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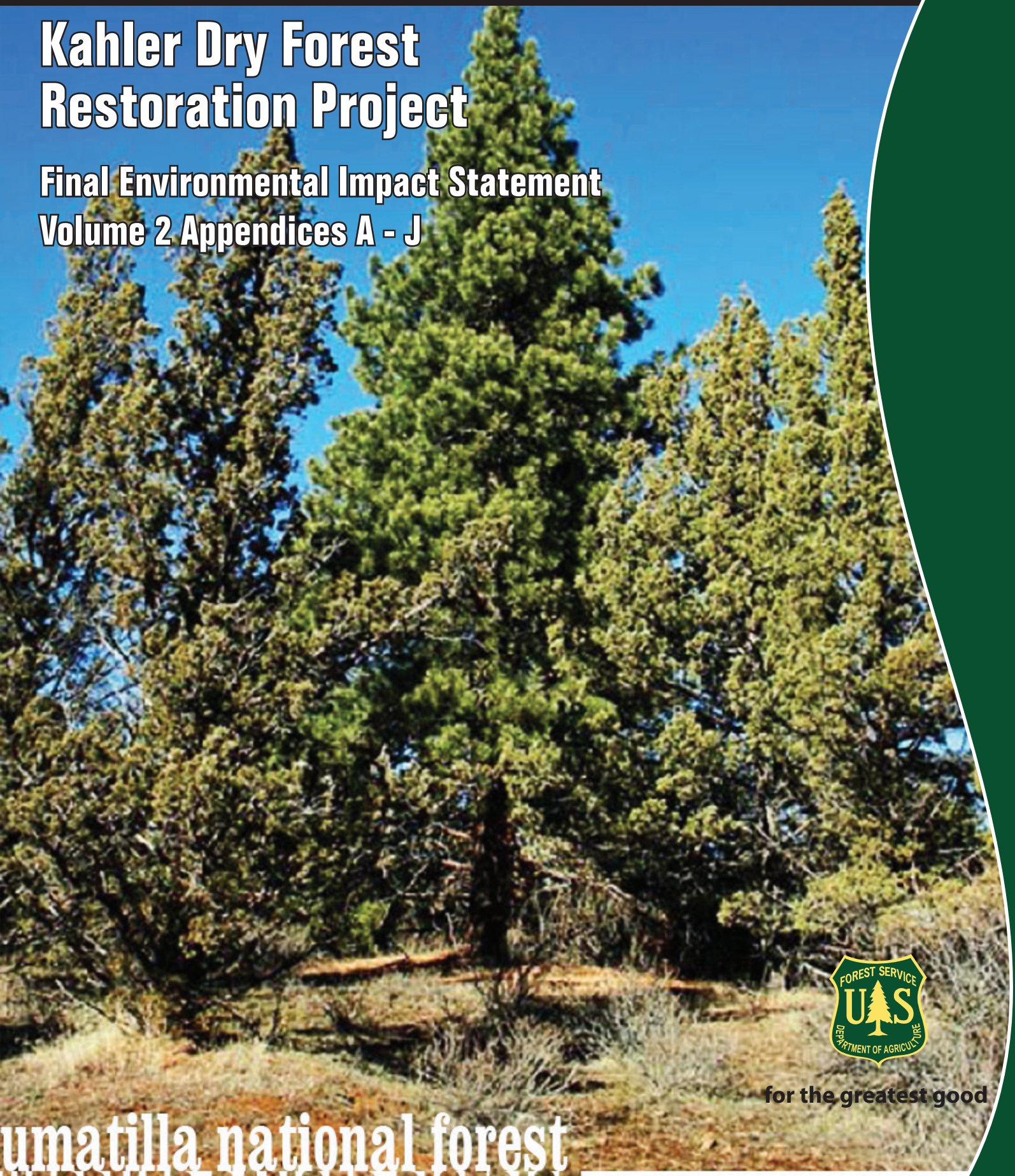
Kahler Dry Forest Restoration Project

Final Environmental Impact Statement
Volume 2 Appendices A - J



for the greatest good

umatilla national forest

HEPPNER RANGER DISTRICT

Project Number 40712
December 2015

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Appendix A
Botanical Resources Report

Kahler Dry Forest Restoration Project

Botanical Resource Report

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for:
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17 March 2015 edited with Alternative 4

7 April 2015, edited to add THEU

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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 1: 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 the one rare plant species known to occur in the Kahler project area, *Thelypodium eucosmum*, plus a list of rare plant species which were thought likely to be encountered within the KDFRPA.

