatial data layer are used annually by livestock.

Certificated Water Rights

There are 94 certificates within the Kahler project in the name of the Umatilla National Forest, and 99 points of diversion (PODs). There are two additional certificates in the name of others for irrigation in the Kahler project area.

Table 1: Summary of certificated water rights and points of diversion in the Kahler project area.

Subwatershed	Total UNF certificates	Total UNF PODs	Total certificates in the name of others
Alder Creek	10	10	0
Bologna Canyon	22	22	0
Haystack Creek	5	5	0
Lower Kahler Creek	5	5	0
Upper Kahler Creek	52	57	2
Totals	*94	99	2

*1 certificate has PODs in both the Alder Creek and Upper Kahler Creek subwatersheds

1 certificate (70063) has 5 PODs; 1 in Alder Creek, and 4 in Upper Kahler Creek, two certificates in Upper Kahler Creek have 2 PODs each; 78494, and 78588, the rest of the certificates are for a single POD.

Purpose of Use

Table 2: Summary of purpose of use for water rights in the Kahler project area.

Purpose	# of certificates	#PODs
*Irrigation	2	2
Livestock	40	42
Livestock and Wildlife	54	57
Total	96	101

*In the name of others on the UNF

Verification of Use

A summary of certificate numbers and their associated INFRA development number by use, allotment, and subwatershed for water rights in the Kahler project area is shown in Table 3. Nine PODs; 9% of

PODs within the project area, do not have a known associated development and are marked with a n/a in the "INFRA Improvement Number" column in Table 3. Since all PODs in the Kahler project area are for livestock purposes, and the Forest has no recent record of use, these PODs are most likely not in use and are the highest priority for field verification.

Table 3: Summary of water rights in the name of the Umatilla National Forest in the Kahler project area

Certificate	INFRA Improvement Number	*Use	Subwatershed	Allotment
61182	14029012	L/W	Alder Creek	WINLOCK
61183	14029010	L/W	Alder Creek	WINLOCK
61184	14029007	L/W	Alder Creek	WINLOCK
61185	14029005	L/W	Alder Creek	WINLOCK
66341	14029006	L/W	Alder Creek	WINLOCK
70063	14029008	L/W	Alder Creek	WINLOCK
78335	n/a	L/W	Alder Creek	WINLOCK
78340	14029009	L/W	Alder Creek	WINLOCK
78354	14029025	L/W	Alder Creek	WINLOCK
78401	14029015	L/W	Alder Creek	YELLOWJACKET
61242	14026116	L/W	Bologna Canyon	MONUMENT
61254	14026114	L/W	Bologna Canyon	MONUMENT
61256	14026014	L/W	Bologna Canyon	TAMARACK
61257	14026113	L/W	Bologna Canyon	MONUMENT
61258	14026111	L/W	Bologna Canyon	MONUMENT
61259	14026103	L/W	Bologna Canyon	MONUMENT
61329	14026104	L/W	Bologna Canyon	MONUMENT
61330	14026711	L	Bologna Canyon	TAMARACK
61332	14026115	L/W	Bologna Canyon	MONUMENT
61334	14026702	L/W	Bologna Canyon	TAMARACK
61340	n/a	L/W	Bologna Canyon	TAMARACK
63458	14026118	L/W	Bologna Canyon	MONUMENT
63459	14026112	L/W	Bologna Canyon	MONUMENT
63473	14026704	L	Bologna Canyon	TAMARACK
63843	14026119	L/W	Bologna Canyon	MONUMENT
63844	n/a	L/W	Bologna Canyon	MONUMENT
63846	14026015 or 14026102	L/W	Bologna Canyon	MONUMENT
63948	n/a	L	Bologna Canyon	MONUMENT
63949	14026106	L	Bologna Canyon	STONEHILL
63950	14026105	L	Bologna Canyon	MONUMENT
78393	14026109	L/W	Bologna Canyon	MONUMENT
78552	14026124	L	Bologna Canyon	MONUMENT
61306	14026705	L/W	Haystack Creek	TAMARACK
61338	14026706	L	Haystack Creek	TAMARACK

61339	14026216	L/W	Haystack Creek	TAMARACK
61341	14026710	L/W	Haystack Creek	TAMARACK
63931	14026708	L	Haystack Creek	TAMARACK
61186	14029011	L/W	Lower Kahler Creek	WINLOCK
61348	14022008	L	Lower Kahler Creek	COLLINS BUTTE
63480	14022007	L	Lower Kahler Creek	COLLINS BUTTE
78211	14022070	L	Lower Kahler Creek	COLLINS BUTTE
78589	n/a	L	Lower Kahler Creek	COLLINS BUTTE
61262	14026211 or 14026024 or 14026023	L	Upper Kahler Creek	TAMARACK
61304	14026210	L	Upper Kahler Creek	TAMARACK
61305	n/a	L	Upper Kahler Creek	TAMARACK
61310	14026209 or 14026217 or 14026321	L/W	Upper Kahler Creek	TAMARACK
61323	14022017	L	Upper Kahler Creek	COLLINS BUTTE
61324	14022038	L/W	Upper Kahler Creek	COLLINS BUTTE
61325	14022040	L/W	Upper Kahler Creek	COLLINS BUTTE
61337	n/a	L/W	Upper Kahler Creek	TAMARACK
61345	14022016	L/W	Upper Kahler Creek	COLLINS BUTTE
61346	14022021	L/W	Upper Kahler Creek	COLLINS BUTTE
61347	14022019	L	Upper Kahler Creek	COLLINS BUTTE
61349	14022012	L	Upper Kahler Creek	COLLINS BUTTE
61350	14022013	L	Upper Kahler Creek	COLLINS BUTTE
61351	14022006	L/W	Upper Kahler Creek	COLLINS BUTTE
61352	14022062	L/W	Upper Kahler Creek	COLLINS BUTTE
61353	14022011	L	Upper Kahler Creek	COLLINS BUTTE
61360	14022066	L/W	Upper Kahler Creek	COLLINS BUTTE
61361	14022060	L	Upper Kahler Creek	COLLINS BUTTE
61363	14022018	L/W	Upper Kahler Creek	COLLINS BUTTE
61364	14022010	L/W	Upper Kahler Creek	COLLINS BUTTE
61365	14022028	L/W	Upper Kahler Creek	COLLINS BUTTE
61371	14022020	L/W	Upper Kahler Creek	COLLINS BUTTE
63380	14022033	L/W	Upper Kahler Creek	COLLINS BUTTE
63381	14022034	L/W	Upper Kahler Creek	COLLINS BUTTE
63416	14022042	L/W	Upper Kahler Creek	COLLINS BUTTE
63417	14022039	L/W	Upper Kahler Creek	COLLINS BUTTE
63418	14022059	L/W	Upper Kahler Creek	COLLINS BUTTE
63465	14022055	L	Upper Kahler Creek	COLLINS BUTTE
63471	14026208	L/W	Upper Kahler Creek	TAMARACK
63474	14026202	L	Upper Kahler Creek	TAMARACK
63475	14022090	L	Upper Kahler Creek	COLLINS BUTTE

63476	14022009	L	Upper Kahler Creek	COLLINS BUTTE
63481	14022022	L	Upper Kahler Creek	COLLINS BUTTE
63927	14026211 or 14026024 or 14026023	L	Upper Kahler Creek	TAMARACK
63928	14026206	L	Upper Kahler Creek	TAMARACK
63929	14026028	L	Upper Kahler Creek	TAMARACK
63930	14026214	L	Upper Kahler Creek	TAMARACK
63932	n/a	L	Upper Kahler Creek	TAMARACK
63956	14026213	L	Upper Kahler Creek	TAMARACK
66334	14022036	L/W	Upper Kahler Creek	COLLINS BUTTE
66732	14022005	L	Upper Kahler Creek	COLLINS BUTTE
70063	14022068	L/W	Upper Kahler Creek	COLLINS BUTTE
70063	14022067	L/W	Upper Kahler Creek	COLLINS BUTTE
70063	14022071	L/W	Upper Kahler Creek	COLLINS BUTTE
70063	14022037	L/W	Upper Kahler Creek	COLLINS BUTTE
78216	14026329	L	Upper Kahler Creek	TAMARACK
78344	14022029	L/W	Upper Kahler Creek	COLLINS BUTTE
78346	14022023	L/W	Upper Kahler Creek	COLLINS BUTTE
78347	14022065	L/W	Upper Kahler Creek	COLLINS BUTTE
78405	14026212	L	Upper Kahler Creek	TAMARACK
78493	14022073	L	Upper Kahler Creek	COLLINS BUTTE
78494	14022074	L	Upper Kahler Creek	COLLINS BUTTE
78494	14022072	L	Upper Kahler Creek	COLLINS BUTTE
78588	14022035	L	Upper Kahler Creek	COLLINS BUTTE
78588	n/a	L	Upper Kahler Creek	COLLINS BUTTE
78595	14022015	L	Upper Kahler Creek	COLLINS BUTTE
61336	14026201	L	Upper Kahler Creek	TAMARACK

*L: Livestock only, L/W: Livestock and Wildlife

References

Belt, George H, Jay O'Laughlin, and Troy Merrill, Design of Forest Riparian Buffer Strips for the Protection of Water Quality: Analysis of Scientific Literature, Idaho Forest, Wildlife and Range Policy Analysis Group Report No. 8, June 1992.

Burroughs, E.R. Jr and J.G. King, 1989. Reduction of Soil Erosion on Forest Roads. General Technical Report INT-264. United States Department of Agriculture, Forest Service, Intermountain Research Station, Ogden, Utah.

Clean Water Act (1972) and amendments. http://www.epa.gov/npdes/pubs/cwatxt.txt

Demmer, Rick and Robert L Beschta; Recent History (1988-2004) of Beaver Dams along Bridge Creek in Central Oregon; Northwest Science, Vol. 82, No. 4, 2008.

Elliot, William J., David E. Hall, Dayna L. Scheele, Disturbed WEPP (Draft 02/2000), WEPP Interface for Disturbed Forest and Range Runoff, Erosion, and Sediment Delivery, Technical Documentation. USDA Forest Service, Rocky Mountain Research Station and San Dimas Technology and Development Center.

Elmore, Wayne and Robert L. Beschta, Riparian Areas, Perceptions in Management; Rangelands, Vol. 9, No. 6 (December, 1987), pages 260-265.

Executive Order (EO) 11988, http://www.archives.gov/federal-register/executive-orders/1977-carter.html

Executive Order (EO) 11990, http://www.archives.gov/federal-register/executive-orders/1977-carter.html

Farren, Edward C. 2006 (a). Harvest and Road Forest Plan Monitoring for the South Zone, Umatilla National Forest. Unpublished paper on file at: USDA Forest Service, Umatilla National Forest, North Fork John Day Ranger District, Ukiah, OR.

Ferguson, Sue A; THE SPACIAL AND TEMPORAL VARIABILITY OF RAIN-ON-SNOW; In Proceedings of the International Snow Science Workshop, 1-6 October 2000, Big Sky, Montana, American Avalanche Association, 178-183.

Flanagan, D.C. and S.J. Livingston (eds.). 1995. USDA-Water Erosion Prediction Project: User Summary. NSERL Report No. 11. USDA-ARS National Soil Erosion Research Laboratory, West Lafayette, IN 47097-1196. 131 pp.

Fritts, Steven H, Edward E Bangs, Joseph A Fontaine, Mark R Johnson, Michael K Phillips, Edward D Koch, John R Gunson; Planning and Implementing a Reintroduction of Wolves to Yellowstone National Park and Central Idaho; Restoration Ecology, Volume 5, Issue 1, March, 1997.

Gucinski, Hermann, Michael J. Furness, Robert R. Ziemer, and Martha H. Brookes, editors, Forest Roads: A Synthesis of Scientific Information, General Technical Report PNW-GTR-509, Portland, OR; US Department of Agriculture, Forest Service, Pacific Northwest Research Station, 2001, 103 p.

Hankin, D. G., and G. H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Canadian Journal of

Fisheries and Aquatic Sciences 45:834-844.

Harris, Robin M., Catherine F. Clifton, and Steven M. Wondzell, Hillslope Erosion Rates in Areas with Volcanic Parent Materials and the Effects of Prescribed Fires in the Blue Mountains of Eastern Oregon and Washington, USA, in: M Furniss, C Clifton, and K Ronnenberg, eds., 2007. Advancing the Fundamental Sciences: Proceedings of the Forest Service National Earth Sciences Conference, San Diego, CA, 18-22 October 2004, PNWGTR- 689, Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Irwin, Larry L; Cook, John G; Riggs, Robert A; Skovlin, Jon M. 1994. Effects of long-term grazing by big game and livestock in the Blue Mountain forest ecosystems. Gen. Tech. Rep. PNW-GTR-325, Portland, OR; US Department of Agriculture, Forest Service, Pacific Northwest Research Station, 49 p. (Everett, Richard L, assessment team leader; Eastside forest ecosystem health assessment; Hessburg, Paul F, science team leader and tech ed, Volume III: assessment.).

Johnson, CA, and RJ Naiman, Boundary dynamics at the aquatic-terrestrial interface: The influence of beaver and geomorphology. Landscape Ecology 1:47-57. 1987.

King, Larry, Clark Hilden, GH (Joe) Searl, Kate Simon; Uniquely Oregon; Kendall/Hunt Publishing Company, 2460 Kerper Boulevard, PO Box 539, Dubuque, IA, 52004; 1992.

Langille, HD, Agent and Expert; THE PROPOSED HEPPNER FOREST RESERVE OREGON; Bureau of Forestry, USDA, 1903.

Lawler J. J., M. Mathias, A. E. Yahnke, and E. H. Girvetz. 2008. Oregon's Biodiversity in a Changing Climate. Report prepared for the Climate Leadership Initiative, University of Oregon.

Luce, C. H. 1997. Effectiveness of Road Ripping in Restoring Infiltration Capacity of Forest Roads. Restoration Ecology, Vol. 5, No.3, pp 265-270, September, 1997.

Luce, C.H. and T.A. Black, 1999. Sediment Production from Forest Roads in Western Oregon. Water Resources Research 35(8):2561-2570.

Luce, C.H. and T.A. Black, 2001 (a), Effects of Traffic and Ditch Maintenance on Forest Road Sediment Production. In Proceedings of the Seventh Federal Interagency Sedimentation Conference, March 25-29, 2001, Reno, Nevada. pp. V67–V74.

Luce, C. H., and T. A. Black, 2001 (b), Spatial and temporal patterns in erosion from forest roads, in Influence of Urban and Forest Land Uses on the Hydrologic-Geomorphic Responses of Watersheds, edited by M. S. Wigmosta and S. J. Burges, pp. 165–178, AGU, Washington, D. C.

Luce, C. H., D. G. Tarboton, E. Istanbulluoglu, and R. T. Pack (2005), Reply to comment by Jonathan J. Rhodes on ''Modeling of the interactions between forest vegetation, disturbances, and sediment yields,'' J. Geophys. Res., 110, F01013, doi:10.1029/2004JF000279.

Luce, C.H. and Z.A. Holden, Declining annual streamflow distributions in the Pacific Northwest United States, 1948–2006, GEOPHYSICAL RESEARCH LETTERS, VOL. 36, L16401, doi:10.1029/2009GL039407, 2009.

Marshall KN, Hobbs NT, and Cooper DJ, 2013. Stream hydrology limits recovery of riparian ecosystems after wolf reintroduction. Proc R Soc B 280: 20122977. http://dx.doi.org/10.1098/rspb.2012.2977.

McAllister, Lynn S; Reconstructing Historical Riparian Conditions of Two River Basins in Eastern Oregon, USA; Environmental Management, 42:412-425; 2008.

Meehan, WR; FJ Swanson; and JR Sedell. 1977. Influences of riparian vegetation on aquatic ecosystems with particular reference to salmonid fishes and their food supply. IN: Importance, Preservation and Management of Riparian Habitat. USDA Forest Service Gen. Tech. Rep. RM-43. pp. 137-143.

Naiman, Robert J, Timothy J Beechie, Lee E Benda, Dean R Berg, Peter A Bisson, Lee H. MacDonald, and E Ashley Steel; Fundamental Elements of Ecologically Healthy Watersheds in the Pacific Northwest Coastal Ecoregion; in Watershed Management, Balancing Sustainability and Environmental Change, Robert J Naiman editor, Springer-Verlag, New York, 1992.

Oregon Department of Environmental Quality, 303 (d) list: <http://www.deq.state.or.us/wq/assessment/rpt2010/search.asp>, 2010. beneficial uses: <http://www.deq.state.or.us/wq/standards/uses.htm>, 2008 Water Quality Standards: <http://arcweb.sos.state.or.us/rules/OARs_300/OAR_340/340_041.html>, 2008.

Oregon Department of Fish and Wildlife, Furbearer Rules, 2014, (http://www.dfw.state.or.us/resources/hunting/small_game/).

Oregon Department of Fish and Wildlife, Oregon's Wolf Conservation and Management Plan, December, 2005.

Oregon Department of Fish and Wildlife, Oregon Wolf Conservation and Management 2013 Annual Report. http://dfw.state.or.us/Wolves/docs/oregon_wolf_program/Oregon_Wolf_Annual_Report_2013.pdf 2014

Reid, L. M., Dunne, T., 1984, Sediment Production from Forest Road Surfaces. Water Resources Research 20, 1753-1761.

Sugden, Brian D., and Scott W. Woods, 2007. Sediment Production From Forest Roads in Western Montana. Journal of the American Water Resources Association (JAWRA) 43(1):193-206. DOI: 10.1111/j.1752-1688.2007. 00016.x

Svejcar, Tony; Riparian Zone: 2) History and Human Impacts; Rangelands 19 (4), August 1997.

Swift, Lloyd W, Soil Losses from Roadbeds and Cut and Fill Slopes in the Southern Appalachian Mountains, Southern Journal of Applied Forestry, 1984.

Thorson, T.D., Bryce, S.A., Lammers, D.A., Woods, A.J., Omernik,

J.M., Kagan, J., Pater, D.E., and Comstock, J.A., 2003. Ecoregions of Oregon (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).

USDA Forest Service and USDI Bureau of Land Management, Decision Notice/Decision Record, Finding of No Significant Impact, Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH), February, 1995.

USDA Forest Service, Pacific Northwest Region, Aquatic and Riparian Conservation Strategy, August 13, 2008.

USDA Forest Service, Pacific Northwest Region, Final Environmental Impact Statement, Land and Resource Management Plan, Umatilla National Forest, 1990.

USDA Forest Service, Pacific Northwest Region, Land and Resource Management Plan, Umatilla National Forest, 1990.

USDA Forest Service, Pacific Northwest Region, Oregon DEQ and U.S. Forest Service Pacific Northwest Region Water Quality MOU, OMB 0596-0217, Jan 14, 2014.

USDA Forest Service, National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1, National Core BMP Technical Guide, FS 990a, April, 2012.

USDA Forest Service, Watershed Condition Framework, FS-977, May, 2011.

USDC, NOAA, National Marine Fisheries Service, Northwest Region, Endangered Species Act-Section 7 Programmatic Consultation Biological and Conference Opinion And Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation: Fish Habitat Restoration Activities in Oregon and Washington, CY2007-CY2012, April 28, 2007.

Walling, DE, Measuring Sediment Yield From River Basins (summary), Soil Erosion Research Methods. Winrock International, Arlington Virginia. 1988. p 39-73. 12 fig, 5 tab, 106 ref.

Wohl, Ellen; Mountain Rivers; Water Resources Monograph 14; American Geophysical Union, Washington, DC, 2000.