Table 2: Rare plant species known to occur and 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 pockets	known historically from the general 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 in the Kahler project area above Bologna Basin

Information Sources

Sources of information utilized to evaluate botanical resources on the ground rely upon the 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 has resulted in much/most of the KDFRPA being strongly modified, with non-native vascular plant taxa 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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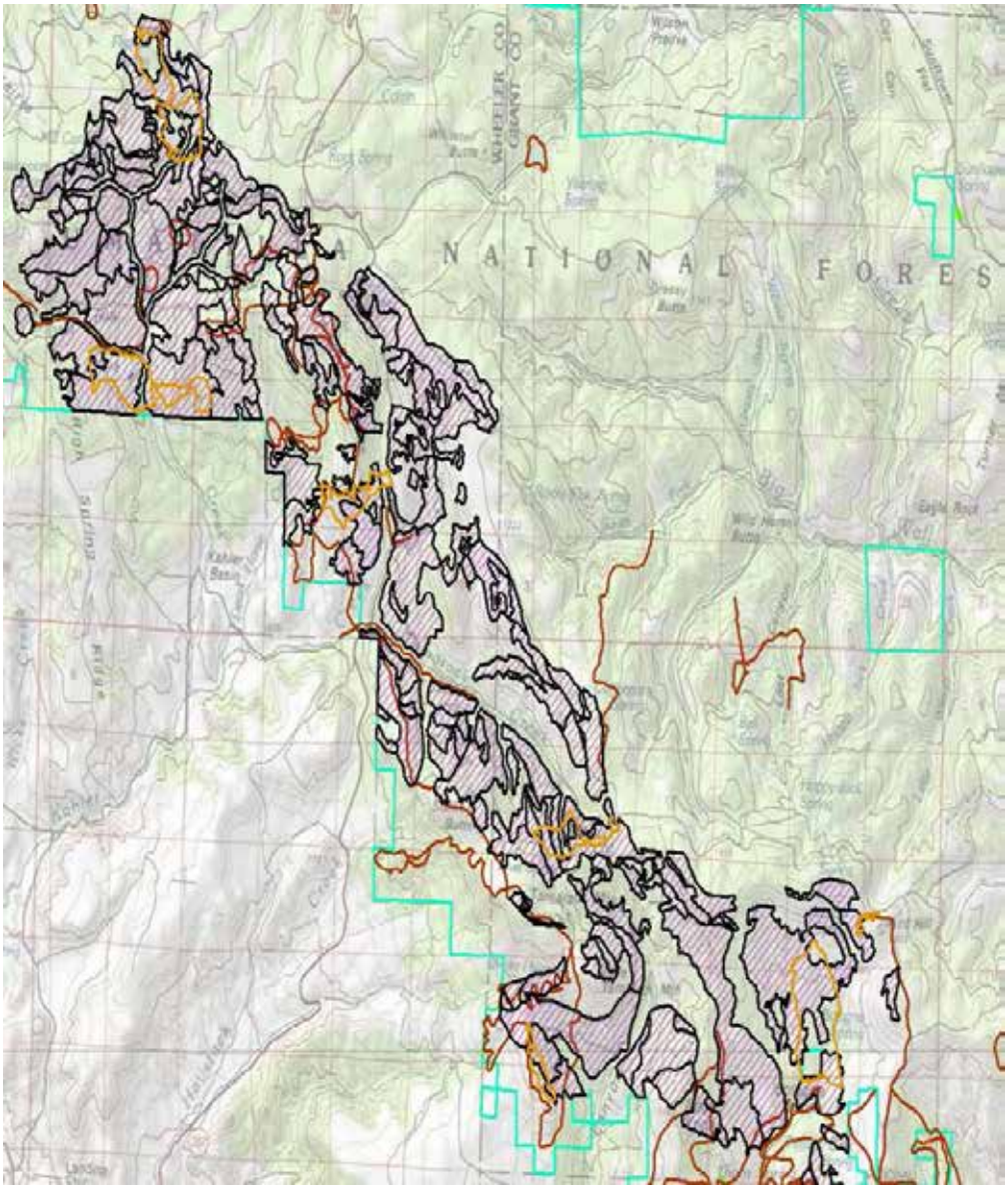

Figure 3: Botanical survey tracks within the KDFRPA. Tracks in orange represent surveys conducted in 2012 and 2013. Survey tracks in brown represent historical surveys conducted within the last 25 years

Rare Plant Populations

Thelypodium eucosmum

Thelypodium eucosmum (arrow-leaf thelypody) was first documented in Bologna Basin in July of 1993 with a total count of 697 plants. This site was revisited in June of 2010 and approximately 1000 plants were counted. This count is difficult to interpret given that the plant was observed to be strongly

rhizomatous. Arrow-leaf thelypody is a locally endemic, biennial or short-lived perennial in the mustard family found only in Grant and Wheeler counties, Oregon, ranging in elevation from 1800 to 5000 feet.

Arrow-leaf thelypody inhabits slopes with vernal moisture sources on otherwise dry sites, and is often found in the shade of junipers or ponderosa pine. It also occurs in sagebrush and grass steppe communities, frequently in association with many introduced weedy species such as *Bromus tectorum* and Lepidium *perfoliatum.*

Thelypodiums propagate by seed, and since they are at least biennial, each plant requires a minimum of one year of adequate moisture to amass the resources necessary to progress from the rosette stage to flowering and fruit set. When the species functions as a short-lived perennial, it may be able to hold for several years as a rosette until conditions are optimum for seed production. However, *Thelypodiums* are known to be highly palatable to cattle, so increasing time to seed set increases vulnerability to predation as well. Since this species often grows in heavily grazed habitat that has lost much of its palatable forage, presence of cattle is probably its primary threat. Several populations documented by historic collections have proved impossible to re-locate, and the species was considered extinct until a new site was documented in 1981.

The population in Bologna Basin, discovered in 1993, is protected by an exclosure fence to keep cattle out.

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.

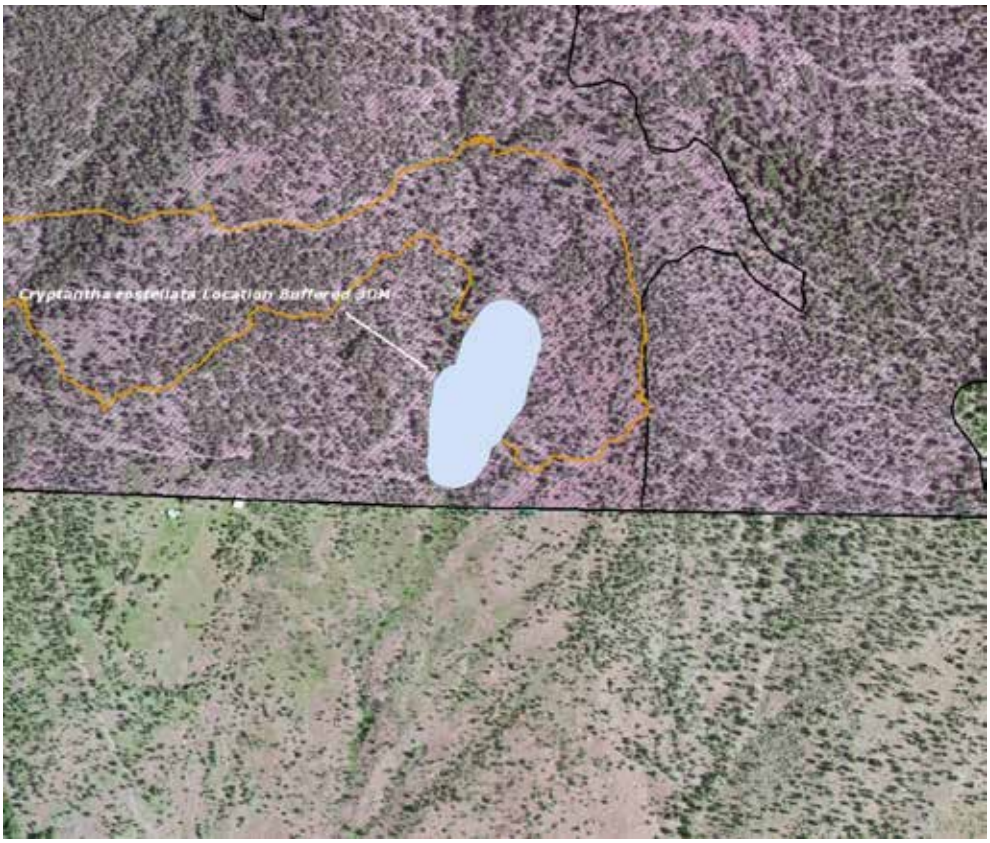

Figure 4: Location of *Cryptantha rostellata* population within the KDFRPA. Track in orange represents survey conducted on 12 June 2013.

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.