Appendix G

Invasive Plants

Kahler Dry Forest Restoration Project

Invasive Plant Report

June 2014

Scale of Analysis

The analysis area for evaluating existing invasive plant populations is consistent with the Kahler analysis area. Invasive plant infestations used in the analysis are only those sites located within project area. This analysis will then focus on those sites located in the specific activity areas as well as preventing invasive plant establishment.

Methodology and Assumptions

Invasive plants, as defined by the Pacific Northwest Region Final Environmental Impact Statement for the Invasive Plant Program, 2005, are non-native plants whose introduction does or is likely to cause economic or environmental harm or harm to human health. This analysis will focus on those species that are listed on the Oregon Department of Agriculture noxious weed list. Invasive species and noxious weeds will be used interchangeably in this report.

Invasive plants will be discussed based on inventoried weed sites as well as known weed species that occur in the analysis area that are not inventoried. Known noxious weed sites, soil disturbance, and the potential spread of invasive plants will be the foundation of the analysis. In rating the priority of noxious weeds for treatment and inventory, the Forest classification will be used.

This analysis is tiered to a broader scale analysis (the Pacific Northwest Region Final Environmental Impact Statement for the Invasive Plant Program, 2005, hereby referred to as the R6 FEIS 2005). The R6 FEIS 2005 culminated in a Record of Decision (R6 2005 ROD) that amended the Umatilla National Forest Plan by adding management direction relative to invasive plants. This project is intended to comply with the new management direction. The portions applicable to the Kahler project area include the prevention standards that are detailed in Appendix A.

The Umatilla National Forest Invasive Plants Treatment Project Record of Decision was signed on July 7th, 2010. All of the existing noxious weed infestations within the Kahler Project area are covered under this analysis and have proposed herbicide treatments for the high priority weed species.

Existing Conditions

Priority Noxious Weeds--Table 1 shows noxious weeds of concern within the Kahler project area and their associated priority category. Several categories are used to prioritize noxious weed species on the Forest list for treating and inventorying:

1. "Potential Invaders" are noxious weed species that occur on lands adjacent to the Umatilla National Forest but which have not been documented on lands administered by the Forest;

2. "New Invaders" are noxious weed species that occur sporadically on the Umatilla National Forest and which may be controlled by early treatment. This category has been split into two subcategories due to changes in weed populations on the Forest:
   a. “New Invaders” are of limited distribution and can probably be eradicated if early treatment can be implemented.
   b. “New Invaders/Established are those species that are presently controllable but which are approaching “Established” and which are prioritized for early treatment.
3. "Established" species are widespread across the Forest in large populations and containment strategies are used to prevent their further spread.

Table 112: Noxious Weed Species and Priority

Species	Common Name	Priority
Centaurea diffusa	Diffuse knapweed	New Invader/ Established
Centaurea biebersteinii	Spotted knapweed	New Invader/Established
Hypericum perforatum	St. Johnswort	Established
Cirsium arvense	Canada thistle	Established
Cirsium vulgare	Bull thistle	Established
Cymoglossum officinale	Houndstongue	New Invader
Linaria dalatica	Dalmation Toadflax	New Invader
Taeniatherum caput-medusae	Medusa-head	New Invader
Cytisus scoparius	Scotch broom	New Invader

Table 113: Current Weed Presence

Species Code	Common Name	Number of Sites	Avg. Plants/Acre	Acres
Centaurea diffusa	Diffuse Knapweed	119	10-20+	319
Cymoglossum officinale	Houndstongue	1	20+	.5
Linaria dalatica	Dalmation Toadflax	61	100+	204
Hypericum perforatum	St. Johnswort	74	100+	220
Cytisus scoparius	Scotch broom	4	10-30	22

Table 2 displays the existing noxious weed sites within the analysis area that are located on National Forest Land.

Spotted and Diffuse Knapweed—There are 119 sites identified within the project area. Most sites are small with 10-30 individual plants. There are 319 acres identified within the project area that Spotted and Diffuse Knapweed have been identified on. Most of these sites are along

existing roads within the project area. Sites that are currently inventoried and are cleared for treatment are being treated manually or treated with hebicides. Treatments will continue to occur at these sites. Manual treatments will be primarily used to treat these small infestations of less than 20 plants. Herbicide treatments may occur if needed on larger sites. Preventing vehicles from spreading knapweed seed into the project area and analysis area would decrease the potential spread and establishment of knapweed.

Dalmatian Toadflax--There are 61 Dalmatian toadflax sites identified within the project area. There are approximately 204 acres of Dalmatian Toadflax that has been inventoried within the project area. Most sites are small with concentrations of 10-100+ plants. In 2005 the biological control agent (*Mecinus janthinus*) Toadflax stem weevil , was released on identified sites on the south end of the district. This agent has been very effective at reducing the number of flowering plants annually. Dalmatian Toadflax appears to establish in harsh sites as well as areas with good soil characteristics and aspect. This species prefers well drained to gravelly soils, through which it spreads by an extensive underground root system. It reproduces both by seed and by sprouting from buds on the roots. Because of their waxy leaves and deep root systems these plants are difficult to control with herbicides. Their capacity to re-sprout from root remnants also makes control by hand-pulling or mechanical means impractical.

Houndstongue—There is 1 inventoried site of houndstongue that has been identified within the project area. This site is approximately .5 acre and there has been anywhere from 10-30 plants annually. It is important to inventory and treat this site before the plants go to seed to reduce the potential of spread. Treatments that have been effective at reducing plants on this site consists of manual and herbicide use. This noxious weed has the potential to spread because of the burr seed that is produced. It is easily transported in fur of domestic and wild animals and in clothing.

Scotch Broom—There are 4 Scotch Broom sites that have been identified within the project area. There are approximately 22 acres of Scotch Broom that have been identified with in the project area. The average number of plants that have been identified in these four sites is 10-30 plants. Scotch Broom has not been a real threat and it does not spread very fast in a dry forest climate. Manual and Chemical treatments have been effective at reducing the spread of this noxious weed within the project area.

Medusahead-- has been inventoried at the forest boundary and in small areas along arterial roads within the analysis area. This annual grass is more prevalent on adjacent private lands within the Kalher Basin area. This noxious weed has the potential to spread rapidly with disturbance to the landscape.

Low Priority Noxious Weeds--Three low priority "established" weeds, Canada thistle, Bull thistle, and St. Johnswort, are fairly widespread within the analysis area and are so extensive Forest-wide that they are not generally inventoried. St. Johnswort and bull thistle are less invasive and/or persistent than the high priority weeds and generally give way to or do not out-compete desirable vegetation. It can be assumed that these three weed species can be found throughout the analysis area.

Low priority weed species, such as Canada thistle, Bull thistle, and St. Johnswort, also readily establish where soil and plant associations have been disturbed. Biological control agents are present on Canada thistle and St. Johnswort in the analysis area; however, success is not known at this time.

EFFECTS ANALYSIS

This section of the report will discuss the direct/indirect and cumulative effects that this project will have on invasive plants within the project area. This section will focus on how each alternative will affect existing infestations as well as the risk the actions will have on the establishment and spread of new invasive plants. **Table 3** below displays what is being proposed in each alternative.

Table 3—Activities by Alternative (Acres)

Treatment	Alt. 1	*Alternative 2	*Alternative 3	Total Harvest Acres Proposed Alt 2.	Total Harvest Acres Proposed Alt 3.
Ground Base	0	496 acres on 64 sites	450 acres on 56 sites	10484	9119
Helicopter	0	3 acres on 5 sites	3 acres on 5 sites	661	490
Sky/ Ground Base	0	96 acres on 6 sites	96 acres on 6 sites	431	431
Sky/Helicopter	0	5 acres on 4 sites	5 acres on 4 sites	395	395
Skyline	0	42 acres on 10 sites	51 acres on 10 sites	477	380

*Acres on numbers of sites is calculated by combining multipule species of high priority noxious weeds that occur within a single noxious weed polygon. This will inflate the actual acreage effected by noxious weeds because unit polygons also overlap noxious weed polygon and there may be multiple sites within a harvest unit polygon.

Effects Unique to Alternative 1 (No Action)

If the no action alternative was selected, no activities would be implemented. Existing native vegetation would continue to stabilize soil and consume resources (i.e. nutrients, water, and space), which would help reduce invasion by noxious weed species. There would be no affects to existing infestations due to harvest or burning activities. There would be no risk of equipment transporting new invasive species into the project area due to harvest or burning activities.

There would continue to be a risk of recreationist transporting invasive plants into the project area. Livestock and wildlife could continue to spread invasive plants within the project area. High priority noxious weeds would continue to be treated consistent with current environmental analysis decisions. Low priority weed species would likely continue to spread within the project area, unless treatment efforts became available and were effective (Biological Control Agent).

Effects Common to all Action Alternatives

Direct and Indirect effects:

Harvest Activities--Areas where the soil surface is disturbed can promote the establishment of noxious weeds. The harvest activities in each action alternative may cause soil disturbance that could cause noxious weeds to become established in the project area. The risk is proportional to the amount of acres treated.

Design criteria that will be implemented to reduce soil disturbance, which therefore reduces the risk of noxious weed establishment and spread, are listed below. These prevention measures

will be applied to all action alternatives and are consisted with the Umatilla National Forest LRMP as amended by the Pacific Northwest Region Invasive Plant Program Final Environmental Impact Statement, Record of Decision, October 2005.

10) Ground-based equipment that is operated in units where the average slope is greater than 35 percent will increase the potential for soil movement on steep slopes. Skid trails, forwarder trails, other log transportation routes, and landings will be approved by the Forest Service sale administrator to meet the Best Management Practices and applicable management requirements during timber sale contract implementation.
11) Use of ground-based equipment will be suspended when conditions (such as intense or prolonged rainfall, saturated soil, or winter breakup) would otherwise result in excessive soil displacement, damage to roads that may increase the potential infestation and spread of noxious weeds.
12) Upon completion of activities, skid trails, landings, or exposed mineral soil will be treated as necessary and appropriate to the site to reduce soil erosion, soil compaction, or establishment of noxious weeds. This may include seeding, water barring, subsoiling of landings, etc. Displaced soil in berms or ruts may be returned to its prior location.
13) The Forest Service will provide necessary seed using seed certified noxious weed free seed (listed in the State of Oregon). Native plant materials are the first choice in revegetation for restoration and rehabilitation where timely regeneration of the native plant community is not likely to occur (Prevention Standard #13).
14) The District noxious weed personnel and timber sale administrators will conduct noxious weed species surveys prior and during the initiation of harvest or other ground disturbing activities within the project area.
15) Forest Service personnel will spot check activities during implementation to determine whether noxious weed mitigation measures and project risk management plans are implemented.
16) After activities are completed, the District noxious weed personnel will conduct an inventories of the treatment area and access routes to determine if existing noxious weed populations have spread or if new infestations have become established.
17) The noxious weed coordinator and timber sale administrator will work closely together to ensure that skid trails, landings, and staging areas are not located in noxious weed infestations.
18) Known high priority infestations will be treated prior to proposed activities to remove mature seeds.

Monitoring similar projects on the Forest found that equipment only caused soil compaction and/or displaced soils (Hydrology Report). The least amount of ground disturbance by heavy equipment used in proposed harvest areas presents the least amount of risk (additional mitigation to minimize soil disturbance described above in landings and skid trails) for the establishment and spread of noxious weeds due to ground disturbance caused by harvest activities.

As the amount of ground disturbance increases, the potential for the spread and establishment of noxious weed increases. Alternative 2 proposes the most acres of potential disturbance using ground base harvest activities (Table 3). Alternative 3 also proposes the use of ground base equipment. There are approximately 1365 acres difference between the two ground base treatments in alternative 2 and alternative 3. Alternative 3 will have less potential to introduce or potentially spread priority noxious weed species (Table 2) within the sale area.

Low priority noxious weeds are those species that are considered widespread throughout the forest and generally are less competitive. Low priority noxious weeds within the analysis area (bull thistle, Canada

thistle, and St. Johnswort) are generally less persistent than high priority weeds. These species tend to decrease as forest canopy increases. As a result, these weed species are generally absent in higher succession stage forested stands. The proposed activity methods and mitigation would minimize ground disturbance, which would allow the existing competing vegetation to reduce the spread and establishment of low priority weeds. However, due to the presence of low priority species within the project area, it is likely that there will be a short term increase in low priority species due to harvest and burning activities. As canopy cover increases, there will likely be a corresponding decrease in low priority invasive species.

Road Use--Monitoring on the district has found that noxious weeds often become established due to vehicles and equipment along road right of ways. Actions conducted or authorized by written permit by the Forest Service that will operate outside the limits of the road prism (including public works and service contracts), require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering National Forest System Lands (Prevention Standard #2). This will reduce the potential for noxious weed seed to be transported onto the project site. It also reduces the potential establishment of noxious weeds in areas where soil disturbance may occur.

Rock pits used for this project were considered in this analysis. Though high priority noxious weed species are found at rock pits within the analysis area, they have not been found at the rock sources that were identified to be used in this project. All gravel, fill, sand stockpiles, quarry sites, and borrow material will be inspected for invasive plants before use and transport (Prevention Standard #7).

Alternative 2, and 3 propose to open closed roads and construct temporary roads. This activity directly affects the potential for the establishment and spread of noxious weeds. Reducing the use of motorized vehicles reduces the potential spread of noxious weeds. Alternative 2, and 3 propose the use of temporary roads. These temporary roads should be placed in areas where there are no infestations of noxious weeds. Closed roads that are opened to implement this project will need to be closed after project activities have been completed.

Burning Activities—Burning activities are common to all alternatives. Broadcast burning would occur in the spring or the fall. Burning could also occur within the proposed harvest units to reduce hazardous fuels.

The purpose of the prescribed burning within the project area is to restore low intensity fire to the ecosystem and to restore the area to within the historic range of variability for vegetative structure. This will result in more fire resistant plant communities within the proposed burn blocks. The short term affects of burning can disturb the soil surface and allow the potential for noxious weeds to become established. The existing noxious weed sites will be treated using manual or chemical control methods. This mitigation is reasonable due to the low densities of noxious weeds within the proposed burn areas. Though it is not feasible to find and remove all high priority weeds (seeds) within the proposed burn block, it will greatly reduce the potential spread. The potential for these existing noxious weed infestations to spread as a result of burning activities is low due to the existing prevention measures.

Fire line will need to be constructed by hand or a tractor in all action alternatives. Fire line construction removes vegetation down to bare soil creating a condition that promotes the establishment of invasive plants. If equipment is used to construct fire lines, the equipment will be washed prior to off road travel to prevent the spread of invasive plant seeds. All constructed fire control lines on steeper slopes (35% +) will be hand line to bare mineral soil. Fire line will be rehabilitated as needed after the burn by returning displaced soil to the line, constructing waterbars, seeding, and/or replacement of downed wood.

Cumulative effects:

Past and present activities within the project area have resulted in the presence of invasive plants within the project area. Past road construction and maintenance, recreation, grazing, wildfire, timber harvest and other soil disturbance have provided:

- environments for noxious weed species establishment,
- vectors for noxious weed dispersal,
- and infestations of noxious weeds for seed sources.

Existing infestations are a result of past harvest activities, domestic livestock grazing, road construction and maintenance, past wildfires, and other ground disturbing activities. See Appendix XX of the Kahler EIS for a complete list of past, present, and future projects that could cumulatively interact with the action alternative treatments. Design criteria for the action alternatives have been designed to reduce the risk of the proposed activities affecting existing infestations.

Domestic livestock and wildlife can spread invasive plant seeds throughout the project area. The project area is located within an several active cattle allotment (See Range Report for specific allotment information) As a result, cattle and wildlife are within the project area when seed maturity occurs and are a vector for seed spread. Cattle and wildlife trails are high risk areas for invasive plants. There will likely be cumulative effects associated with livestock grazing, wildlife, and activities associated with this project. Those effects are the spread of existing infestations of low and high priority weed species and the establishment of new invasive species. Though design criteria will reduce the cumulative effects, they will not be eliminated.

Inventorying and monitoring noxious weeds on the Heppner Ranger District has found that roads are high risk areas for noxious weed infestations. The ongoing maintenance of roads within the project area and the use of roads by the public increases the risk of invasive plants becoming established in the project area. The design criteria being implemented for harvest activities and prescribed fire will reduce but not eliminate the potential for road maintenance and public use of roads and to spread invasive plants within the disturbed areas cause by the proposed activities.

Recreation activities will continue to occur within the project area. Recreationists can be a vector of noxious weeds. This area is primarily used for hunting by recreationists. Dispersed camps and road use by recreationists are considered high risk areas. There will continue to be a risk of recreationists spreading invasive plants within the project area.

/s/ Tim Collins *09/08/2014*

Tim Collins DATE

Range Management Specialist

APPENDIX A: Pertinent Prevention Standards for Invasive Species Prevention from the Pacific Northwest Region Invasive Plant Program Final Environmental Impact Statement, Record of Decision, October 2005.

Standard #1: Prevention of invasive plant introduction, establishment and spread will be addressed in watershed analysis, roads analysis, fire and fuel management plans, recreation management plans, vegetation management plans, and other land management assessments. (This standard will apply to all assessments and analysis documents started or underway as of March 1, 2006; this standard does not apply to assessments and analysis documents signed or completed by February 28, 2006.)

Standard #2: Actions conducted or authorized by written permit by the Forest Service that will operate outside the limits of the road prism (including public works and service contracts), require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering National Forest System Lands. This standard does not apply to initial attack of wildland fires, and other emergency situations where cleaning would delay response time.

Standard #3: Use weed-free straw and mulch for all projects conducted or authorized by the Forest Service on National Forest System Lands. If State certified straw and/or mulch is not available, individual forests should require sources certified to be weed free using the North American Weed Free Forage Program standards, or a similar certification process.

Standard #7: Inspect gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that is judged to be weed free by District or Forest weed specialists.

Standard #8: Conduct road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants in consultation with District or Forest-level invasive plant specialists; incorporate invasive plant prevention practices as appropriate.

Standard #13: Native plant materials are the first choice in revegetation for restoration and rehabilitation where timely regeneration of the native plant community is not likely to occur.

Appendix H

Recreation

Recreation Executive Summary and Report

Executive Summary

The scale of analysis is the Kahler project boundary (32,848 acres).
The proposed action and its alternatives would not change the Recreation Opportunity Spectrum class of any of the affected Forest Plan management areas (A4, A6, C3, C5, or E1).
Harvest along Highway 207 would remain visually subordinate to the surrounding landscape due to a harvest prescription that would leave fully stocked stands that mimic tree distribution in other stands along the highway. Mitigation to minimize stump height and speed recovery of soil disturbance would assist in meeting the visual quality objective of Partial Retention for A4. There would also be no created openings greater than 2 acres. Trees would be irregularly spaced and a diversity of tree species would remain. Scenic character at the Fairview Campground would change from a densely stocked, closed mixed conifer forest to an open, park-like mature Ponderosa pine forest. This would reduce fuels in the campground, increasing the likelihood that the campground could survive a wildfire. Mitigations would assist in meeting the visual quality objective of Partial Retention for A-6. Visual quality around the Tamarack rental cabin would change from a closed canopy forest to a 3-acre opening. Since this facility is located within the E1 management area, the associated visual quality objective (Maximum Modification) would be met. An added benefit would be the opening up of views of distant landscapes without having to climb the adjacent fire lookout. Visual quality objectives for the remaining management areas would also all be met under all alternatives. All alternatives would be consistent with Forest Plan standards pertaining to visual quality (Forest Plan 4-106 through 4-109 and 4-183).
The Fairview Campground would need to be temporarily closed for about one week during harvest operations for safety reasons. Adjacent harvest would create noise, dust, and extra traffic within and around the campground. These effects would be limited in duration (2-3 weeks). Campers could be displaced to other sites during this time. Fuel conditions within the campground would improve through a reduction in the number of trees and removal of ladder fuels, which would increase the likelihood that the campground could survive a wildfire. The Tamarack Rental Cabin would need to be closed for two weeks during harvest operations for safety reasons. Again, fuels would be reduced around the cabin and the road accessing the cabin.
The Kahler project area has a number of dispersed campsites, which are most frequently used during the hunting seasons. The proposed activities of harvest, hauling, and prescribed burning could cause some displacement of campers due to dust, noise, or smoke. This displacement would only affect a few campsites at one time and last one season. There were a number of unoccupied campsites during the hunting seasons observed, so proposed activities should not completely push campers out of the project area. As a result of prescriptions, irregular unit shapes, and seeding of soil disturbance harvest would meet the Visual Quality Objective of Partial Retention of all affected dispersed sites (Forest Plan 4-49)
Under Alternative 3, access to one uninventoried, dispersed campsite on Road 2500063 would be lost due to road closures. However, this could be offset by new camping opportunities being created by log landings located adjacent to open roads.
Other recreation activities in the area include hunting, ATV riding, sightseeing, firewood collection, and food gathering. Alternative 2 would close 19.3 miles of road and Alternative 3 would close 17.3 miles of road to mitigate effects of harvest on wildlife. Access for dispersed recreation such as hunting, sightseeing, and firewood collection would be reduced. Road closures would include 0.4 miles of ATV trail O-2400140, which would reduce ATV riding opportunities by 3 percent in the Kahler planning area. However, this would also remove an ATV trail stream crossing which would eliminate the expense of installing and maintaining a bridge. There would be an increase in traffic during log hauling, which could pose hazards to ATV riders, but once hauling is complete there would be no lasting effects. Use of the 24 Bypass trail as a temporary road during harvest would improve the trail condition by clearing rocks from

the trail that make riding extremely rough. The route would revert back to use as a trail after harvest is complete.

Hunters could be temporarily displaced from parts of their hunting area by harvest activities or burning. Disturbance from harvest, hauling, and burning might also push big game out of the project area until the disturbance ceases. This could temporarily reduce the quality of the hunting experience. While proposed road closures would reduce disturbance to big game during the spring, the amount and configuration of cover removed might not be offset by road closures during the fall hunting season. Under Alternative 2, the wildlife biologist predicts that big game would likely leave the Kahler area due to increased disturbance and a lack of hiding cover, reducing the opportunity for a successful hunt. Under Alternative 3, blocks of big game cover would be retained, and coupled with the road closures big game would be less likely leave the Kahler area during the hunting seasons, maintaining a quality hunting experience.

Firewood gathering could diminish slightly after harvest and prescribed burning, as dead material is either removed or consumed by fire. Fire could enhance opportunities for gathering of some wild foods, though the best results would occur with a broadscale underburn.

The Kahler project area would continue to provide for a spectrum of recreational activities (Forest Plan 4-49).

A potential wilderness area inventory was conducted as part of the analysis of the proposed Kahler projects. No areas met the inventory criteria for potential wilderness. Other undeveloped lands would decrease under the action alternatives, with a 7% decline within the Kahler project area under Alternative 2 and a 6% decline under Alternative 3.

Scale of Analysis

The scale of analysis is the Kahler project boundary (32,848 acres).

Methodology and Assumptions

Geographic Information Systems mapping was used to portray spatial relationships between recreation use areas and activities that could affect the continued use of the area. Effects of harvest on visual quality were also determined using these maps. Areas of concern were then verified on the ground.

Recreation Opportunity Spectrum

Existing Recreation Uses and Conditions

Each Forest Plan Management Area within the Kahler analysis area is assigned a class under the Recreation Opportunity Spectrum (ROS) (Table 1). Each class is defined by the degree certain recreation experience needs are satisfied. This is based on the extent that the natural environment has been modified, the type of facilities provided, the degree of outdoor skills needed to enjoy the area, and the relative density of recreation use.

Table 1. ROS Classes within the Kahler analysis area

Management Area	Acres	ROS Class
A4 - Viewshed 2 (Highway 207)	901	Roaded Natural to Roaded Modified
A6 – Developed Recreation (Fairview Campground)	50	Primarily Roaded Natural with some Rural
C1 – Dedicated Old Growth	1616	Primitive to Roaded Natural
C3 – Big Game Winter Range	11958	Roaded Modified
C5 – Riparian	793	Roaded Natural to Roaded Modified
D2 – Research Natural Area	84--	None identified
E1 – Timber and Forage	17446	Roaded Modified

ROS classes within the Kahler analysis area are defined as follows (Forest Plan GL 32-33):

Primitive

Area is characterized by an essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.

Roaded Natural

Area is characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.

Roaded Modified

A considerably modified natural-appearing environment characterizes the area with considerable evidence of the sights and sounds of humans. Such evidence seldom harmonizes with the natural environment. Interaction between users may be low to moderate, but evidence of other users is prevalent. Resource modification and utilization practices are evident and seldom harmonize

with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities.

Rural

Area is characterized by a substantially modified natural environment. Sights and sounds of people are evident. Renewable resource modification and utilization practices enhance specific recreation activities or provide soil and vegetative cover protection.

Effects of No Action Alternative

Direct and Indirect Effects: Recreation conditions would only be affected by ongoing management and changes caused by natural events. The Recreation Opportunity Spectrum (ROS) identified for each management area would not be affected by this alternative.

Effects Common to All Action Alternatives

Direct and Indirect Effects: Treatment activities would occur in all management areas, although the portion of C1 that is treated would be converted to E1 through a Forest Plan Amendment in both action alternatives and the replacement C1 would not receive treatment. The results of these activities would all fall within the Roaded Natural to Roaded Modified ROS classes. Given the Forest Plan Amendment, none of the proposed activities under any of the alternatives would change the Recreation Opportunity Spectrum class as described in the Forest Plan (**Table 1**).
Cumulative Effects: Proposed activities, when combined with past, ongoing, and foreseeable future activities, would still meet the ROS class identified for each Management Area.

Visual Quality

Existing Condition

There are 901 acres of the project area that occur within Forest Plan designated management area A4 which emphasizes visual quality. These acres occur along the State Highway 207. Visual quality standards for each of the management areas within the Wilkins analysis area are listed in Table 2.

Table 2. Visual Quality Objectives within the Wilkins Planning Area

Forest Plan Mgt. Area	Visual Quality Objective	Definition
A4- Viewshed 2	Partial Retention in foreground and Modification in middleground	*Partial Retention* – Human activity may dominate the characteristic landscape, but must, at the same time, follow naturally established form, line, color, and texture. It should remain visually subordinate when viewed in foreground. *Modification* – Human activity may dominate the characteristic landscape, but must, at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground
A6 – Developed Recreation	Partial Retention	Refer to definition under A4
C1 – Dedicated Old Growth	Retention	Human activities are not evident to the casual forest visitor.
C3 – Big Game Winter Range	Retention to Maximum Modification	Refer to definition under C1 for Retention and E1 for Maximum Modification. .
C5 – Riparian	Retention to Modification	Refer to definition under C1 for Retention and A4 for Modification.
D2 – Research Natural Area	Retention	Refer to definition under C1.
E1 – Timber and Forage	Maximum Modification	*Maximum Modification* – Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background

Effects of No Action Alternative (1)

Direct and Indirect Effects: There would be no change to visual quality within the analysis area. The management areas around Tamarack Lookout would remain split between C1 and E1 and views from the rental cabin would change only due to natural events. Visuals within the Fairview Campground and in the A4-Scenic Viewshed along Highway 207 would range from retention to partial retention. Highway 207 would continue to provide a diverse viewing experience for travelers.

Effects Common to All Action Alternatives (2-3)

Direct and Indirect Effects: There are no activities proposed within the D2 or C1 management areas, although a Forest Plan amendment would swap 11 acres of C1 around the Tamarack Lookout to E1, replacing it with 15 acres of C1 on the south end of the same stand of trees. Activity units are proposed within the A4, A6, C3, C5, and E1 management areas.

Harvest within Fairview Campground (A6-Developed Recreation) would result in a fully stocked, but very open stand. The prescribed basal area of 34 would equate to approximately 34 12" diameter trees per acre. In reality, the trees will vary in size, so there could be more or less than this amount in any given area. Trees would be unevenly spaced and a screen of untreated trees 10 to 20 feet wide would be retained around sites 2 and 5 to retain privacy. Mitigation directs that stumps would be low-cut to reduce their visibility. The timbered portion of the campground would change from a dense, mixed conifer stand to a very open, park-like stand primarily containing Ponderosa pine. This should blend with the remaining portion of the campground, which currently exhibits scattered clumps of Pondersosa pine with a thick ground cover of grass. Visual quality would be reduced for up to three years following harvest until slash is treated and soil disturbance is revegetated. Where there is seeding of soil disturbance, recovery could be as quick as one year, depending on growing conditions. Once recovery is complete, the visual quality objective of Partial Retention would be achieved.

Proposed harvest along Highway 207 (A4-Viewshed 2) would again result in open, scattered trees (27-48 basal area). Treated stands would convert from multi-storied, dense, mixed conifer to single-storied, large trees (primarily Ponderosa pine). Remaining trees would be scattered unevenly across the landscape, blending with natural openings and tree clumps seen along existing portions of the highway. The emphasis on leaving late, old structure ponderosa pine would increase visual diversity along the route, which is currently dominated by middle age stands. Treatment using ground-based systems would cause soil disturbance that would be evident for 1-3 seasons, depending on seeding of disturbance and growing conditions. Treatment using helicopter systems would result in little soil disturbance, so treated units would be natural- appearing as soon as the slash is treated. There are two potential skyline units totaling less than 40 acres located downslope of the highway. Because of the angle of terrain, ground disturbance would be minimally visible and likely only viewed from two corners on the highway. Skyline corridors would not be evident on completion of the project due to the open nature of the remaining stand (prescribed basal area of 48). Mitigation directs that stumps within 300 feet of the highway would be low-cut to reduce their visibility. The thinning should allow more sunlight to reach the forest floor, which would increase the amount of cover that could hide stumps from view. Harvest debris would be piled and burned; the burned areas should blend with the surrounding areas within one year. Given these mitigations, proposed activities would appear subordinate to the natural landscape as viewed from Highway 207, meeting the visual quality objective of Partial Retention in the Foreground and Modification in the middle ground.

Harvest is proposed around the Tamarack rental cabin (E1 – Timber and Forage) to clear a viewing area for the fire lookout. Most trees would be removed from the foreground and middleground as viewed from the cabin. Trees directly adjacent to the cabin would remain, unless they pose a hazard to the cabin. Removal of the trees would likely open up distant views as seen from area surrounding the cabin. This would create a very open site, with a visual quality of maximum modification, consistent with the objective for E1.

The Forest Plan also directs that dispersed occupancy sites be managed to at least a partial retention visual quality level. There are seven inventoried dispersed sites that occur inside or within 300 feet of proposed units (Table 4). The treatment for most of these units would be commercial thinning, with one unit receiving juniper removal treatment. As a result, stands would remain fully stocked. None of the inventoried dispersed campsites would be used as log landings. Stumps and soil disturbance could be visibly evident in the foreground of affected campsites, although overall views should be minimally affected. The length of time that visual quality is affected would be shortened where seeding is used to

treat areas of soil disturbance. As a result of prescriptions and associated design criteria, harvest would meet the Visual Quality Objective of Partial Retention adjacent to all affected dispersed sites.

Table 4. Dispersed campsites within 300 feet of a proposed unit

		Alternatives	
		2	3
Unit #	**Unit Prescription**	**# Sites**	**# Sites**
65	Commercial thin	1	1
57a	Commercial thin	1*	1*
89	Commercial thin	2*	2*
88	Commercial thin	1*	1*
52	Commercial thin	1*	1*
202	Shrub/steppe	1*	1*
28a	Commercial thin	1	1
19	Commercial thin	1	1
17	Commercial thin	1	1

*** indicates that site is affected by more than 1 harvest unit**

Both C3 and C5 management areas allow for a range of visual quality, including Modification in C5 – Riparian and Maximum Modification in C3 – Big Game Winter Range. The proposed treatments together with the mitigation and design criteria described in Chapter 2 of the EIS would meet the visual quality objectives for these two management areas.

Cumulative Effects Common to All Action Alternatives (2-3)

Past fires, timber harvest, and road construction have created a patchwork of vegetation densities and sizes throughout the analysis area. Proposed commercial and non-commercial harvest, and prescribed fire would add to this existing patchwork. Cumulatively, the visual quality objectives for each of the affected management areas would still be met.

Camping

Existing Conditions

There is one developed campground (Fairview Campground) within the Kahler project area. Fairview has five campsites, a vault toilet, a potable water fountain, and is one of the access points to the OHV trail system. Occupancy is very low, except during hunting season when occupancy can reach 100 percent. A portion of the campground lies in open forest, while the remainder is densely stocked with trees. This campground lies within the A6 – Developed Recreation management area (see Tables 1 and 2)
There is also a rental cabin adjacent to Tamarack Lookout that allows for overnight use. This cabin consists of one room with a porch, has an occupancy limit of 4 people, and rents for $40 per night. There is also an exterior propane tank, fire ring and picnic table, and separate vault toilet. This rental cabin lies within the E1 – Timber and Forage management area (see Tables 1 and 2).
Dispersed camping has traditionally been a popular activity in the area, with sites used intermittently during the three-month big game hunting seasons in the fall. A generic description of a dispersed campsite consists of a user-made area that is generally adjacent to a developed road. The site often has a meat pole hanging in the trees, a rock fire ring and a hardened parking/camping surface for one to three families. There are 16 inventoried dispersed campsites within the Kahler planning area. Sites are predominantly located along Forest Roads 2142, 2400, and 2500.

Table 3. Location of inventoried dispersed campsites

Road Number	# of dispersed camps
2400	4
2500	6
2500160	1
2142	4
2500100	1

Effects of No Action Alternative (1)

Direct and Indirect Effects: Campers at Fairview Campground would remain undisturbed by noise or harvest activity within the campground. The character of the campground is open and grassy with scattered trees on one side of the access road and dense forest, with continuous vegetation from the ground to the tree canopies on the other side. Under this alternative, sites 2 and 5 would continue to be surrounded by dense forest and would be most impacted should a wildfire occur in this area.
Campers at Tamarack Lookout rental cabin would also remain unaffected by noise or nearby harvest activity. The character of the surrounding area would continue to display a full overstory and relatively open understory.
Campers using dispersed sites would remain undisturbed by noise, smoke, or increased traffic. Dispersed campsite use patterns would change only due to natural events (fire, windthrow, etc).

Effects Common to All Action Alternatives (2-3)

Direct and Indirect Effects: Under both alternatives, campers at Fairview Campground would be temporarily affected by the proposed activities. The existing character of the campground is open and grassy with scattered trees on one side of the access road and dense forest, with continuous vegetation from the ground to the tree canopies on the other side. Under this alternative, harvest would occur around sites 2 and 5 although a untreated area 10-20 feet wide would be left around each campsite to retain a feeling of privacy. Unit CG-1 would commercially thin within the campground using ground-based logging systems. Unit 99 is adjacent east of the campground and would also be commercially thinned using ground based systems. Unit 80 which is adjacent southwest and downhill of the campground would be commercially thinned using a helicopter system. Harvest of all three units would create noise, dust, and extra traffic within and around the campground. During harvest of unit CG-1, the campground would need to be closed for safety reasons. These effects would be limited in duration (about 1 week). Campers would be displaced to other sites during this time. Effects on campers would be reduced if harvest of these three units is conducted from late November through the end of July when there is minimal use of the campground. After all associated activities are completed, harvest of unit CG-1 would improve fuel conditions within the campground by reducing the number of trees and removing ladder fuels, increasing the likelihood that the campground would survive a wildfire.
The proposed units adjacent to Tamarack Rental Cabin (units LO1, LO2, and LO3) would require temporary closure of the cabin during implementation. This would last about 2 weeks until the access road is no longer needed to haul out logs (although the road should be open on weekends). Upon completion of logging, the character of the area would be much more open, with all trees removed on the 3 acres surrounding the fire lookout (Unit LO3). Some trees would remain around the rental cabin for visual appearance and shade, and the cabin would be much more defendable should a wildfire occur in this area. Treatment of Unit LO1 would reduce fuels along the egress route from the cabin, which would make for safer evacuation in a fire situation.
The four inventoried dispersed camps located along Road 2142 should not be affected by the proposed thinning activities. These four camps do, however, lie on the boundary of proposed burning, so campers

could be affected by smoke and increased traffic. All dispersed campsites would be affected to some degree by smoke from prescribed burning. This would generally occur on the fringes of the camping season because conditions during the main camping season are too hot and dry to allow adequate control of fire. Late fall campers (primarily hunters) would be the most likely affected. Dense smoke could cause campers to relocate to another area, but the duration that this impact could occur would be short (1-2 weeks). Burning would also improve elk forage for several years, which could improve the quality of the hunting experience during that period.

Twelve dispersed camps lie on proposed haul routes and would experience increased traffic, dust, and noise in addition to smoke related to prescribed burning. Harvest could improve camper safety by removing weakened or dead trees that could otherwise fall and cause injury. For several years after harvest, campers would also benefit from an increased availability of firewood in the treatment units. Noise and dust would likely cause campers to use another site during treatment activities, but the effects would be limited to a small number of sites at one time and would cease as soon as treatment of the adjacent unit is complete (generally 1-2 weeks as work is occurring). Also, the early hunting season occurs during the driest part of the year, when there are often limitations on industrial operation in the forest due to fire concerns so the highest use period would not likely be affected.

Effects Unique to Alternative 2

Direct and Indirect Effects: Alternative 2 would close 19.3 miles of road to mitigate effects of harvest on wildlife. One known, but uninventoried, dispersed campsite would be affected by closing Road 2500063. However, this campsite has been unused for some time due to a conflict with an adjacent private landowner. As a result, dispersed camping would not be affected by the road closures.

Effects Unique to Alternative 3

Direct and Indirect Effects: Alternative 3 would close 17.3 miles of road to mitigate effects of harvest on wildlife. Access to two uninventoried, dispersed campsites would be lost: the campsite discussed under alternative 2 as well as an uninventoried campsite on 2500063. As a result, dispersed camping opportunities within the Kahler planning area would experience a slight decline. This could be offset by new opportunities being created by log landings adjacent to open roads.

Cumulative Effects of All Action Alternatives

Past harvest has occurred throughout the Kahler area; in a number of places old, recovered log landings have become dispersed campsites due to their proximity to roads and relatively flat topography. Proposed activities under both alternatives could increase the number of dispersed campsite options in the long-term where new landings are created. Even with the road closures proposed under Alternatives 2 and 3, dispersed camping opportunities would likely increase.
There would be no other cumulative effects on camping with any of the alternatives based on a review of the Past, Present and Future projects listed in the project analysis file.

Trails and Dispersed Recreation

Existing Condition

The main use of the analysis area is for big game hunting. The analysis area falls within the Heppner and Fossil Big Game Management Units designated by the Oregon Department of Fish and Wildlife (Kahler Wildlife Report). The hunting season typically begins at the end of August and extends through the end of November. There are a number of other popular dispersed recreation activities in the area:

- ATV riding
- sight seeing
- camping
- food gathering
- firewood collection

There are 13.5 miles of OHV trail within the Kahler analysis area. The trail system was recently established (West End OHV Environmental Analysis, 2009) and is not well known beyond the local area. Most use occurs during the hunting seasons as a means to access hunting locations. All roads are considered open to ATV travel unless signed as closed under the District's Access and Travel Management Plan. There are no groomed winter trails within the analysis area.