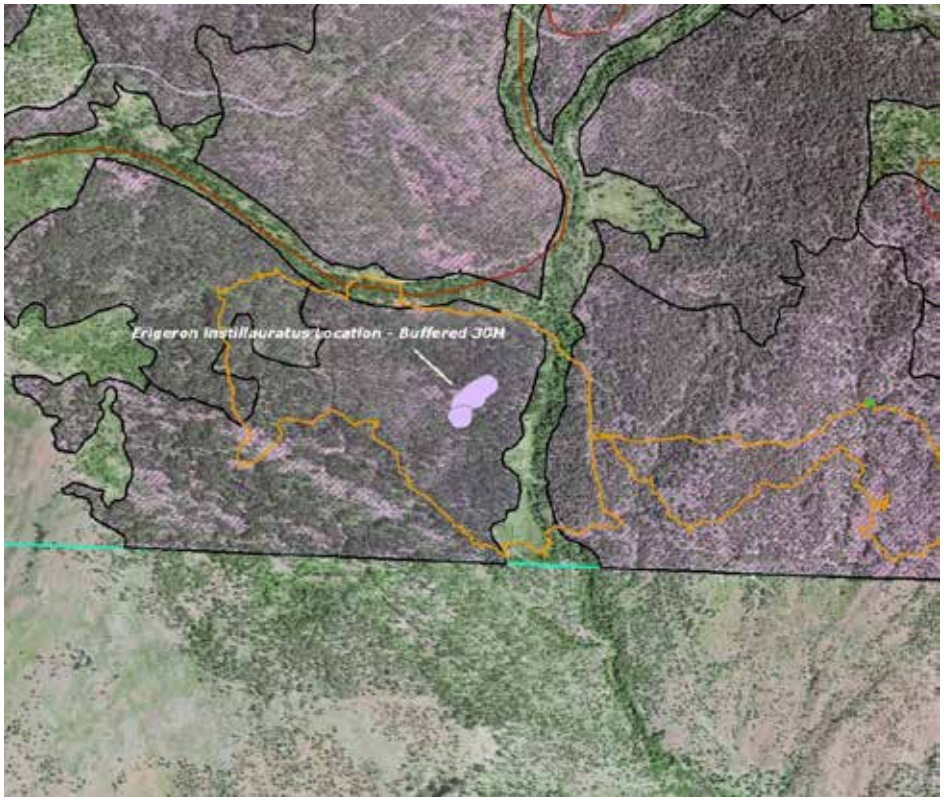

Figure 6: Location of *Erigeron instillauratus* population within the KDFRPA. Tracks in orange represent survey conducted on 6 June 2013 (east) and 11 June 2013 (west).

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.

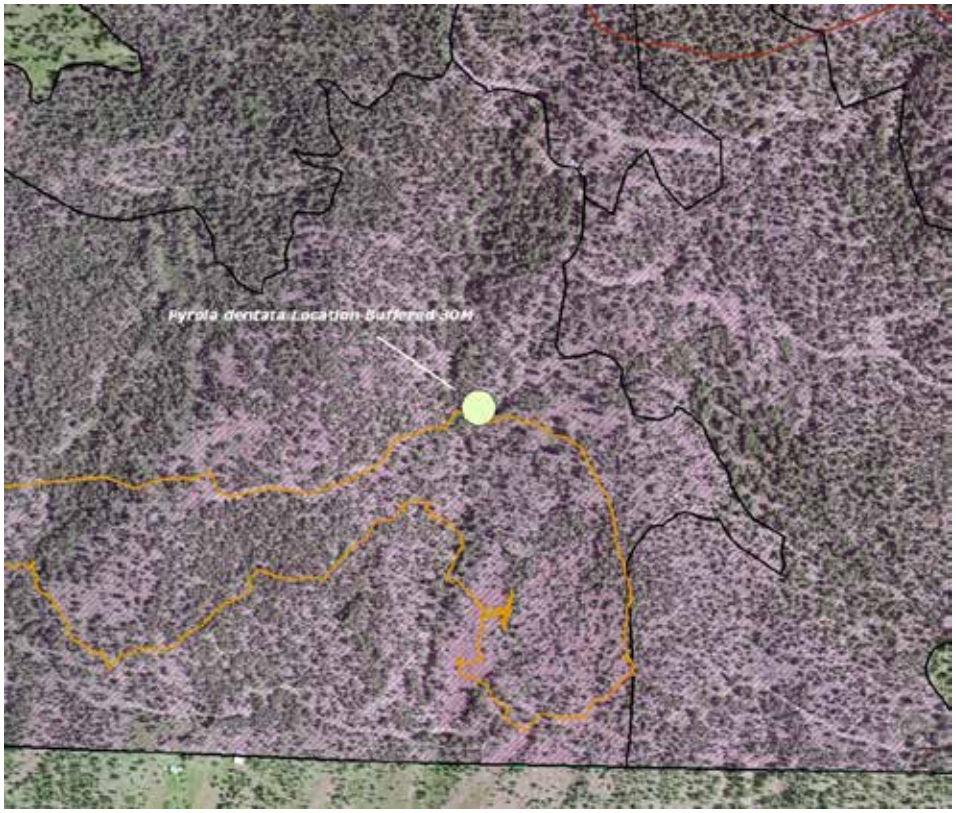

Figure 8: Location of *Pyrola dentata* on the KDFRPA in unit 22.

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.

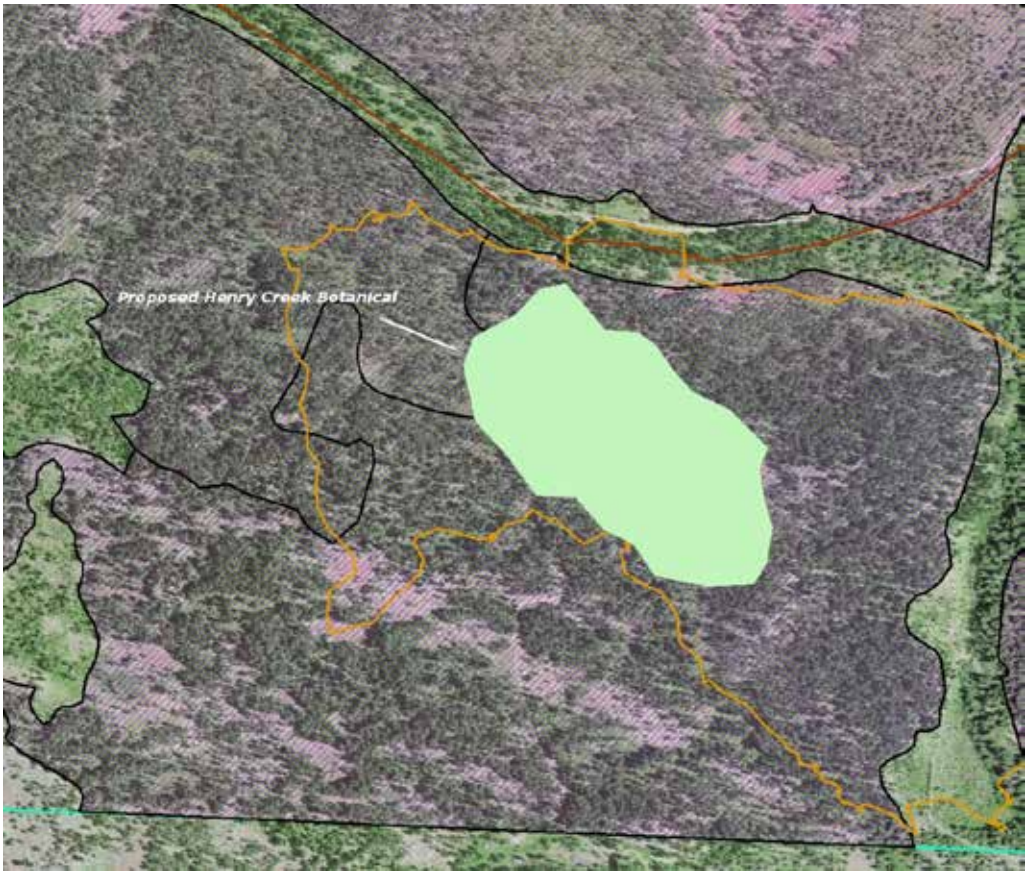

Figure 10: Location of proposed Henry Creek Botanical Area in KDFRPA Unit 14.

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

Effects from Alternative 1 – No Action

Under Alternative 1, the Kahler project would not be implemented. The one sensitive plant species listed on the RFSSSL known to occur in the project area would likely continue to grow and reproduce, protected from cattle grazing by the exclosure fence. 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 severity 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.

Since there is no proposed action under Alternative 1, there are no cumulative effects to consider.

Action Alternatives 2 (Proposed Action), 3 and 4

Complete descriptions of the Proposed Action (Alternative 2) and Alternatives 3 and 4 are located in Chapter 2 of the Environmental Impact Statement (EIS) for the Kahler Dry Forest Restoration project. A brief overview of the 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. Approximately 10,000 acres of upland commercial thinning is proposed.

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 project area based on

examination of 1939 aerial photographs. Grassland/shrub-steppe enhancement through conifer reduction would occur on approximately 1540 acres in the project area.

Following mechanical treatment, approximately 31,020 acres of the project area will be treated using landscape underburning. 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 5,690 acres; 690 acres outside harvest units and 5,000 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 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.

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 EIS.

Alternative 3 was developed to respond to issues related to wildlife, management of the transportation system, and silvicultural treatment within Class 4 RHCA's. 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, refer to Chapter 2 in the Kahler EIS.

Under Alternative 4, trees greater than 21 inches will not be harvested, commercial harvest in Riparian Habitat Conservation Areas will not occur, and no new temporary roads will be constructed. Commercial thinning acres are reduced to 8,230 and non-commercial thinning acres are reduced to 4,110. For a complete comparison of all proposed activities in the three action alternatives see chapter 2 in the Kahler EIS.

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, 3, and 4. 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.

The exclosure fence protecting the RFSSSL listed arrow-leaf thelypody in Bologna Basin from cattle grazing may suffer damage to fence posts that are wood. Design criteria (PF-11) included in Chapter 2 states 'Unit 18 contains a rare plant exclosure, constructed to exclude cattle from the rare plant population. Take steps to limit damage to the fence. Replace posts following the burn, if necessary.'