Effects of No Action Alternative (1)

Direct and Indirect Effects: Trail use and dispersed recreation would continue unchanged by management activities.

Effects Common to All Action Alternatives (2-3)

Direct and Indirect Effects: Big game could relocate out of the project area during harvest, log hauling, and prescribed burning until the disturbance ceases, temporarily reducing the quality of the hunting experience if activities occur in the fall. Hunters could also be directly displaced by harvest activities or burning, although the effect would be temporary (1-2 weeks). After the proposed activities are completed, big game cover would be reduced and there would be an increase in forage. Together with the proposed road closures under both alternatives, big game could be expected to occupy the Kahler area more during the spring and summer improving wildlife viewing opportunities. However, the configuration of harvest and the level of road closures would result in a difference in fall distribution between alternatives (conversation with Zone Wildlife Biologest) which could affect the big game hunting experience.

There would be an increase in traffic during log hauling, which could pose hazards to ATV riders, but once hauling is complete there would be no lasting effects. Closure of 0.4 miles of ATV trail O-2400140 would reduce ATV riding opportunities by 3 percent in the Kahler planning area. However, it would also remove a stream crossing which would eliminate the expense of installing and maintaining a bridge. Use of the 24 Bypass trail as a temporary road during harvest would improve the trail condition by clearing rocks from the trail that make riding extremely rough. The route would revert back to use as a trail after harvest is complete.

Most sightseeing is associated with Highway 207 in the central part of the Kahler project area and the Tamarack Lookout site. Mitigations described in Chapter 2 of this EIS should minimize effects on visuals along the highway. Removal of trees from around Tamarack Lookout will open up views of distant landscapes. Firewood gathering could diminish slightly after harvest and prescribed burning, as dead material is either removed or consumed by fire. Fire could enhance opportunities for mushroom picking, with the best results occurring under a broadscale underburn.

Effects Unique to Alternative 2

Alternative 2 would close three roads seasonally and 10 roads permanently, totaling 19.3 miles of road to mitigate effects of harvest on big game. This would reduce motorized access for hunting, gathering, and sightseeing, but other modes of travel would still be permitted. At the same time, these road closures would reduce disturbance to wildlife, particularly big game, during the spring, increasing wildlife viewing opportunities. However, the amount and configuration of cover removed would not be offset by road closures during the fall hunting season and big game would likely leave the Kahler area due to increased disturbance and a lack of hiding cover, reducing the opportunity for a successful hunt.

Effects Unique to Alternative 3

Alternative 3 would close two roads seasonally and 11 roads permanently, totaling 17.3 miles of road to mitigate effects of harvest on big game. This would reduce motorized access for hunting, gathering, and sightseeing, but increase wildlife viewing opportunities in the spring. Under this alternative, blocks of big game cover would be retained, and coupled with the road closures big game would be less likely leave the Kahler area during the hunting seasons, maintaining a quality hunting experience.

Cumulative Effects of All Action Alternatives

In the long-term, the proposed harvest and thinning together with past harvest and prescribed burning would benefit recreationists by creating a more open forest environment. An open forest setting is important for many recreation activities and provides greater cross-country access. Proposed road

closures would combine with past road closures associated with the District Access and Travel Management Plan to reduce disturbance of big game, improving the opportunity for hunting success. Even with extensive past management in the analysis area, outdoor recreation use, in general, has steadily increased over the years. Other past, present, or foreseeable future projects identified in the Appendix to the EIS would not result in cumulative effects on the recreational experience.

Wilderness and Inventoried Roadless Areas

There is no congressionally designated Wilderness or Inventoried Roadless Areas located in or near the project area. The nearest Wilderness is the North Fork John Day Wilderness located approximately 40 miles from the project area. The nearest IRA is the Skookum IRA located approximately 9.5 miles from the project area. Due to their distances from the project area the proposed project would have no direct, indirect or cumulative effects on designated Wilderness or IRA areas.

Potential Wilderness Areas and Other Undeveloped Lands

Introduction

This section of the report discloses the affected environment and environmental consequences for potential wilderness areas (PWAs); and remaining other undeveloped lands. This resource topic has a complicated set of terminology. The following paragraphs of this section are included to help the reader understand the context of this analysis. Appendix A of this report discloses additional narrative and maps in support of this topic.

The USDA Forest Service, Pacific Northwest Region (Region 6) covers approximately 27.2 million acres within the states of Oregon and Washington. This represents approximately 27% of the total acreage of both states combined. These 27.2 million acres are allocated and managed based on the land allocations designated within the respective National Forest Land and Resource Management Plan. However, two types of land designations are overriding and common among all units within the region (indeed the nation), these are the management of Wilderness areas and the management of Inventoried Roadless Area. In Region 6, there are approximately 4 million acres of Inventoried Roadless Areas (15%) and approximately 5 million acres of Wilderness (18%).

The Umatilla National Forest (NF) is one of 16 administrative units that manage National Forest System Lands within the Pacific Northwest Region. The Umatilla NF covers approximately 1.4 million acres and is situated in the northeastern corner of Oregon and southeastern corner of Washington. The Umatilla National Forest contains 303,000 acres of wilderness (21%) and 282,000 acres of Inventoried Roadless Areas (20%). The Forest consists of four Ranger Districts one of which is the Heppner Ranger District. The Heppner Ranger District is about 212,213 acres in size and contains no Wilderness (0%) and 19,908 acres of Inventoried Roadless Areas (9.3% of District). The Kahler project planning area occurs in the northwestern portion of the Heppner District. The site specific analysis for the Kahler project identified an additional 9,931 acres of lands that had no history of development and were subsequently classified using the criteria discussed later in this section.

Table 5. Contextual Display of Wilderness and Roadless Areas in PNW Region, Umatilla NF, Heppner RD and Kahler project planning area

Unit	Acres	Percentage
Pacific Northwest Region	27.2 million	27%[1]
• **Wilderness**	5 million	18%
• **Inventoried Roadless Area**	4 million	15%
Umatilla National Forest	1.4 million	5%[2]
• **Wilderness**	303,000	21%

• **Inventoried Roadless Area**	282,000	20%
Heppner Ranger District	212,213	15%[3]
• **Wilderness**	0	0%
• **Inventoried Roadless Area**	19,908	9.3%
Kahler Project Planning Area	32,848	15.5%[4]
• **Wilderness**	0	0%
• **Inventoried Roadless Area**	0	0%
• **Other lands that have undeveloped character**	9,931[5]	30.2%

[1] Portion (acres) of both Oregon and Washington that are National Forest System lands.
[2] Portion (acres) of US Forest Service Pacific Northwest Region that is managed by Umatilla National Forest.
[3] Portion (acres) of Umatilla National Forest that is managed by the Heppner Ranger District
[4] Portion (acres) of the Heppner Ranger District that occurs within the boundary of the Kahler project area.
[5] This number reflects the inventory of other undeveloped lands.

During public involvement for this project, and in past similar projects, a wide range of terms have been used by respondents, the courts, and the Forest Service when referring to these topics such as roadless, unroaded, uninventoried roadless, undeveloped areas, and roadless expanse.

From the mid-1970s through 2001 the Forest Service maintained a roadless area inventory of undeveloped lands that we used and updated for RARE, RARE II, and in support of Land and Resource Management Planning completed in 1990 for Umatilla National Forest. All during that time we called these polygons "roadless areas" or "inventoried roadless areas" (IRAs). With completion of the Roadless Area Conservation Rule (RACR) in 2001 these lands ceased being just an inventory, and IRAs became more of a designation, with fixed boundaries and prohibitions set by Forest Service regulation (36 CFR 294). Confusion ensued because two Forest Service maps used the same name; IRA. One map had fixed boundaries set by the RACR and another map had changeable boundaries based on inventory criteria.

To address this situation, the Forest Service created a new term for their inventory of undeveloped lands called "potential wilderness areas" (PWAs) to make a clear distinction between the IRA term used by the 2001 RACR. This terminology addition was made policy by changing the 2006 handbook for wilderness evaluation (FSH 1909.12, Chapter 70) and is also reflected in the 2008 Forest Service NEPA regulations (36 CFR 220). In the regulations, potential effects to "inventoried roadless areas" and "potential wilderness areas" are factors in determining whether a CE, EA, or EIS is the appropriate NEPA document for a particular project. The term "other undeveloped lands" is presented and used in this document to provide a consideration for the balance of those remaining lands that did not meet the inventory criteria for a PWA, were not designated an IRA under the RACR, and do not contain roads and evidence of timber harvest (see definitions below).

To resolve this confusion the Forest Service uses its discretion to rely on agency policy, agency definitions of terms, and agency procedures for the inventory of resources and facilities. Inventory criteria and procedures for potential wilderness areas are found in Forest Service Handbook 1909.12, Chapter 71.

The terms and definitions as stated below will be used in this site-specific analysis. The four resource topics are based on current law, regulation, agency policy, and Umatilla Land and Resource Management Plan (Forest Plan), as amended

5. **Wilderness:** A wilderness area is designated by congressional action under the Wilderness Act of 1964 and other wilderness acts. Wilderness is undeveloped Federal land retaining primeval

character and influence without permanent improvements or human habitation (Umatilla Forest Plan, page GL-45).

6. **Inventoried Roadless Areas (IRA)**: These areas were identified in the 2001 Roadless Area Conservation Rule in a set of inventoried roadless area maps, contained in Forest Service Roadless Area Conservation Final Environmental Impact Statement, Volume 2, dated November 2000, which are held at the National headquarters office of the Forest Service, or any subsequent update or revision of those maps (36 CFR 294.11). These areas were set aside through administrative rulemaking and have provisions, within the context of multiple use management, for the protection of IRAs. Most IRA boundaries are substantially identical to those identified as "Roadless Areas" referred to in the 1982 planning rule (36 CFR 219.17) and identified by the Forest Plan, FEIS, Appendix C; however some localized, minor differences in boundaries may exist.

   All roadless area acres were allocated to various management area strategies as disclosed in the Umatilla Forest Plan FEIS, Appendix C and described in the Record of Decision (page 6-9) for the FEIS. Some management area strategies were intended to retain the undeveloped roadless character of the roadless area and some management area strategies were intended to develop the lands with timber harvest and road building activities; thus forgoing roadless character.

7. **Potential Wilderness Area (PWA)**: Areas identified using potential wilderness inventory procedures found in Forest Service Handbook (FSH) 1909.12, Chapter 71 are called potential wilderness areas. The inventory is conducted by the Forest Service with the purpose of identifying potential wilderness areas in the National Forest System. The National Forest System Land and Resource Management Planning Rule (currently the 1982 Rule, 36 CFR §219.17) directs that roadless areas be evaluated and considered for wilderness recommendation during the forest planning process.

   Potential wilderness areas (PWAs) are not a land designation decision, they do not imply or impart any particular level of management direction or protection, they are not an evaluation of potential wilderness (FSH 1909.12,Chapter 72), and lastly, they are not preliminary administrative recommendations for wilderness designation (FSH 1909.12, Chapter 73). The inventory of PWAs does not change the administrative boundary of any inventoried roadless area (IRA) or any congressionally designated wilderness.

   Typically, PWAs substantially overlap, and/or are contiguous with inventoried roadless areas. PWAs may also be contiguous with designated wilderness. Some newly inventoried PWAs may be stand-alone areas that were not identified as "roadless areas" in Appendix C of the 1990 Umatilla Forest Plan and "inventoried roadless areas" as identified in a set of maps in the 2001 Roadless Area Conservation Rule (RACR). PWAs overlap inventoried roadless areas only where those acres of land are consistent with the inventory criteria (FSH 1909.12, Chapter 71) and may extend beyond IRA and wilderness boundaries consistent with inventory criteria.

8. **Other undeveloped lands**: These acres of land have no history of harvest activity, do not contain forest roads[12] and are not designated as a wilderness area or inventoried as a potential wilderness area.

[12] **Forest road** – A road wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and

Appendix A of this document describes the methodology and rationale used to inventory and identify PWAs within the 32,848 acre Kahler project planning area. Maps included in Appendix A (maps A-2 to A-5) show a visual progression of the inventory process, final results, and proposed project activity, if any, that would occur in these areas.
The effects to wilderness, inventoried roadless areas (IRAs), potential wilderness areas (PWAs), and other undeveloped lands were based on maps created using agency inventory procedures (Appendix A) and are considered and disclosed below.

Scale of Analysis

The scale of analysis is the 32,848 acre Kahler project planning area. The scale of the analysis area is appropriate because the project planning area is bounded by roads, past harvest activity and private land (see maps in Appendix A).

Indicators for comparison between alternatives are:

- *Roadless characteristics* (features that are often present in and characterize inventoried roadless areas) as identified in the 2001 Roadless Area Conservation Rule (36 CFR §294.11)
    - High quality or undisturbed soil, water, and air
    - Sources of public drinking water
    - Diversity of plant and animal communities
    - Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land
    - Primitive, semi-primitive, non-motorized and semi-primitive motorized classes of dispersed recreation
    - Reference landscapes
    - Natural appearing landscapes with high scenic quality
    - Traditional cultural properties and sacred sites and
    - Other locally identified unique characteristics

Affected Environment

The table below is a summary of all the acres evaluated in the PWA inventory process for this project. Information summarized for this table can be found in Appendix A, Tables A-1, A-2 and A-3. Maps A-1, A-2, A-3, A-4 and A-5 are a visual representation of this inventory process.

Table 6. Potential Wilderness Area Inventory Summary

	Approximate Acres Kahler Project Planning Area
Map A-1; Total Acres Inventoried.	32,848
Map A-2; Acres Removed from inventory due to past harvest.	25,054
Map A-3; Acres removed from inventory due to activities related to roads	11,540*
Map A-4; Resulting lands that remain after past harvest and activities related to roads are removed from inventory. (undeveloped lands)	9,931**

the use and development of its resources. Road – A motor vehicle route over 50 inches wide, unless identified and managed as a trail (36CFR §212.1)

Map A-5; Acres of Potential Wilderness Areas (PWAs)	0
Acres of undeveloped lands that did not meet PWA inventory criteria at FSH 1909.12 Chapter 71.1 (other undeveloped lands)	9,931**
* Most of these acres overlap with acres of past harvest. ** This number does not include polygons less than one acre in size.	

Environmental Consequences

No PWAs were identified within the project planning area during the PWA inventory process. Therefore, there are no direct, indirect or cumulative effects to inventoried PWA resulting from the proposed project or alternatives to the proposed action. All of the acres within the undeveloped polygons are considered other undeveloped lands and are displayed in Map A-5.

Other Undeveloped Lands

Background

An outcome of the PWA inventory process was the identification of polygons of other undeveloped lands (Table A-2). These polygons did not meet inventory criteria as PWAs and they are not inventoried roadless areas or a designated wilderness area. Each individual polygon of land has no history of harvest activity and does not contain forest roads. They are stand-alone polygons of varying acreages all less than 4,999 acres within the project planning area. All polygons less than one (1) acre were considered in the inventory process but dropped from detailed study because individual polygons this small cannot be preserved due to physical terrain and natural conditions and they do not have self-contained ecosystems, such as an island. Detailed information regarding the inventory process and methodology used for the Kahler project analysis, along with maps and tables is located in Appendix A of this document.
There are no forest-wide or management area standards specific to other undeveloped lands in the Umatilla Forest Plan. All lands, including undeveloped lands, are managed consistent with forest-wide standards and guidelines and by designated Forest Plan management area allocations.

Scale of Analysis

The scale of analysis is represented by the Kahler project planning area. Other undeveloped lands have intrinsic ecological and social values because they do not contain roads and evidence of past timber harvest. These values are used as indicators of comparison to display effects between alternatives. Values and features that often characterize an inventoried roadless area (36 CRF 294) were specifically avoided as indicators of comparison to reduce confusion as described in the Introduction and Background. That is, other undeveloped lands are not inventoried roadless areas or potential wilderness areas and therefore are described using different indicators of comparison.

Indicators of comparison between alternatives are:

- Intrinsic physical and biological resources (soils, water, wildlife, fisheries, etc.)
- Intrinsic social values (apparent naturalness, solitude, remoteness)
- Change in acres of other undeveloped lands

Affected Environment

Table A-1 displays the acres of other undeveloped lands within the Kahler project planning area along with references to maps in Appendix A for a visual representation. In the 32,848 acre Kahler project planning area, approximately 9,931 acres (about 30.2 percent of the project planning area) have been identified as isolated polygons of other undeveloped lands that area at least one acre in size. No acres have been identified as potential wilderness areas (PWA), and the remaining 22,917 acres (about 69.8 percent) are developed and managed (contain evidence of past harvest and forest roads). Individual polygons of other undeveloped lands less than an acre were eliminated from further study because no special or unique resource values were identified and the description of effects to individual pieces of land less than one acre are better disclosed as part of the other resource effects section in this EIS.
Table 7 displays the number, size class, and approximate acres of other undeveloped lands represented. For perspective, one square mile is about 640 acres. The residual shape of each undeveloped polygon is the result of boundaries created by past harvest and road building or natural openings.

Table 7. Size Class and Acres of Other Undeveloped Lands in the Kahler Planning Area

Number of Polygons	Size Class	Approximate Acres
49	1 to 99 acres	938.6
7	100 to 499 acres	1799.3
1	500 to 999 acres	567.2
4	1,000 to 4,999 acres	6,626.1
0	5,000+ acres	0
61	**Total**	**9,931.2**

Other undeveloped lands include soils, water, fish and wildlife habitat etc. that have not been impacted directly by past harvest and road building. The current condition of soil; water quality; air quality; plant and animal communities; habitat for threatened, endangered, and sensitive species; noxious weeds; recreation; and cultural resources within the project planning area, including other undeveloped lands are described in other resource reports associated with the Kahler project.
No special or unique values in other undeveloped lands have been identified by project resource specialists in their environmental analysis for the implementation of any alternative analyzed in detail. Human influences have had limited impact to long-term ecological processes within the other undeveloped lands. Disturbance by insects and fire has been and most likely will continue to be the factors with the most potential to impact the area. Opportunities for primitive recreation are limited to gathering of wild foods, hiking, hunting and dispersed camping. Ongoing firewood collection and removal of danger trees along forest roads that border each polygon changes the vegetation, leaves stumps, and presents a managed appearance within a developed transportation corridor.

Opportunities for a feeling of solitude, the spirit of adventure and awareness, serenity, and self-reliance are limited by the size and shape of polygons. Distance and topographic screening are also factors. Nearby, non-conforming sights and sounds of roads and timber harvest can be heard and often seen from within the other undeveloped lands.

The existing condition of all remaining 22,917 acres of land within and affected by the Kahler project presents a landscape that has been managed and is generally developed in nature; these lands contain evidence of past harvest and forest roads. Past management actions and current conditions reflect the multiple-use intent and decisions made in the Forest Plan (1990 as amended), and reflects consistency with Forest Plan management area allocations.

Effects of No Action Alternative (1)

Direct and Indirect Effects: There would be no direct effects to other undeveloped lands because no activities would occur in these areas. The affected environment would remain unchanged, except by natural processes and ongoing management activities. Biological and ecosystem functions would continue. The landscape would likely continue developing complex fuel loads. A wildfire would have potential result in extensive mortality within denser forest stands which would result in larger acreages of blackened landscapes compared to prescribed fires. Some forest visitors could avoid blackened landscapes until green vegetation returns after 3 to 5 years. Fire is a natural occurrence and expected disturbance process in this landscape. All polygons of other undeveloped lands would continue to not meet inventory criteria as potential wilderness areas and would continue to not be an inventoried roadless area or a designated wilderness area.