Direct and Indirect Effects from Action Alternatives 2, 3, 4

There is one RFSSSL listed sensitive plant population in the Kahler project area in Bologna Basin in a proposed prescribed fire unit. Prescribed fire units are consistent across all three action alternatives. The direct effect of fire on this species is not known. Presence of enough ground fuels to carry a fire could result in injury or death of individual plants.

Habitat could be negatively affected by loss of overstory junipers or pines that provide shade to existing populations. Another indirect effect of fire is an increase in non-native invasive plants such as cheatgrass which would result in a degradation of habitat. The indirect effect of damage to the existing exclosure fence will be avoided by design criteria to reconstruct the fence post-fire. The determination for this sensitive plant species is, 'May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species.'

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 from Action Alternatives 2, 3, 4

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 2025, based on the knowledge of proposed projects in the Kahler project area.

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

Past fire suppression activities plus the full suite of ground disturbing activities included in the list of past, present and reasonably foreseeable activities for the Kahler project in the EIS (Chapter 4) are relevant to cumulative effects analysis for sensitive plants.

Cumulative effects to the one RFSSSL sensitive plant species, arrow-leaf thelypody, include effects from the accumulation of fuels as a result of fire suppression, the occurrence of non-native invasive plants such as cheatgrass, and the historic as well as ongoing effects of cattle grazing. The protection of the exclosure fence around the sensitive plant population will ensure its survival in this finite area. The accumulation of fuels may increase the intensity of the fire, thereby resulting in an increase in death and injury of individual plants of the sensitive thelypody. The accumulation of fuels may also increase the risk of death of ponderosa pine and juniper trees providing shade to the thelypody plants. The spread of invasive non-native plants is a cumulative effect of many past and ongoing ground disturbing events and exacerbation of the spread as a result of fire may result in habit degradation and competition for space. 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, the determination of impacts from the proposed Kahler project for RFSSSL sensitive arrow-leaf thelypody is, 'May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species.' The exclosure fence protecting this sensitive plant population from cattle grazing will be reconstructed after the prescribed burn if there is damage to the fence. 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.

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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

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the bases of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, or all or part of an individual's income is derived from any public assistance program, or protected genetic information in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases will apply to all programs and/or employment activities.)

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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 ($)Stump-to-truck	Total($) Log Haul	Road Maint. $/total	total ($)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	23,588,661	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	

Total Project									**12,477,104**

Table 3Financial Summary Alternative #4

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	50820	$19,362,420	3,554,175	2,132,505	236,945	47,389	-	5,971,014	12,084,195
1 Ground based Green Bio	11597	347,910	869,775	521,865	57,985	11,597	-	1,461,222	(1,113,312)
2 Helicopter saw	2743	1,045,083	740,610	123,435	13,715	2,743	-	880,503	164,580
2 Helicopter Green Bio	0	-	-	-	-	-	-	-	-
3 Skyline saw	4497	1,713,357	562,125	202,365	22,485	4,497	-	791,472	921,885
3 Skyline Green Bio	317	9,510	39,625	14,625	1,585	317	-	55,792	(46,282)
4 Shrub Stepp/ Juniper	4916	147,480	368,700	221,220	24,580	4,916	-	621,874	(474,394)
Totals Stump to Truck	71459	21,318,549	6,135,010	3,215,655	357,295	71,459	-	9,779,419	11,539,130
Road Const and Oblit									
Total Project									**11,539,130**

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.

Alternative 4

Alternative 4 was found to be financially viable with a net value of approximately $21,318,549. Alternative 4 has a lower net value than Alternative 3 because of fewer acres and not harvesting Fir trees overs 21 inches DBH. The helicopter volume has dropped to Approx. 1.38 mmbf which makes it potentially unfeasible to harvest due to low volumes and high move in and move out costs. Usually there has to be a minimum of 2mmbf for a helicopter contractor to bid on the contract.

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 Report

Kahler Dry Forest Restoration Project

Fisheries Specialist Report

And

Biological Evaluation

Prepared by:

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July 13, 2015

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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 (CH), 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 1. Summary of Effects by Alternative

	Effects Determination by Alternative			
Species	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
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	No Effect
Chinook salmon and Essential Fish Habitat (EFH)	No Effect	No Effect	No Effect	No Effect
Mid-Columbia River Bull Trout and DCH	No Effect	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	No Impact
Hells Canyon Land Snail	No Impact	No Impact	No Impact	No Impact
Shortface Lanx	No Impact	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	No Impact
Westslope Cutthroat	No Impact	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 2. 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 (USDA Forest Service 2015).

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).