For the No Action alternative, the Kahler project would not be authorizing any actions; therefore it would not be adding anything to the effects of past, present, and reasonably foreseeable future actions. Based on the definition provided in the CEQ regulations there would be no cumulative effects for the No Action Alternative.

Effects Common to All Action Alternatives (2-3)

Direct and Indirect Effects: Effects to the intrinsic physical and biological resources of other undeveloped lands within the Kahler planning area (soils, water, wildlife, recreation, fisheries, etc.) are disclosed in the applicable resource sections of the EIS and are not reiterated here. Environmental effects to resources in other undeveloped lands due to the implementation of proposed project activities would be consistent with applicable laws, regulations, and Forest Plan management area standards and guidelines (see applicable sections of the EIS for Findings of Consistency for each resource).

Both alternatives proposed some level of activity within other undeveloped lands, varying only by the number of acres or miles treated. Timber harvest and associated activities in Alternative 2 would occur on approximately 2,332 acres of other undeveloped lands. Alternative 2 would also include 3.6 miles of temporary road constructed in other undeveloped lands to facilitate haul and 9,390 acres of prescribed burning. Timber harvest and associated activities in Alternative 3 would occur on approximately 2,166 acres of other undeveloped lands. There would be 3.0 miles of temporary road constructed in other undeveloped lands under Alternative 3 and 9,390 acres of prescribed burning. See the Appendix and associated maps to see the location of activity units and other undeveloped lands and the EIS Chapter 2 for a listing of harvest activity units and logging method. Table 8 shows the number of acres of activities proposed under each action alternative that would occur within other undeveloped lands.

Table 8 Activities proposed in Other Undeveloped Lands in Kahler

Activity	Alternative 2	Alternative 3
Commercial Thinning and Non-commercial Thinning	2332 acres	2,166 acres
Temporary Road	3.6 miles	3.0 miles

Constructed		
Prescribed Fire	9,390 acres	9,390 acres

On acres treated by commercial thinning, noncommercial thinning, or juniper removal, apparent naturalness and a sense of remoteness would be reduced for up to 50 years, depending on the rate of stump decay and recovery of disturbed soils. However, most areas of other undeveloped lands are less than 1,000 acres, so the sense of solitude would likely be nonexistent due to intruding sights and sounds from the surrounding managed areas. Areas of other undeveloped lands greater than 1,000 acres (four areas totaling 6,626 acres) were field checked to determine whether there were signs of past management that were not captured in existing records (see various field notes in Kahler analysis file). In one such area (polygon 57 totaling 1,548.3 acres), aerial photo and field evidence indicate a number of old roads or skid trails bisect the area. In polygons 11 (2,111.6 acres) and 27 (1,451.5 acres), stumps, stock ponds, and evidence of old skid trails/roads were found in the vicinity of the proposed harvest units. While there is little evidence of past management in polygon 21 (1,514.6 acres), an existing road almost entirely bisects the polygon; resulting noise intrusion would reduce the sense of solitude and remoteness.

Other undeveloped lands with no proposed treatments (7,599 acres in Alternative 2 and 7,765 acres in Alternative 3) would remain the same as described in the affected environment. They would remain free of developments such as forest roads or timber harvest units. All 9,931 acres of other undeveloped lands within the project planning area would still not be considered PWAs, roadless areas, inventoried roadless areas, or a designated wilderness area.

Table 9 is a summary showing the changes in acres for other undeveloped lands by alternative.

Table 9 Undeveloped Lands in Kahler Planning Area by Alternative

Alternative	Acres Prior to Activity	Acres Remaining After Implementation	Acres changed	Percent of Area* After Implementation	Percent Change
Alternative 1	9,931	9,931	No change	30%	No change
Alternative 2	9,931	7599	(-2,332)	23%	(-7%)
Alternative 3	9,931	7,765	(-2,166)	24%	(-6%)

*32,848 acres within the project planning area.

Cumulative Effects Common to All Action Alternatives (2-3)

For undeveloped lands in which project activities would occur the cumulative effects to soil, water quality, air quality; plant and animal communities; habitat for threatened, endangered, and sensitive species; recreation; noxious weeds; and cultural resources are disclosed in the applicable resource sections of the EIS and are not reiterated here.

The cumulative effects geographic boundary is the 32,848 acre Kahler planning area. This boundary is appropriate because it can reasonably be expected that the types of direct/indirect effects expected to occur as a result of the Kahler project (intrinsic physical and biological resources and intrinsic social values) are not expected to interact with any similar effects that might occur elsewhere outside of the project area.

The temporal boundary for this cumulative effects analysis is 10 years. This timeframe is appropriate, because the effects to a sense of solitude and remoteness would be limited to the times when Kahler activities would be occurring since the sights, smells and sounds of mechanical activities will only occur during this project's implementation.

In the planning area the increased numbers of stumps and the open nature of the forest stand would likely be the most apparent visual change resulting from implementation. In the long term (about 50+ years), the project would result in the development of historic open, park-like conditions, characterized by larger diameter trees, though more stumps would be present than currently exist.

Prescribed burning and future wildfires would cumulatively change composition and structure of vegetation which could affect some forest visitor's sense of naturalness and remoteness. Prescribed burning would change composition and structure of vegetation (EIS, Chapter 3). Burned areas would display a blackened color for about one year. Outside the burned areas, the conditions described in the affected environment would remain unchanged except by natural processes and ongoing management activities such as grazing and hunting.

Apparent naturalness and solitude and remoteness would be cumulatively impacted by grazing, dispersed camping, and motorized ATV and vehicle use on roads. Effects associated with recreational use, including noxious weed spread, erosion, litter, and evidence of fire rings, are expected to remain cumulatively minor. Ongoing removal of danger trees along forest roads changes the vegetation but does not change the overall sense of naturalness or sense of solitude along an existing developed transportation corridor. Overall, cumulative impacts from these activities on apparent naturalness, solitude and remoteness of the other undeveloped polygons are very small (not measurable/indistinguishable).

Finding of Consistency

None of the proposed activities, as designed and mitigated, would change the Recreation Opportunity Spectrum class in any of the management areas (Forest Plan 4-49).

Activities proposed under any of the action alternatives, as mitigated, would meet the visual quality objectives for the A-4, A-6, C-3, C-5, and E-1 management areas. Harvest prescriptions in the A4 area are for commercial thinning, so there would be no created openings greater than 2 acres. Trees would be irregularly spaced and a diversity of tree species would remain. This would be consistent with Forest Plan standards pertaining to visual quality (Forest Plan 4-106 through 4-109 and 4-183). Harvest in A-6 has been designed to meet recreation objectives of reducing fuels so the campground could survive wildfire while retaining a sense of privacy in the immediate vicinity of campsites.
As a result of prescriptions, irregular unit shapes, and seeding of soil disturbance, dispersed camps would retain a Visual Quality Objective of Partial Retention in the foreground. (Forest Plan 4-49)
The Kahler project area would continue to provide for a spectrum of recreational activities (Forest Plan 4-49).

All 9,931 acres of other undeveloped lands identified within the planning area would not qualify as a potential wilderness area, inventoried roadless area, or a designated wilderness area. This outcome is consistent with the intent of the land allocation decisions made in the Forest Plan.

_____ _____

JANEL LACEY DATE
South Zone Recreation Manager

Attachments:

Appendix: Inventory of Potential Wilderness Areas and Identification of Other Undeveloped Lands.

BIBLIOGRAPHY

U.S. Department of Agriculture, Forest Service, Pacific Northwest Region; Land and Resource Management Plan for the Umatilla National Forest.
U.S. Department of Agriculture, Forest Service, Landscape Aesthetics: A Handbook for Scenery Management. Agriculture Handbook #701. December 1995.

Appendix I

Potential Wilderness Areas

Kahler Project Recreation Report
Potential Wilderness Inventory

APPENDIX A

Background:
This document describes the process and rationale used to inventory for and identify potential wilderness areas within the Kahler project, Heppner Ranger District, Umatilla National Forest. The inventory is based on, and consistent with criteria found at Forest Service Handbook (FSH) 1909.12 Ch. 71.
Each step of the inventory process is visually documented as a map (see map discussion below). These maps are displayed in this appendix. The Forest Service used professional judgment and local knowledge regarding unique, site-specific conditions of each area being considered for placement in the inventory of potential wilderness areas.
Potential Wilderness Areas (PWA): Areas identified using inventory procedures found in Forest Service Handbook (FSH) 1909.12 Chapter 71 are called potential wilderness areas. The inventory is conducted with the express purpose of identifying all lands that meet the criteria for being evaluated for wilderness suitability.
Potential wilderness areas are not a land designation decision, they do not imply or impart any particular level of management direction or protection, they are not an evaluation of potential wilderness (FSH 1909.12, Chapter 72), and lastly they are not preliminary administrative recommendations for wilderness designation (FSH 1909.12, Chapter 73). The inventory of potential wilderness does not change the administrative boundary of any inventoried roadless areas (IRAs), any congressionally established wilderness, or any forest plan management areas.
Typically, PWAs substantially overlap and/or are contiguous with inventoried roadless areas. PWAs may also be contiguous with designated wilderness. Some newly inventoried PWAs may be stand-alone areas that were not identified as 'roadless areas' in Appendix C of the 1990 Umatilla Forest Plan and 'inventoried roadless areas' as identified in a set of maps in the 2001 Roadless Area Conservation Rule (RACR). PWAs overlap inventoried roadless areas only where those acres of land are consistent with the inventory criteria (FSH 1909.12 Chapter 71) and may extend beyond IRA and wilderness boundaries consistent with inventory criteria.
The scope of this potential wilderness analysis inventory includes all acres contained within the Kahler project planning area which is sufficient to consider the potential wilderness area criteria found at FSH 1909.12 Chapter 71.1 because the project is bounded by roads and private land.
Methodology: The inventory process was conducted through a sequence of GIS analyses and application of professional judgment. The judgment applied was situational and instance by instance. Each map (Appendix map 1, 2, 3, 4, and 5) documents the outcome of the application of specific inventory criteria. Inventory criteria were applied in a different order than appears in Chapter 71 but all criteria were considered and accounted for as described below under the series of five maps.
Examples of typical situations that required applications of professional judgment included, but are not limited to:

1. Placement of PWA boundaries along permanent natural or semi-permanent human-made features such as ridges, streams, topographic breaks, past harvest, or forest roads to facilitate easy on the ground identification.
2. Whether to proceed through an isthmus (or pinch point) created between two roads or two harvest areas or place a PWA boundary across the isthmus;
3. Whether to locate a PWA boundary around a peninsula or place the boundary through the peninsula.

Table 1.1 is a summary of acres evaluated in the inventory process. Table 1.2 was used to account for and display all polygons as described in Map 4. Table 1.3 is a summary of all inventoried lands in the project area.

Table A-1 Potential Wilderness Area Inventory Map by Map Description

	Approximate Acres Kahler Project Planning Area
Map 1 Total Acres Inventoried.	32,848
Map 2 Acres Removed from inventory due to past harvest.	25,054
Map 3 Acres removed from inventory due to activities related to roads	11,540*
Map 4 Resulting lands that remain after past harvest and activities related to roads are removed from inventory. (undeveloped lands)	9,931**
Map 5 Acres of Potential Wilderness Areas (PWAs)	0**
Acres of undeveloped lands that did not meet PWA inventory criteria at FSH 1909.12 Chapter 71.1 (other undeveloped lands)	9,931**
* Most of these acres overlap with acres of past harvest. ** This number does not include polygons less than one acre in size.	

Map 1 (Analysis Area)

Map 1 displays the Kahler project planning area, forest roads, and proximity of the planning area to Inventoried Roadless Areas and Wilderness. The project planning area for Kahler is approximately 32,848 acres.

Map 2 (Past Harvest)

Map 2 displays Kahler project planning area forest roads and past harvest. The project planning area was overlain with Heppner district's GIS harvest layer, which displays locations of timber harvest over the past 50 years. Past timber harvest included clear-cuts to thinning units. The past timber harvest layer also includes lands where local knowledge and field visits were utilized to verify past timber harvest. Field surveys and photo interpretation revealed that many of the forested portions of the project area contained evidence of past harvest or old road beds. Notes from field verification can be found in the Kahler project record. In all cases, past timber harvest resulted in features such as stumps, skid trails etc. which are evident; therefore, all acres (25,054 acres) depicted on the map do not meet FSH 1909.12 Ch 71.11(9) inventory criteria and were removed from the inventory in Map H-3.

Map 3 (Roads)

Forest roads have associated permitted uses and maintenance. Road maintenance and many permitted uses have removed trees and created visible stumps and these activities are expected to continue into the future. To determine which acres are affected, the entire planning area was overlain with Heppner district's GIS forest roads layer. Map 3 displays the Kahler project planning area, forest roads, and a 300-foot width on either side of roads that is associated with human-caused disturbance.

During initial road construction, trees were felled within a clearing limit to provide for safe and efficient construction and future operational safety of road users. Clearing distances away from the edge of a road varied by many factors including tree height, topographic slope, and other factors. Past clearing of trees along forest roads created stumps that are evident and recognizable.

Road maintenance occurs to varying degrees along each road according to an assigned maintenance level and available funding. Road maintenance includes the periodic clearing of brush and the falling of danger trees that present a hazard to forest visitors, employees, and contractors as defined by the Region 6 Danger Tree Policy (2008). The distance of the hazard removal away from a road varies by tree height, topographic slope, and other factors. Past removal of danger trees along forest roads created stumps that are evident and recognizable.

Harvest of trees for personal-use firewood is permitted within 300 feet of open forest roads consistent with project NEPA decisions and travel and access management plan decisions. Past firewood gathering along open forest roads created stumps that are evident and recognizable.
It is recognized stumps are not present along every mile of forest road; for example roads adjacent to a meadow, talus, or a lake. The judgment we applied in setting a PWA boundary balanced inventory criteria regarding excluding past harvest and facilitating easy on-the-ground identification.
Based on local knowledge, and professional judgment regarding the evidence of recognizable stumps, skid trails, etc. which occur to varying degrees adjacent to forest roads (as described above) and to facilitate easy on-the-ground identification of a uniform, measurable boundary along a semi-permanent, human-made feature; the boundary was set as 300 feet each side of the forest road.
This boundary is fully consistent with and supported by the following inventory criteria:

- FSH 1909.12 at 71.1(3); potential wilderness areas do not contain forest roads therefore all acres that are a forest road will be removed from the inventory in Map 4.
- FSH 1909.12 at 71.1(9); acres with evidence of past logging and roads will be removed from the inventory in Map 4.
- FSH 1909.12, at 71; locate potential wilderness area boundaries at semi-permanent, human-made features to facilitate easy on-the-ground identification of a boundary.

Therefore, highlighted acres along forest roads (11,540 acres) in Map 3 were removed from the inventory in Map 4. Note most of the highlighted acres overlap with acres removed due to past harvest activities.

Map 4 (Acres not containing Past Timber Harvest or Forest Roads)
Map 4 displays the Kahler project planning area, forest roads and acres that do not contain evidence of past harvest or forest roads (undeveloped lands). Approximately 10,038 acres of undeveloped lands were inventoried in the planning area. Of those acres, 107 acres occurred in polygons less than one acre in size so they were eliminated from further study. The removal of these acres resulted in 61 remaining individual polygons, ranging in size from 1 acre to approximately 2,112 acres, covering a total of 9,931 acres.

Map 4 displays the 61 polygons of undeveloped lands, each with its own unique, numeric identifier. These polygons do not have substantially recognizable stumps, do not contain forest roads, and each polygon boundary is greater than or equal to 300 feet from a forest road. About 3,864 acres of these undeveloped lands consist of non-forested scablands and open meadows.

Map 5 (Potential Wilderness Areas and Other Undeveloped Lands)
The completed PWA inventory resulted in 0 acres meeting PWA inventory criteria. Map 5 displays the remaining other undeveloped lands.

The acres of undeveloped polygons in Map 4 were considered individually and compared to inventory criteria found at FSH 1909.12 at 71.1 (1, 2a, 2b, 2c). This process and the results are documented in Table 1.2 below and displayed in Map 5. Acres of any polygon need only meet one of the four found at FSH 1909.12 71.1 criteria 1, 2a, 2b, or 2c to be retained and displayed on Map 5 as PWA.
Of the 61 polygons (9,931 acres) evaluated in the planning area, none of the areas are contiguous with wilderness, primitive areas, Administration-endorsed wilderness, or potential wilderness in other Federal ownership due to the presence of forest roads and/or past timber harvest activity. Based on review of a site-specific orthophoto (project record) and local knowledge, each of these individual polygons is a part of a larger ecosystem and not a separate, self-contained ecosystem, such as found on an island surrounded

by water. These polygons cannot be separately preserved due to physical terrain or a natural condition in part because of their small size and in part because they are each part of the larger, continuous ecosystem distributed throughout the project area. Based on the discussion above, local knowledge and professional judgment, none of these individual polygons met inventory criteria, and therefore were removed from the inventory. They will be evaluated as "other undeveloped lands" and discussed in Chapter 3 of the EIS.

Map 6

Map 6 displays the relationship between other undeveloped lands and proposed activities.

Table A-2: Kahler Project Potential Wilderness Inventory

The following inventory for the Kahler project planning area was created using the inventory criteria found in Forest Service Handbook (FSH) 1909.12 Chapter 71.1. Each polygon from Map 4 (described above) were examined against the following criteria from FSH 1909.12 Chapter 71.1:

(1) Area is more than 5,000 acres in size

(2) Area contains less than 5,000 acres, but can meet one or more of the following criteria:

2a. Area can be preserved due to physical terrain and natural conditions.

2b. Areas are self-contained ecosystems, such as an island, that can be effectively managed as a separate unit of the National Wilderness Preservation System.

2c. Areas are contiguous to existing wilderness, primitive areas, Administration-endorsed wilderness, or potential wilderness in other Federal ownership, regardless of their size.

The Forest Service relied on local knowledge and judgment regarding unique, site specific conditions of each area being considered for placement on the inventory of potential wilderness. Delineation of areas for potential wilderness inventory; locate boundaries at prominent natural or semi-permanent human-made features to facilitate easy on-the-ground identification.

Note: The scope of this potential wilderness inventory analysis was limited to acreage contained within the project planning area boundary because the project is bounded by roads, past harvest and private land.

Kahler PWA Inventory - Polygons 1 acre or larger

Poly ID	Acres	Meets one or more criteria	FSH1909.12 71.1(1) Is area greater than 5000 acres in size?	FSH1909.12 71.1(2a) Can be preserved due to terrain?	FSH1909.12 71.1(2b) Is it a self-contained ecosystem?	FSH1909.12 71.1(2c) Is area contiguous?	Comments
1	76.8	No	No	No	No	No	
4	4.6	No	No	No	No	No	
5	127.9	No	No	No	No	No	
6	16.0	No	No	No	No	No	
7	2.1	No	No	No	No	No	
8	10.0	No	No	No	No	No	
9	2.4	No	No	No	No	No	
10	4.6	No	No	No	No	No	
11	2111.6	No	No	No	No	No	Evidence of old roads and stumps in northwestern part of polygon
12	29.0	No	No	No	No	No	
13	1.7	No	No	No	No	No	
14	5.3	No	No	No	No	No	

15	**484.1**	No	No	No	No	No	
16	**2.1**	No	No	No	No	No	
17	**82.3**	No	No	No	No	No	
19	**1.7**	No	No	No	No	No	
20	**3.4**	No	No	No	No	No	
21	**1514.6**	No	No	No	No	No	Evidence of old road in middle of proposed harvest unit 71a
23	**1.7**	No	No	No	No	No	
24	**50.7**	No	No	No	No	No	
25	**1.7**	No	No	No	No	No	
26	**226.4**	No	No	No	No	No	
27	**1451.5**	No	No	No	No	No	Evidence of old road along northeast portion of polygon separating proposed activities from the remainder of the polygon
28	**1.1**	No	No	No	No	No	
29	**567.2**	No	No	No	No	No	
30	**39.0**	No	No	No	No	No	
33	**35.6**	No	No	No	No	No	
40	**53.0**	No	No	No	No	No	
41	**3.4**	No	No	No	No	No	
42	**4.7**	No	No	No	No	No	
43	**29.2**	No	No	No	No	No	
44	**15.3**	No	No	No	No	No	
45	**4.2**	No	No	No	No	No	
46	**3.0**	No	No	No	No	No	
47	**6.6**	No	No	No	No	No	
48	**23.2**	No	No	No	No	No	
49	**8.6**	No	No	No	No	No	
50	**2.5**	No	No	No	No	No	
51	**47.5**	No	No	No	No	No	
52	**333.0**	No	No	No	No	No	
53	**1.7**	No	No	No	No	No	
54	**13.8**	No	No	No	No	No	
55	**23.7**	No	No	No	No	No	
56	**80.3**	No	No	No	No	No	
57	**1548.3**	No	No	No	No	No	There are old roads in much of this polygon
58	**1.9**	No	No	No	No	No	
59	**257.9**	No	No	No	No	No	
60	**2.5**	No	No	No	No	No	

61	**208.2**	No	No	No	No	No	
62	**11.5**	No	No	No	No	No	
63	**2.6**	No	No	No	No	No	
64	**58.7**	No	No	No	No	No	
65	**24.8**	No	No	No	No	No	
66	**27.8**	No	No	No	No	No	
67	**4.6**	No	No	No	No	No	
68	**162.0**	No	No	No	No	No	
69	**62.1**	No	No	No	No	No	
70	**42.9**	No	No	No	No	No	
71	**1.6**	No	No	No	No	No	
72	**1.2**	No	No	No	No	No	
73	**3.9**	No	No	No	No	No	

Inventory Results: In summary none of the acres contained in the undeveloped polygons meet PWA inventory criteria. All of the acres within the undeveloped polygons are considered other undeveloped lands and are displayed in Map 5.

Table A-3; Summary of inventoried lands for the Kahler Project

	Isolated PWA polygons	Other Undeveloped Lands	Developed Lands (evidence of past harvest and/or roads)	**Total (Acres)**
Kahler Project Planning Area	0	9,931	22,917	**32,848**

Appendix J

Roads and Travel

Travel Action Plan

Kahler
Umatilla National Forest
2014
Risk vs. Value

Prepared By:

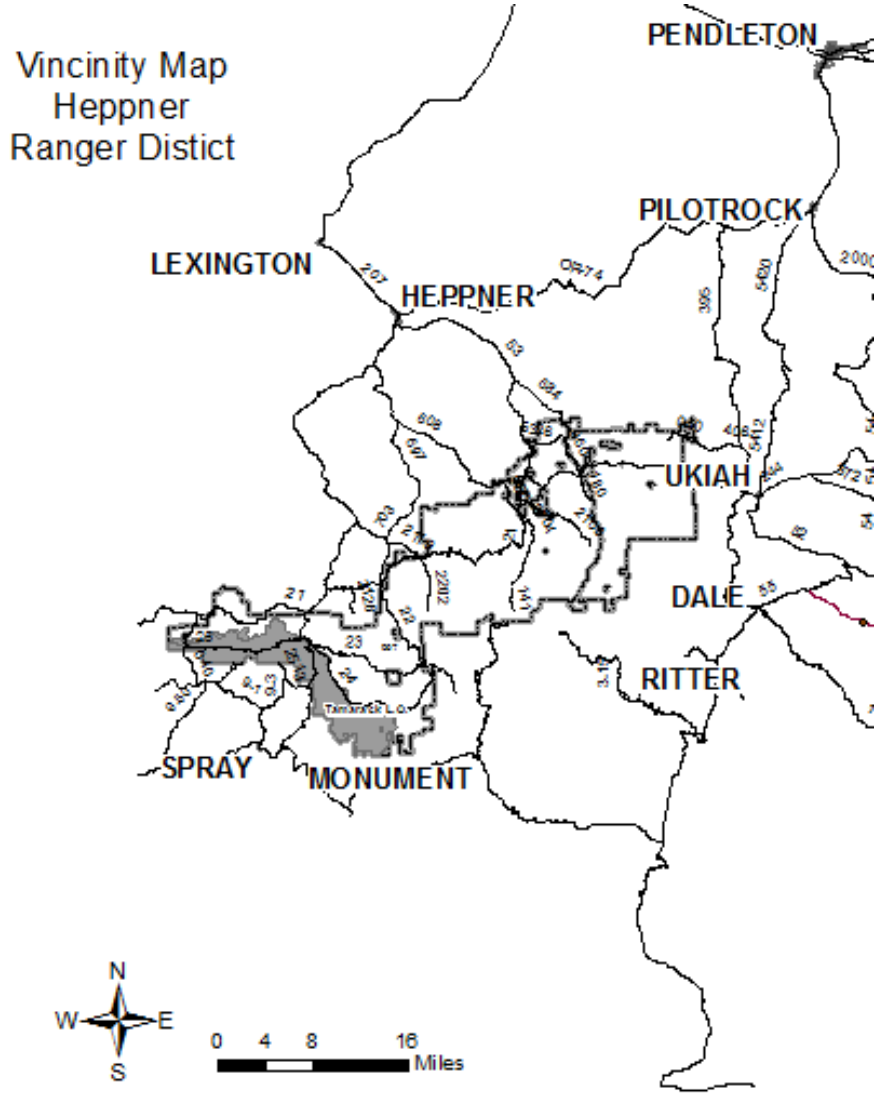
Lori Seitz, South Zone Road Manager
May 2014

The Interdisciplinary team (IDT)

- William Dowdy- Fish Biologist
- Allen Madril - Archeologist
- Kristen Marshal- Fire Fuels
- Tim Garber - Timber
- Edward Farren - Hydrologist
- Gary Popek - GIS Coordinator
- John Evans - Planning
- Joan Frazee- Botanist
- Jim Archuleta- Soils
- Dave Powel –Silviculture
- Randy Scarlet - Wildlife Biologist

INTRODUCTION TO THE ANALYSIS

The Kahler project area is located on the Heppner Ranger District, Umatilla National Forest in the south west end of the district on 32849 acres. This planning area has



Map 1. Vicinity Map of Kahler Project area.

The US Forest Service (FS), Washington Office (WO) recently directed Regional Foresters to implement, by the end of FY15, those sections of Subpart A of the 2005 Travel Management Rule that require each unit of the National Forest System (NFS) to:

- Identify the minimum road system needed for safe and efficient travel and for the protection, management, and use of NFS lands; and ,

- Identify roads that are no longer needed to meet forest resource management objectives and which therefore should be scheduled for decommissioning or considered for other uses.

This process applies the 2012 Travel analysis strategies. By completing this work, the FS expects to identify and maintain an appropriately-sized and environmentally-sustainable transportation system that is responsive to ecological, economic, and social concerns. The WO stated that the NFS road system of the future must continue to provide needed access for recreation and resource management, as well as support watershed restoration and resource

protection to sustain healthy ecosystems. The Heppner Ranger District completed and implemented a travel management plan in the early 1990's. This plan addresses about 178 miles of road in the Kahler analysis area. In 2010 the west end of the district was reevaluated for OHV use. Rimrock, West Bologna, and Wheeler Point planning projects also have influenced the existing travel plan in place. The decision to no longer allow cross country travel by OHVs was made and 15 miles of OHV trails were implemented. The Motor Vehicle Use Maps (MVUM) display the current Access Travel Management (ATM) in this area. The planning area will have several timber sales to be sold starting in 2015 and beyond, prescribed burning and mechanical fuel treatments will also be necessary.
The Kahler timber haul routes will appraise flowing to Highway 207 and can flow to John Day, Pilot Rock, or Reith mills from there.

THE CURRENT SITUATION

The following road classification was used in the analysis.
Table 1. Road classifications.

Functional Class	**Maintenance Level Objective**
Arterial: Provides service to large land areas. Connects with other arterials or public highways. **Collector:** Serves smaller land areas than arterials. Connects arterials to local roads or terminal facilities. **Local:** Single purpose road. Connects terminal facilities with collectors or arterials. **Temporary roads:** These are roads proposed for the Kahler project that will be under permit or other authorization and decommissioned upon the termination of the authorization. These Roads are not necessary for long-term resource management **Unclassified or Unauthorized Roads.** These are defined as Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned traveled way, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization. Roads not authorized or necessary for long-term resource management.	**Level 1:** Closed more than 1 year. **Level 2:** Open - High-clearance vehicles. **Level 3:** Open - Passenger vehicles—surface not smooth. **Level 4:** Open - Passenger vehicles–smooth surface. **Level 5:** Open - Passenger vehicles–dust free; possibly paved.

Transportation System

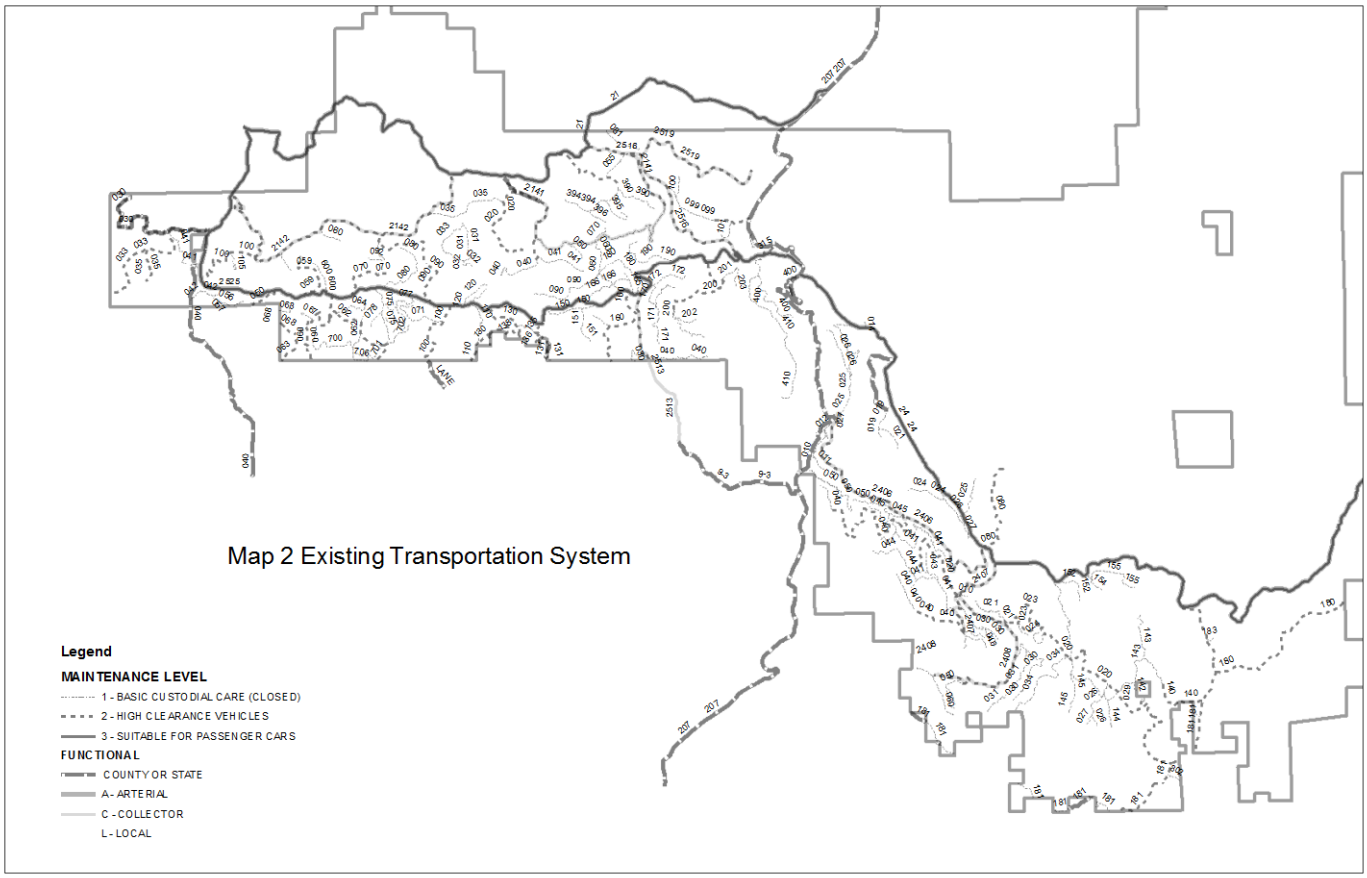
The transportation system on the Heppner Ranger District serves a variety of resource management and access needs. Most roads on the District were originally constructed for commercial use including timber, and grazing. Chronological road construction history within the analysis area correlated with timber harvest. Road 21,24, and 25, are arterial roads that will be resurfaced if funding is available, the timber quantity proposed for this project does not allow for this to be done as part of the sale. Roads 2142, 2406, 2407, 2408, 2513 and 2519 serve as collectors, and are accurately identified as Maintenance Level 2 High Clearance roads. Road 2141 is also identified as a collector but parts of this road is closed and only function as a collector during timber haul. The majority of the roads in this area are locals and in good condition. One new road is proposed to avoid using a private road that is not to standard for haul, and this will allow the decommissioning of an OHV trail that is in a riparian area and in need of a small OHV bridge. The new road will allow OHV access for this area. Nine other roads were found to extend further than mapped adding about 5 miles, of closed road. Nine roads are proposed to decommission. Two unclassified roads were added to the system, during field reconnaissance they were found and are full bench constructioned roads with

culverts, and pit run material, they are needed for management of the National Forest Lands and will be managed as closed with administrative use as necessary.

Table and Map 2. Existing transportation system.

Functional Class	Objective Maintenance Level	Length (MI)
A - Arterial	3 - Suitable for Passenger Car	39
C - Collector	2 - High Clearance Vehicles	19
C - Collector	1 – Basic Custodial Care (Closed	3
L - Local	3 - Suitable for Passenger Car	1
L - Local	2 - High Clearance Vehicles	39
L – Local	1 – Basic Custodial Care (Closed)	55

Map 2. Existing Transportation System.



Access and Travel Management

This area was included in the Heppner Ranger District 1992 Access and Travel Management Plan, and updated with project level analysis over the years such as; Wheeler Point Fire Yr.1996, Rimrock Yr. 2000, Bologna Yr. 2004. The Forest Plan required each district to have an access management plan with an average of about 2.0 miles/ square mile. The Heppner access and travel management planning in the early 90's the forest goal was to have approximately **1.5** miles/sq. miles of open road, this area has an average of 1.8mi/sq. mi. The open roads were review for potential closure. Recreational use in this area is primarily dispersed camping and hunting. Roads with limited campsites were considered as well as ones the reviewers felt could be effectively closed. Both Alternative 2 and 3 meet the Distict goal of 1.5 miles/sq. miles of open road

Table 3. Roads Kahler Project Area.

	Current			Alternative 2			Alternative 3		
	Mi.	%	Density (Mi/Sq. Mi.)	Mi.	%	Density (Mi/Sq. Mi.)	Mi.	%	Density (Mi/Sq. Mi.)
Total Roads	202		3.9	202					
Roads Open	92	45	1.8	75	37	1.5	76	38	1.5
Roads Closed	111	55		127	63		126	62	

*Roads Open include State, County and Motorized trails and not seasonally closed roads or trails as they are open outside of the critical time periods.

Proposed Seasonal Closures (Mi.)		**Alt 2**	**Alt 3**
2407020		1.8	0.0
2408020		2.0	2.0
2408000		3.7	3.7
Total		7.5	5.7
Proposed Year-round Closures (Mi.)			
2141000		1.2	1.2
2406040		3.4	3.4
2407020		0.0	0.5
2408023		0.6	0.6
2500060		0.7	0.7
2500063		0.9	0.9
2500068		0.3	0.3
2500200		1.3	1.3
2500701		0.4	0.4
2500035		0.2	0.6
Total		9.0	9.9
O-2400140 OHV Trail to be closed		0.4	0.4
Total Proposed Road Closures including Seasonal/OHV Trail	16.9	16.0	

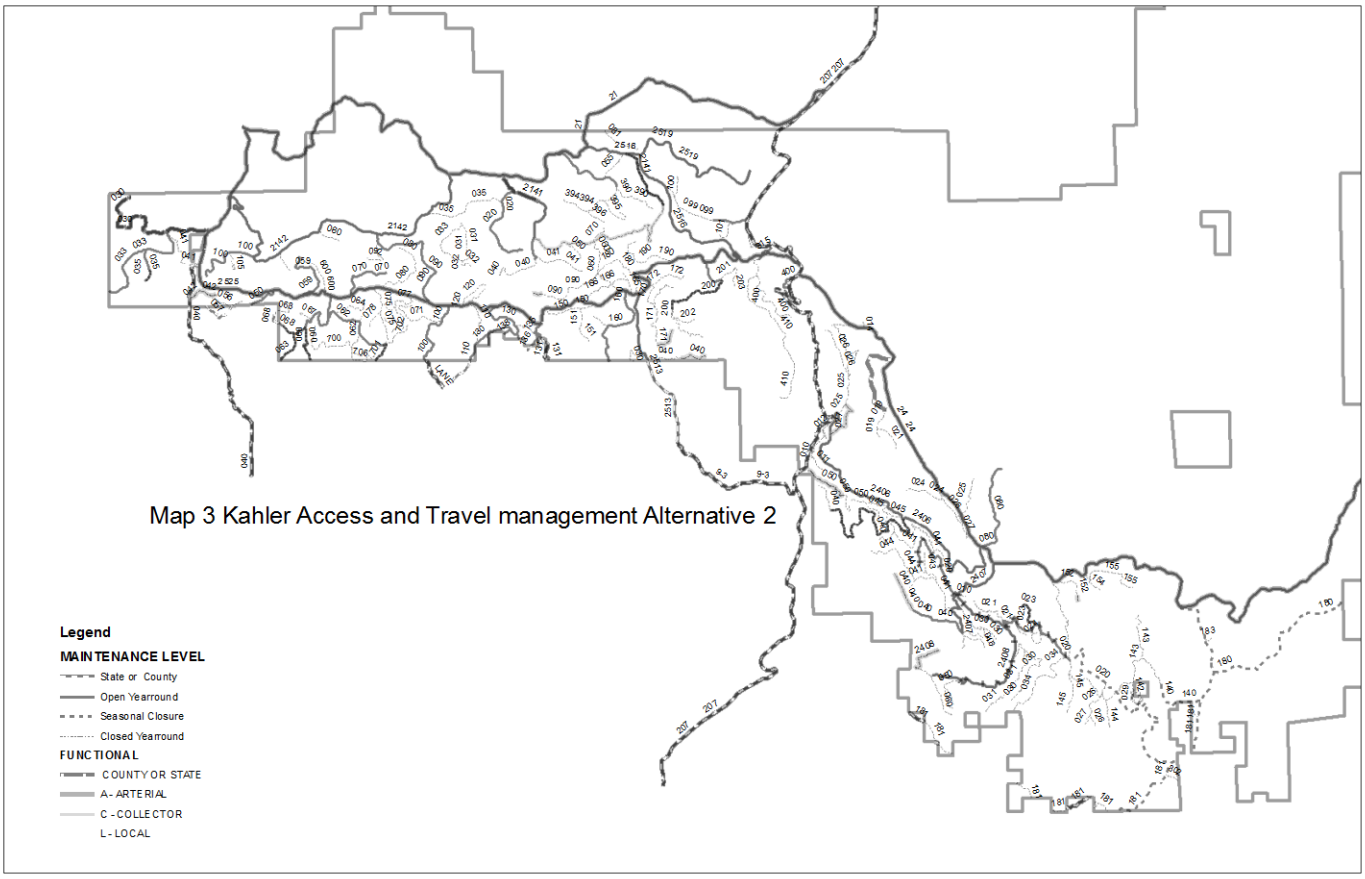
In field work some roads were found to be longer than mapped and two roads that were determined to be a **Forest Road** – *(FSM 7700). A road wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.* These road miles are calculated in the density as closed miles. One New Road is proposed to avoid using and existing road going through private land without a Right of Way and an old road converted to and OHV trail. This new road will also avoid the need to build a bridge going through a stream channel and the need to reconstruct a private road for haul. This trail will then be decommissioned.