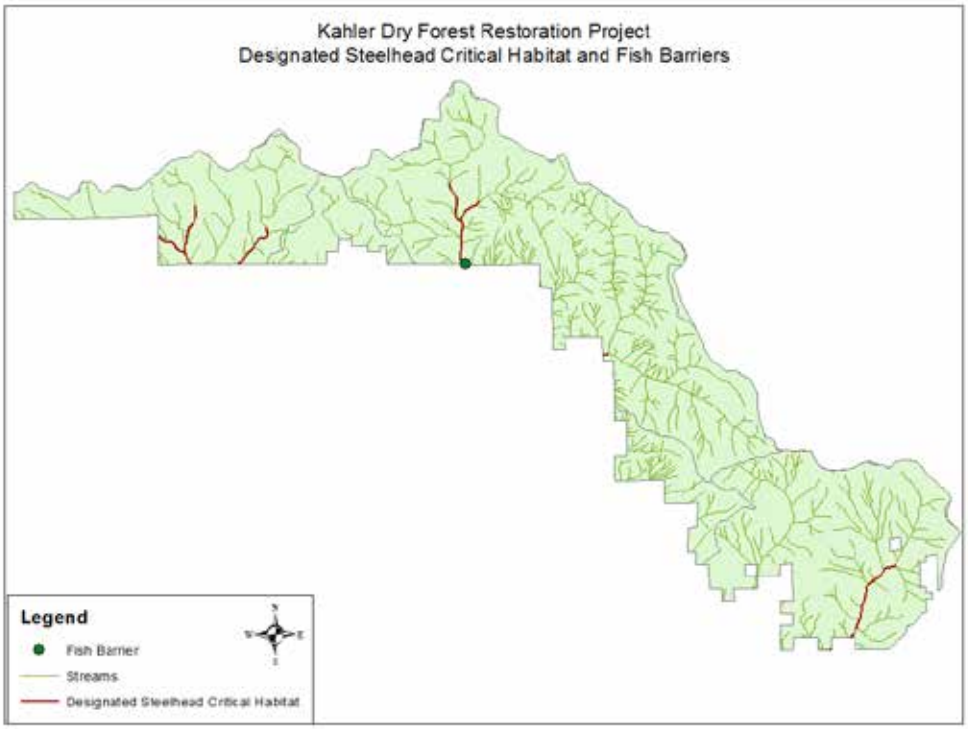
The North Fork John Day (NFJD) summer steelhead population is distinct but, part of the larger John Day River Major Population Group (MPG), within the Mid-Columbia Steelhead ESU. This population of steelhead occupies the highest elevation, and wettest area in the John Day basin. According to the Oregon 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). Mid-Columbia steelhead have been observed in 9.9 miles of streams in the Kahler Project area.

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 1: 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 Bull trout** 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 3. 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 4: 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 5: PACFISH RMO's (UNF LRMP as amended by PACFISH, 1995)

Habitat Feature	RMO's
Pool Frequency 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. Pool frequency values in Table 6 are more reflective of natural stream capabilities within the project area than the RMO values in table 5.

Table 6: 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 7: Seven day maximum moving average stream temperatures (°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 8: 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 2: 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 9: 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 10: 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 11: 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 12: 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 collorate with the lack of LWD in the streams.

Table 13: 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 14: Current status of PACFISH RMO's and trends for fish bearing streams in the analysis area

Stream	Reach	Temp.	RMO* Pools/ mile	ICBEMP[1] Pool/mile	Bank Stability	Width:Depth 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 15: 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	233

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).

The Forest Service guidance for reaching the PACFISH Goals (Desired Conditions) is elaborated in PACFISH components-RHCAs, RMOs, Standards and Guidelines, Watershed Analysis and Key Watersheds (defined under PACFISH as those with listed anadromous species and Designated Critical Habitat-PACFISH EA) and Monitoring. The proposed project contains riparian habitat conservation areas, is within a watershed for Mid-Columbia steelhead, includes active and passive restoration elements, and project monitoring. A watershed analysis was determined unnecessary for compliance with applicable PACFISH Standards and Guidelines.

The Kahler Project is designed to meet the PACFISH Riparian Management Objectives (RMOs) for Fire/Fuels Management TM-1 a. and b, and FM-1 and FM-4.

Riparian Goals Page C-4

The goals are to maintain or restore:

(1) Water quality to a degree that provides for stable and productive riparian and aquatic ecosystems;
(2) Stream channel integrity, channel processes, and the sediment regime including the elements of timing, volume, and character of sediment input and transport under which the riparian and aquatic ecosystems developed;
(3) Instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges;
(4) Natural timing and variability of the water table elevation in meadows and wetlands
(5) Diversity and. productivity of native and desired non-native plant communities in riparian zones;
(6) Riparian vegetation to:
    a) Provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems;
    b) Provide adequate summer and winter thermal regulation within the riparian and aquatic zones; and
    c) Help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed.
(7) Riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region; and
(8) Habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities.