Roads miles added to System (Mi.)

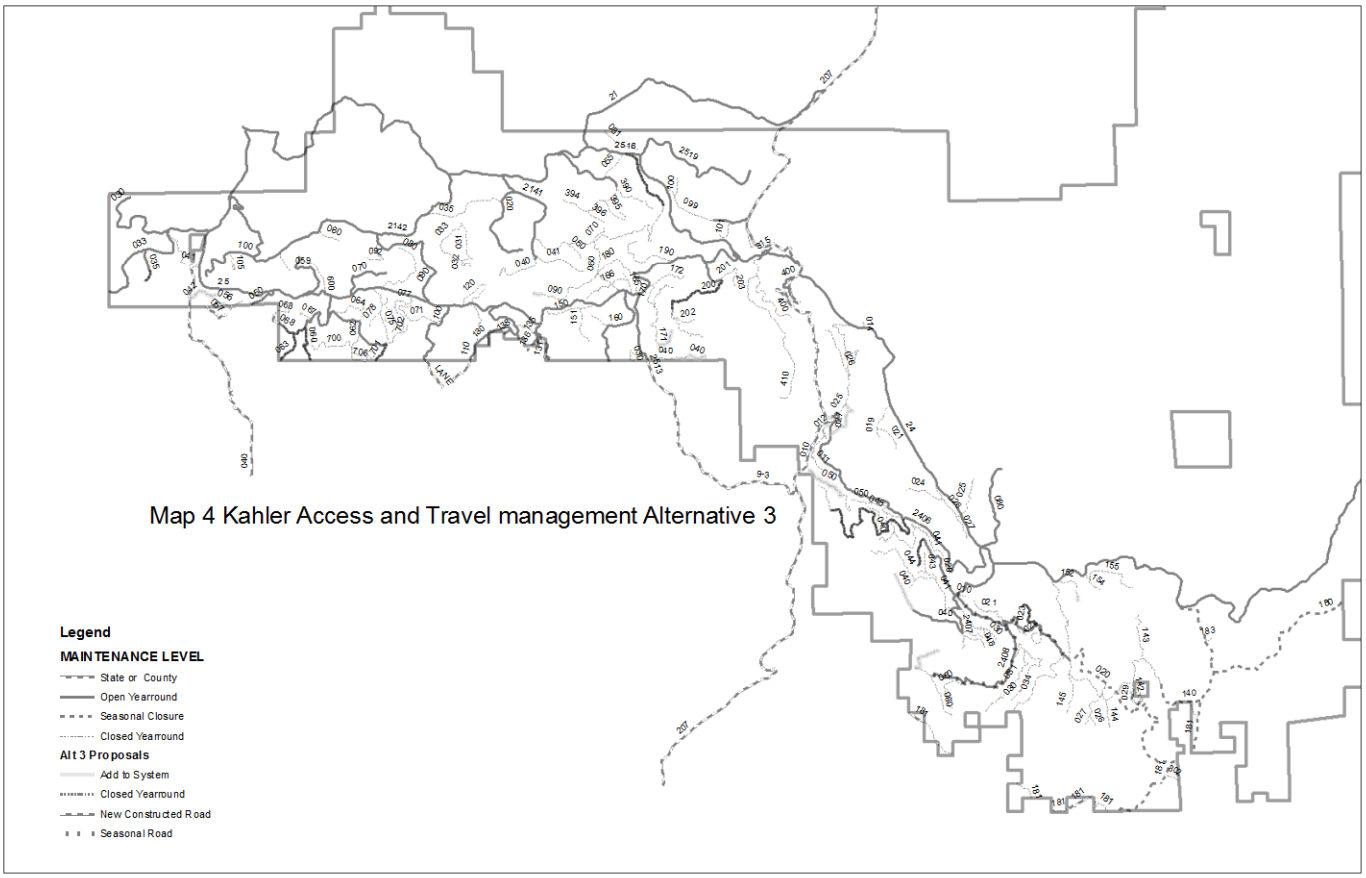
2141090 Corrected length Extended 0.2

2400152 Corrected length Extended		0.1
2406027 Road added as system road.		0.9
2406050 Corrected length Extended		0.9
2407040 Corrected length Extended		0.7
2408000 Corrected length Extended		0.7
2408029 New road construction	0.4	
2500042 Road added as system road.		0.6
2500171 Corrected length Extended		0.4
2513040 Corrected length Extended		0.5
Grand Total		5.4

Map 3. Kahler Access and Travel Management Map Alternative 2



Map 4. Kahler Access and Travel Management Map Alternative 3



Map 4 Kahler Access and Travel management Alternative 3

Minimum road system

Minimum road system analysis also included a value vs. risk assessment. The roads in this Kahler area were analyzed using the following process.

Values vs. Risk

To assess the problems and risks posed by the current road system, the Inter disciplinary Team evaluated the primary transportation system in the Kahler area using the following tools: a GIS assessment, a road matrix, and a road management graph and input from district specialist.

GIS Assessment: The effect of roads on the watershed and aquatic resources was analyzed using GIS computer technology combined with the Forest transportation inventory and cartographic feature files.

Road Event Layer: This is a layer using the management direction for each road. The roads may be segmented by management criteria. Private and County roads are not rated as the USFS does not have management authority for them.

The Road Matrix: The matrix assigns low, medium, or high values to resources, and includes a engineering value of for roads. This is a broad assessment, so the detail and accuracy for road risk and values contain a degree of subjectivity and potential for inaccuracies. However, this road matrix provides road-specific information that will help identify roads that pose high risk to other resources. It categorizes the values and risks of the current road system and helps identify opportunities.

The Road Management Graph: The graph developed to display the information in the road matrix. It categorizes the values and risks of the current road system and helps identify opportunities for managing the road system. This graph is only a management guide.

The risks and values from the road matrix and the road management map are defined below.

Road-related Values:

Recreation Use Values: High values were assigned to roads that are open yearlong or provided direct access to developed recreation sites or private land. Medium values were assigned to road seasonally open. Low values were assigned to roads that are closed.

Resource Management Values: High values were assigned to open road segments that access suitable timber base or range improvements. Medium values were assigned to road segments that are closed but access timber base or range improvements or open roads not accessing timber land. Low values were assigned to road segments closed with little timber base or range use.

Fire Management Values: High values were assigned to open road segments that would assist in quick fire suppression efforts. Medium values were assigned to road segments that are closed but could be used for suppression. Low was assigned to road segments closed in stream channels that would not be used or as a last resort.

Road Engineering Values: There were two ratings given for the engineering values. The first criteria were based on investment in the road surfacing. High values were given to roads with an aggregate surface. Medium values were given to roads improved with pitrun. Low values were assigned to roads with no rock improvement. The second criteria used were based on maintenance. No High values were given as all the open roads in this area are a maintenance level 2 that do not see annual maintenance.

Road-Related Risks

Watershed: Watershed risk was evaluated using the average of three criteria. Some roads were upgraded to higher values based on local Hydrologist input.

- Road crossing the stream channels: High risks were assigned to roads that have segments crossing class 1 or 2 streams. Medium risks were assigned to roads that have segments crossing class 3 streams. Low risks were assigned to roads that have segments crossing class 4 streams.

- Road within the stream buffers: High risks were assigned to roads within 300 feet of class 1 or 2 streams or any passage problems. Medium risks were assigned to roads within 150 feet of 3 streams. Low risks were assigned to roads that are within 150 feet of class 4 streams.

Wildlife Species: High risks were assigned to road segments were open yearlong to travel in summer or winter range. Medium risk was assigned to roads segments open in general forest. Low risks were assigned to roads closed yearlong or road segments open seasonally in summer or winter range. Some roads were upgraded to higher values based on local wildlife biologist input.

Invasive Plant Species: Noxious Weeds is considered a high priority on the district. The noxious weed layer was intersected with the roads layer. Only two ratings were given. High risk was given to any road segment intersecting a known noxious weed site. Low risk was given to all the other roads.

Road Risk/Value Categories

After performing a road-by-road rating of risk and value based on the established criteria, the following road management categories was developed to display the information and present opportunities for road management strategies.

Road Management Categories and Graph

The following four categories of roads were identified based on value and risk. Within each category, there are possible management options for the roads.

Category 1: High Value and Low Risk – Stable Condition

- Consider road maintenance funds on these roads to keep them in this category.
- Low Resource Concerns
- These roads form part of the potential minimum road system for the Forest.

Category 2 – High Value and High Risk – Priorities for Capital Improvements

- Consider opportunities to reduce high risks
- Consider road improvement or capital improvement would reduce risk.
- Consider closing to reduce risk.

Category 3 – Low Value and High Risk – Priority for Action to Reduce Risk

- Consider closing or seasonally closing to reduce risk
- High potential for decommissioning, obliteration or improving value to reduce risk.

Category 4 – Low Value and Low Risk – Stable condition

- Lowest priority for expending annual road maintenance funding.
- Moderate potential for reducing maintenance level and/or functional classification.

Road Risk-Value Graph

Category 2 **HIGH VALUE / HIGH RISK** 30% Review Resource Concerns Priority for Investment	**Category 3** **LOW VALUE / HIGH RISK** 37% 3% After Closures, installation of culverts, Review Resource Concerns Consider Closing/Decommissioning
Category 1 **HIGH VALUE / LOW RISK** 22% Good Condition No Work Necessary	**Category 4** **LOW VALUE / LOW RISK%** 41% Stable Condition No Work Necessary

Risk

*Road miles include entire road segr fined to project boundary.

Figure 4. Road Risk vs. Value

Opportunities and Priorities

One purpose of a roads analysis is to identify ways to more efficiently spend the limited road maintenance dollars allocated to the forests. One approach is to reduce or eliminate expenditures on roads that are not needed or not needed at their current maintenance level. The process described above identifies the Potential Minimum Primary Road System. The following term are used in this plan.

OPEN ROAD	A road without restrictions on motorized use. Open Yearlong to the public.
SEASONAL ROAD	Seasonal is closed to use during certain seasons
CLOSED ROAD	A road on which traffic has been excluded by natural blockage, physical barricade, regulation, or by obscuring the entrance. A closed road is still an operating facility on which traffic has been removed and remains on the Forest transportation system.
DECOMMISSION	To remove those elements of a road that reroute hill slope drainage and present slope stability hazards. Another term is hydrologic obliteration.
	Obliteration: The reclamation and or restoration of land to resource production from that of a transportation facility. The roadbed is treated so that it no longer functions as a road. The wheel tracts or pathway is no longer continuous or suitable for traffic. Obliteration can involve: • Closing entrances. • Scarifying road surfaces, or decompacting (sub soiling) to establish vegetation and reduce run-off. • Seeding to control erosion. • Partial to full restoration of stream channel by removing culverts and fills. • Removing unstable portions of embankments.
ROAD MAINTENANCE	The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective
ROAD RECONSTRUCTION	Activity that results in improvement or realignment of an existing classified road as defined below: • Road Improvement. Activity that results in an increase of an existing road's traffic service level, expands its capacity, or changes its original design function. • Road Realignment. Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway.

Category 1 High Value / Low Risk. These roads form part of the potential minimum road system for the Forest and pose low resource concerns. They are considered to be in a stable condition and no changes are needed.

Road Number	BMP	ATM	ATM Changes	Comment
2000400	0.00	O		
2100390	0.00	O		
2141000	0.00	O		
2141000	4.88	O	C	Proposed closure, more effective
2141020	0.00	O		
2141040	0.00	O		
2142000	1.90	O		
2142000	4.47	O		
2142100	0.00	O		
2142105	0.00	C		
2400080	0.00	O		
2400140	3.35	C		OHV Trail
2400140	4.62	S		
2400180	0.00	S		
2406027	0.00	C		Added to system, has culverts, needed
2407000	0.00	O		
2407020	0.00	O	S	Proposed Seasonal closure wildlife mitigation
2407040	0.00	O		
2408000	0.00	O	S	Proposed Seasonal closure wildlife mitigation
2408020	0.00	O	S	Proposed Seasonal closure wildlife mitigation
2408023	0.00	O	C	Correction Already closed
2408028	0.00	S		
2500030	0.00	O		
2500033	0.00	O		
2500035	0.00	O	C	Proposed closed wildlife mitigation
2500100	0.00	O		
2500131	0.40	O		
2500133	0.00	O		
2500135	0.00	O		
2500136	0.00	O		
2500137	0.00	O		
2500138	0.00	O		
2500139	0.00	O		
2516000	0.00	O		
2519000	0.00	O		
O-2400018	0.00	OHV		

Category 2 High Value / High Risk. These roads will be reviewed as funding becomes available for possible improvements or closure to reduce the risk.

Road Number	BMP	ATM	ATM Changes	Comment

2142000	0.00	O		Major Road Monitor Noxious Weeds
2400000	0.00	O		Major Road Monitor Noxious weeds
2400181	0.00	S		Major Road Monitor Noxious Weeds
2400181	1.85	S		Monitor Noxious Weeds
2406000	0.00	O		Major Road Monitor Noxious weeds
2406040	0.00	O	C	Propose closure
2500000	0.00	O		Major Road Monitor Noxious Weeds
2500050	0.00	O		Access Private Land
2500059	0.00	O		Need Road monitor
2500060	0.00	O		Need Road Monitor Noxious Weed
2500060	0.87	O	C	Proposed closed wildlife mitigation
2500062	0.00	O		Need Road Monitor Noxious Weed
2500063	0.00	O	C	Proposed closed wildlife mitigation
2500070	0.00	O		Need Road Monitor Noxious Weed
2500090	0.00	O		Need Road Monitor Noxious Weed
2500130	0.00	O		Private Land Access
2500160	0.00	O		Need Road Monitor Noxious Weed
2500200	0.00	O		Need Road Monitor Noxious Weed
2500200	1.27	O	C	Proposed closed wildlife mitigation
2500400	0.00	O		Need Road Monitor Noxious Weed
2500701	0.00	O	C	Proposed closed wildlife mitigation
2513000	0.00	O		Major Road

Category 3 Low Value / High Risk. These will be reviewed as funding for possible closures and decommissioning to reduce the risk. The following recommendations will be put in the database for future review.

Road Number	BMP	ATM	ATM Changes	Comment
2406025	0.00	C	D	Proposed Decommission pull Culverts
2406040	3.36	C		Has culverts and monitor noxious weeds. Move to Low Risk
2406041	0.00	C		Clean Culvert keep closed
2500042	0.00	C		Road added to system Install CMP keep closed, Low Risk
2500068	0.00	O	C	Proposed closed wildlife mitigation
2500165	0.00	C	D	Already Decommissioned, Low Risk
2500170	0.00	O		Install culvert, monitor noxious weeds, Low Risk
2500171	0.00	C		Install culvert, Low Risk
2500172	0.00	C	D	Install temporary Crossing Decommission after use

Category 4 Low Value / Low Risk. These roads are in a stable condition with low resource risk and low maintenance cost. They do not pose a high risk to the environment and do not justify additional road maintenance expenditure. They also meet the management direction as most are closed and in a hydrological stable condition.

Road Number	BMP	ATM	ATM Changes	Comment
2000013	0.00	C		
2100390	1.40	C		
2100394	0.00	C		
2100395	0.00	C		
2100396	0.00	C	D	Decommission End
2141000	1.62	C		
2141000	2.39	C	D	Decommission wet area
2141000	2.84	C		Harden and Install culvert
2141035	0.00	C		
2141040	0.44	C		
2141041	0.00	C		
2141050	0.00	C		
2141060	0.00	C	D	Decommission
2141070	0.00	C		
2141090	0.00	C		Fix washout
2141090	1.21	C		Correct length
2142031	0.47	C		
2142032	0.00	C		
2142033	0.00	C		
2142060	0.00	C		
2142095	0.00	C		
2400014	0.00	C		
2400019	0.00	C		
2400021	0.00	C		
2400024	0.00	C		Lengthen culvert
2400025	0.00	C		Pit Road, water source
2400026	0.00	C		OHV trail, wet area
2400027	0.00	C		
2400140	0.00	C		
2400140	1.57	C		OHV Trail
2400140	2.99	C	C	Decommission OHV after new road
2400141	0.00	C		
2400142	0.00	C		Close need to verify not on private
2400142	0.35	C		
2400143	0.00	C		
2400144	0.00	C		
2400145	0.00	C		
2400152	0.00	C		Correct Length
2400154	0.00	C		
2400155	0.00	C		
2400181	3.72	C		Goes in and out of private
2400183	0.00	C		
2400802	0.00	C		
2406010	0.00	C		
2406011	0.00	C		
2406012	0.00	C		
2406020	0.00	C		

2406020	0.37	O		
2406026	0.00	C	D	Already Decommission Can't Find
2406042	0.00	C		
2406045	0.00	C		
2406050	0.00	C		
2406050	1.10	C		Correct Length
2406055	0.00	C		
2407030	0.00	C		
2407031	0.00	C		
2407032	0.00	C		
2407040	1.04	C		Corrected Length
2407041	0.00	C	D	Decommission at end in Stream Not used
2407042	0.00	C		
2407043	0.00	C		
2407044	0.00	C		
2407045	0.00	C		
2407046	0.00	C		
2407047	0.00	C		
2408000	3.84	C		
2408000	4.26	C		Corrected Length
2408010	0.00	C		
2408020	1.97	S		
2408020	4.09	S		
2408021	0.00	C		
2408022	0.00	C		
2408024	0.00	C		
2408025	0.00	C		
2408026	0.00	C		
2408027	0.00	C		
2408029	0.00	C		Proposed New Construction, to avoid private road damage
2408030	0.00	C		
2408031	0.00	C		
2408034	0.00	C		
2408034	1.00	C		
2408034	1.35	C		
2408050	0.00	C		
2408051	0.00	C		
2408060	0.00	C		
2500041	0.00	C		
2500056	0.19	C		
2500056	0.21	C		
2500057	0.50	Other		
2500058	0.09	C		Starts on private no access
2500064	0.00	C		
2500067	0.00	C		

2500068	0.82	C		No access from Private
2500071	0.00	C		
2500075	0.00	C		
2500076	0.00	C		
2500077	0.00	C		
2500078	0.00	C		
2500079	0.00	C		
2500080	0.00	C		Monitor Noxious weeds Weeds
2500092	0.00	C		
2500110	0.00	C		
2500110	0.85	O		
2500120	0.00	C		
2500122	0.00	C		
2500131	0.00	C		
2500131	0.68	O		
2500131	0.97	O		
2500150	0.00	C	D	Decommission in RHCA
2500151	0.00	C		
2500158	0.00	C		
2500161	0.00	C	D	Decommission in RHCA
2500166	0.00	C	D	Already Decommission
2500167	0.00	C		
2500170	0.40	C		
2500171	0.40	C		
2500171	1.30	C		Correct length
2500180	0.00	C		
2500190	0.00	C		
2500200	1.80	C		
2500201	0.00	C		
2500202	0.00	C		
2500203	0.00	C		
2500315	0.00	O		
2500400	0.08	C		
2500410	0.00	C		
2500600	0.00	C		
2500700	0.00	C		
2500702	0.00	C		
2500703	0.00	C		
2500706	0.00	C		
2500706	0.44	C		
2500710	0.00	C		
2513030	0.00	C		Log bridge failed at MP0.32, stable
2513040	0.00	C		
2513040	0.69	C		Correct length
2516055	0.00	C		
2516099	0.00	C		
2516100	0.00	C		
2516101	0.00	C		
2519081	0.40	C		

Map 5 Value Risk Category

Roads Analysis Spreadsheets

Transportation System for Timber Sale

The following is the proposed transportation system for the timber sale by alternative. The roads in the planning area are currently in place, with the exception of one new road proposed temporary roads. Temporary roads are roads proposed for the Kahler project that will be under permit or other authorization and decommission upon the termination of the authorization. These Roads are not necessary for long-term resource management. Some temporary roads were not successfully decommissioned after previous use and are referred to as existing temporary roads. They are not necessary for long-term resource management and will be decommissioned after use.

A new permanent road 0.4 mile in length will be constructed in Alternative 2 and 3 to avoid using and existing road going through private land without a Right of Way or an old road converted to and OHV trail O-2400140. This new road will avoid the need to build a crossing going through a stream channel and the need to harden a private road for haul. OHV trail O-2400140 will then be decommissioned after the project as funds allow. This new road will also give more constant access to NF lands without impacting a private inholding. The new road will be constructed as a mid-slope road allowing for better drainage and reduced sediment issues.

The existing roads are not adequate in some areas and will be reconstructed as necessary for timber haul the rest will be maintenance with standard maintenance work. Road maintenance work includes prehaul and post haul blading, removal and replacement of earth barricade, cleaning of culverts and ditches, and brushing of smaller than 6” reproduction and log out of down trees as necessary. Some rivate roads are also proposed for use. Standard maintenance will be used for these and a road permit from the land owner will be obtained.

Kahler Summary of Alternative

(Miles)

Road Status	Alternative 2	Alternative 3
New Temporary	3.0	3.0
Existing Temporary	6.9	5.4
Private Road	1.2	1.6
Closed Roads	58.2	53.5
Seasonal Roads	5.7	5.7
Open Roads	80.4	76.9
Total Road Miles Used	145.8	143.1

Transportation System Haul Routes Alternative 2

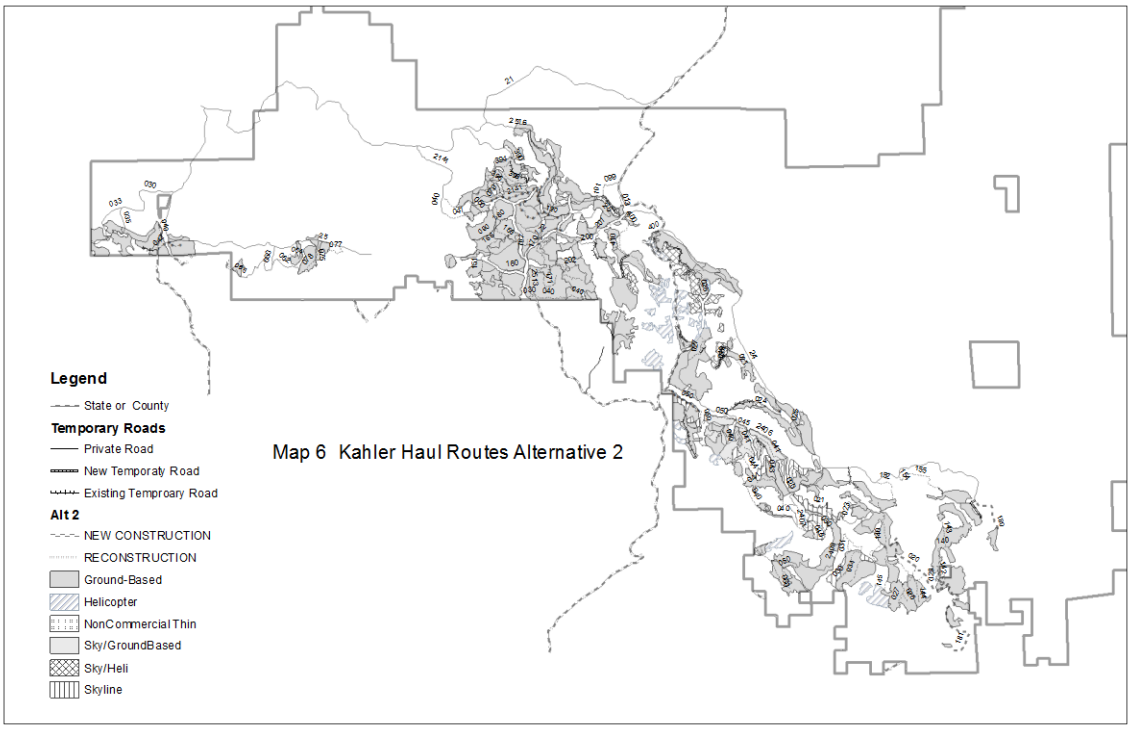
Road No	Reconst (Miles)	Cost	Maint Level	Open Seasonal	Closed	Comments
2000013			1	0.00	0.34	
2000400			3	0.53	0.00	
2100000			2	14.07	0.00	
2100390			2	1.38	0.85	
2100394			1	0.00	0.77	
2100395			1	0.00	0.72	
2100396			1	0.00	0.37	
2141000			2	1.64	0.78	
2141000	2.1	$ 32,640	1	0.00	2.12	Harden and Replace Culvert
2141000			2	1.22	0.00	
2141040			2	0.41	0.00	
2141041			1	0.00	0.61	
2141050			1	0.00	0.37	
2141060			1	0.00	0.49	
2141070			1	0.00	0.36	
2141090			1	0.00	0.59	
2400000			3	10.99	0.00	
2400019			1	0.00	0.66	
2400021			1	0.00	0.54	
2400024	0.1	$ 2,520	1	0.00	1.02	Lengthen Culvert
2400025			1	0.00	0.45	
2400026			1	0.00	0.17	
2400140			1	0.00	3.28	
2400142			1	0.00	0.16	
2400143			1	0.00	0.89	
2400144			1	0.00	0.49	
2400145			1	0.00	0.72	
2400152			1	0.00	0.70	
2400154			1	0.00	0.14	
2400155			1	0.00	1.06	
2400180			2	0.91	0.00	
2400181			2	0.54	0.00	
2406000			2	5.69	0.00	
2406025			1	0.00	1.02	
2406027	0.1	$ 1,500	1	0.00	0.90	Reconstruct Junction
2406040			2	3.38	0.53	
2406041			1	0.00	2.20	
2406042			1	0.00	0.13	
2406045	0.1	$ 1,500	1	0.00	0.67	

2406050	1.1	$ 16,500	1	0.00	1.99	Reconstruct Junction and Remove Slump material last Miles
2407000			2	2.01	0.00	
2407020			2	1.79	0.00	
2407030			1	0.00	0.94	
2407040			2	1.05	0.71	
2407041			1	0.00	1.22	
2407042			1	0.00	0.41	
2407043			1	0.00	0.37	
2407044			1	0.00	1.17	
2407045			1	0.00	0.45	
2407046			1	0.00	0.55	
2408000			2	3.75	1.00	
2408020			2	6.02	0.00	
2408021			1	0.00	0.79	
2408023			2	0.57	0.00	
2408025			1	0.00	0.21	
2408026			1	0.00	0.68	
2408027			1	0.00	0.21	
2408028			2	0.19	0.00	
2408029	0.4	$ 17,500	1	0.00	0.35	
2408030			1	0.00	1.89	
2408031			1	0.00	0.38	
2408034			1	0.00	1.69	
2408050			1	0.00	0.84	
2408051			1	0.00	0.34	
2408060			1	0.00	0.82	
2500000			3	13.91	0.00	
2500030			2	1.51	0.00	
2500033			2	2.17	0.00	
2500035			2	0.63	0.00	
2500042	0.1	$ 2,500	1	0.00	0.60	
2500060			2	1.29	0.00	
2500062			2	0.82	0.00	
2500063			2	0.25	0.00	
2500064			1	0.00	0.79	
2500068			2	0.34	0.00	
2500075			1	0.00	0.59	
2500077			1	0.00	0.57	
2500078			1	0.00	0.33	

2500150			1	0.00	0.28	
2500151			1	0.00	0.67	
2500158			1	0.00	0.54	
2500160			2	1.75	0.00	
2500166			1	0.00	0.80	
2500167			1	0.00	0.17	
2500170	0.1	$ 8,000	1	0.00	1.24	
2500171			1	0.00	1.29	
2500172	0.1	$ 2,500	1	0.00	0.55	
2500180			1	0.00	0.90	
2500190	1.3	$ 19,200	1	0.00	1.28	
2500200			2	1.80	0.99	
2500201			1	0.00	0.40	
2500202			1	0.00	0.62	
2500203			1	0.00	0.38	
2500400			2	0.08	0.41	
2500410			1	0.00	1.84	
2513000			2	1.33	0.00	
2513030			1	0.00	0.18	
2513040			1	0.00	1.20	
2516000			2	3.79	0.00	
2516099			2	0.34	0.00	
2516101			1	0.00	0.41	
O2400018			1	1.50	0.00	
		$104,360		87.66	58.15	

Label	Existing	New	Private	Length
T2000000U43	0.0	0.3		0.3
T2100394U20	0.8	0.0		0.8
T2141U21B	0.1	0.0		0.1
T2400000U69	0.6	0.0		0.6
T2400019U49	0.0	0.4		0.4
T2400021U49b	0.0	0.4		0.4
T240024U58	0.0	0.2		0.2
T2406025U40a	0.0	0.2		0.2
T2406026U99	0.9	0.0		0.9
T2406027R	0.2	0.0		0.2
T2406040U208	1.0	0.0		1.0
T24U73	0.0	0.5		0.5
T2500024L	0.7	0.0		0.7
T2500035	0.3	0.0		0.3
T2500040U3a	0.3	0.0		0.3
T2500152U91	0.2	0.0		0.2
T2500200_1	0.2	0.0		0.2
T2500200U29	0.4	0.0		0.4
T2500410U32	0.0	0.6		0.6
T2516101U28	0.0	0.5		0.5
TU31	0.8	0.0		0.8
TU31b	0.4	0.0		0.4
WHE_3_1	0.0	0.0	1.1	1.1
	6.9	3.0	1.1	11.1

Map 6 Kahler Haul Routes Alternative 2



Transportation System Haul Route Alternative 3

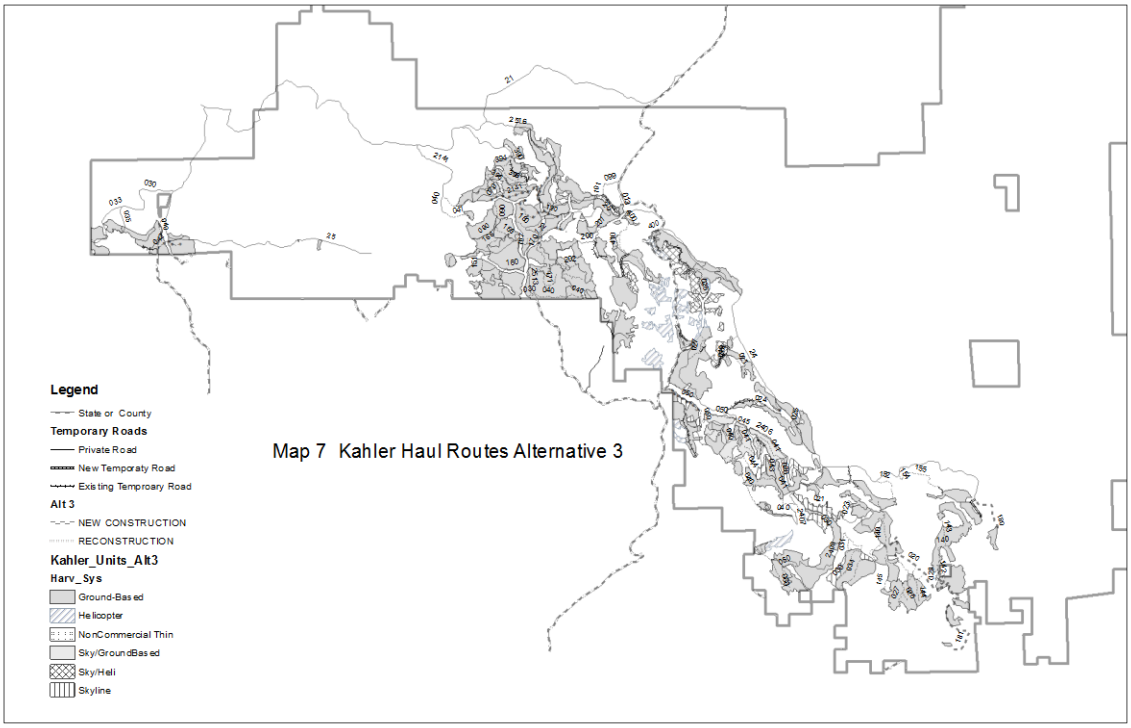
Road No	Reconst (Miles)	Cost	Maint Level	Open Seasonal	Closed	Comments
2000013			1	0.0	0.3	
2000400			3	0.5	0.0	
2100000			2	14.1	0.0	
2100390			2	1.4	0.9	
2100394			1	0.0	0.8	
2100395			1	0.0	0.7	
2100396			1	0.0	0.4	
2141000			2	1.6	0.8	
2141000	2.1	$ 32,640	1	0.0	2.1	Harden and Replace Culvert
2141000			2	1.2	0.0	
2141040			2	0.4	0.0	
2141041			1	0.0	0.6	
2141050			1	0.0	0.0	
2141060			1	0.0	0.5	
2141070			1	0.0	0.4	
2141090			1	0.0	0.6	
2400000			3	11.0	0.0	
2400019			1	0.0	0.7	
2400021			1	0.0	0.5	
2400024	0.1	$ 2,520	1	0.0	1.0	Lengthen Culvert
2400025			1	0.0	0.4	
2400026			1	0.0	0.2	
2400140			1	0.0	3.3	
2400142			1	0.0	0.2	
2400143			1	0.0	0.9	
2400144			1	0.0	0.5	
2400145			1	0.0	0.7	
2400152			1	0.0	0.7	
2400154			1	0.0	0.1	
2400155			1	0.0	1.1	
2400180			2	0.9	0.0	
2400181			2	0.5	0.0	
2406000			2	5.7	0.0	
2406025			1	0.0	1.0	
2406027	0.1	$ 1,500	1	0.0	0.9	Reconstruct Junction
2406040			2	3.4	0.5	
2406041			1	0.0	2.2	
2406042			1	0.0	0.1	

2406045	0.1	$ 1,500	1	0.0	0.7	
2406050	1.1	$ 16,500	1	0.0	2.0	Reconstruct Junction and Remove Slump material last Miles
2407000			2	2.0	0.0	
2407020			2	1.8	0.0	
2407030			1	0.0	0.9	
2407040			2	1.1	0.7	
2407041			1	0.0	1.2	
2407042			1	0.0	0.4	
2407043			1	0.0	0.4	
2407044			1	0.0	1.2	
2407045			1	0.0	0.0	
2407046			1	0.0	0.0	
2408000			2	3.8	1.0	
2408020			2	6.0	0.0	
2408021			1	0.0	0.8	
2408023			2	0.6	0.0	
2408025			1	0.0	0.2	
2408026			1	0.0	0.7	
2408027			1	0.0	0.2	
2408028			2	0.2	0.0	
2408029	0.4	$ 17,500	1	0.0	0.4	
2408030			1	0.0	1.9	
2408031			1	0.0	0.4	
2408034			1	0.0	1.7	
2408050			1	0.0	0.8	
2408051			1	0.0	0.3	
2408060			1	0.0	0.8	
2500000			3	13.9	0.0	
2500030			2	1.5	0.0	
2500033			2	2.2	0.0	
2500035			2	0.6	0.0	
2500042	0.1	$ 2,500	1	0.0	0.6	
2500060			2	0.0	0.0	
2500062			2	0.0	0.0	
2500063			2	0.0	0.0	
2500064			1	0.0	0.0	
2500068			2	0.0	0.0	
2500075			1	0.0	0.0	
2500077			1	0.0	0.0	
2500078			1	0.0	0.0	
2500150			1	0.0	0.3	

2500151			1	0.0	0.7	
2500158			1	0.0	0.5	
2500160			2	1.7	0.0	
2500166			1	0.0	0.8	
2500167			1	0.0	0.2	
2500170	0.1	$ 8,000	1	0.0	0.6	
2500171			1	0.0	1.3	
2500172	0.1	$ 2,500	1	0.0	0.6	
2500180			1	0.0	0.9	
2500190	1.3	$ 19,200	1	0.0	1.3	
2500200			2	1.8	1.0	
2500201			1	0.0	0.4	
2500202			1	0.0	0.6	
2500203			1	0.0	0.0	
2500400			2	0.1	0.4	
2500410			1	0.0	1.8	
2513000			2	1.3	0.0	
2513030			1	0.0	0.2	
2513040			1	0.0	1.2	
2516000			2	3.8	0.0	
2516099			2	0.3	0.0	
2516101			1	0.0	0.4	
		$104,360		82.6	53.5	

Label	Existing	New	Private	Length
T2000000U43	0.0	0.3		0.3
T2100394U20	0.8	0.0		0.8
T2141U21B	0.1	0.0		0.1
T2400000U69	0.6	0.0		0.6
T2400019U49	0.0	0.4		0.4
T2400021U49b	0.0	0.4		0.4
T240024U58	0.0	0.2		0.2
T2406025U40a	0.0	0.2		0.2
T2406026U99	0.9	0.0		0.9
T2406027R	0.2	0.0		0.2
T2406040U208	1.0	0.0		1.0
T24U73	0.0	0.5		0.5
T2500024L	0.7	0.0		0.7
T2500040U3a	0.3	0.0		0.3
T2500152U91	0.2	0.0		0.2
T2500200_1	0.2	0.0		0.2
T2500200U29	0.4	0.0		0.4
T2500410U32	0.0	0.6		0.6
T2516101U28	0.0	0.5		0.5
WHE_3_1	0.0	0.0	1.1	1.1
WHE_3_3	0.0	0.0	0.4	0.4
	5.4	3.0	1.5	9.9

Map 7 Kahler Haul Routes Alternative



Bibliography

U.S. Department of Agriculture, Forest Service. 1992. Motorized access and travel management environmental assessment. Heppner Ranger District. Pacific Northwest Region, Umatilla National Forest, Heppner, OR.

U.S. Department of Agriculture, Forest Service. 2004. Umatilla Forest-Scale Roads Analysis Pacific Northwest Region, Umatilla National Forest.

U.S. Department of Agriculture, Forest Service. 2012. Western Route Transportation Action Plan. Heppner Ranger District. Pacific Northwest Region, Umatilla National Forest.