Effects for Fisheries

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 16: Indicators for Assessing Effects for Fisheries

Objective	Indicator	Justification
Water Quality	Stream temperature	UNF and LRMP as amended by PACFISH, 1995
Water Quality	Sedimentation	UNF and LRMP as amended by PACFISH, 1995
In-stream Habitat	Large Woody Debris (LWD)	UNF and LRMP as amended by PACFISH, 1995
In-stream Habitat	Pools per mile	UNF and LRMP as amended by PACFISH, 1995
Channel Stability	Stream Bank Stability	UNF and LRMP as amended 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 alternatives 2 - 4are 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 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 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. These effects would be similar under alternatives 2 and 3 because both alternatives harvest in Class IV RHCA's. Alternatives 1 and 4 would have similar no effect because there would be no harvest in Class IV RHCA's.

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 17: 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 18: 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 the following 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

Alternative 2

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

Alternative 3

The connected actions in Alternative 3 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.

Alternative 4 – modified Proposed Action

Alternative 4 was developed to meet the Purpose and Need for the Kahler Dry Forest Restoration Project, while addressing the issues identified in Chapter 1 of the EIS.

Under Alternative 4 trees greater than 21 inches will not be harvested, no commercial harvest in Riparian Habitat Conservation Areas will occur, and no new temporary roads will be constructed. Actual harvest acres in this alternative would be approximately 9,700 acres.

Upland Forest Thinning

Alternative 4 will also utilize variable density thinning with skips and gaps to reduce tree density, shift species composition, and promote old forest structure. Approximately 8,230 acres of upland forest thinning would occur within the project area.

Shrub Steppe Enhancement

Under Alternative 4, treatment of Shrub/Steppe areas would be less than Alternative 2 - approximately 1,465 acres.

Prescribed Fire

Prescribed fire would be the same under Alternative 4 as Alternative 2 - approximately 31,020 acres of the project area could be treated.

Noncommercial Thinning

Similar to Alternative 2, noncommercial thinning would occur on approximately 4,800 acres; 690 acres outside harvest units and 4,110 acres within harvest units. An additional 155 acres of juniper thinning is proposed for two units (23 and 12) and would be non-commercially thinned (by hand) in marginal elk cover stands to due to fuels, silviculture, and wildlife concerns related to juniper encroachment in these stands and retaining elk cover adjacent to the Wheeler Point burn.

Riparian Area Thinning

Only prescribed fire would be used for thinning in riparian areas.

Tamarack Fire Lookout Thinning

Thinning operations near the Tamarack Fire Lookout under Alternative 4 would be the same as Alternative 2.

Connected Actions

Alternative 4

The connected actions in Alternative 4 would be the same as Alternatives 2: Danger tree removal (less due to changes in use and maintenance of access and haul roads described below) would occur where necessary, 10 acres of aspen restoration, reforestation where needed, and treatment of residual debris.

Access

The miles of roads would be decreased under Alternative 4 and three miles of new temporary road construction would not occur. See the Travel Action Plan for tables of open and closed roads in Alternative 4.

Treatment Comparison Tables by Alternative

Table 19 presents a summary of timber harvest acreages of different treatments by all action alternatives.

Table 19: Timber Harvest Acreages by Alternative

	Alternative 2 (Acres)	Alternative 3 (Acres)	Alternative 4 (Acres)
Commercial Thinning	10,000	9,170	8,230
Non-Commercial Thinning	690	845	845
Shrub/Steppe	1,540	1,540	1,465
Total Treatment	**12,230**	**11,555**	**10,540**

Tables 20 – 22 presents summaries by acres of different harvest systems in the categories of the proposed actions as presented in alternatives 2, 3, and 4.

Table 20: Alternative 2 Acres of Riparian Treatments within Class 4 Buffers. All Class IV riparian areas have 75 – 100 foot no mechanical entry dependent on site specific conditions.

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

Table 21: Alternative 3 Acres of Riparian Treatments within Class 4 Buffers). All Class IV riparian areas have 75 – 100 foot no mechanical entry dependent on site specific conditions.

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 22: Other Activities

	Alternative 2	Alternative 3	Alternative 4
Underburning and piling	7,000* acres	6,420* acres	5,760 acres
Landscape Underburning	31,019 acres	31,019 acres	31,020 acres
Anticipated volume (Board Feet)	~49 mmbf**	~47 mmbf**	
Stream Restoration			
Headcut Repair	None		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 23: FS Road Miles by Alternative

	Alternative 2	Alternative 3	Alternative 4
Open	80.4	76.9	76.9
Seasonal	5.7	5.7	5.7
Closed	58.2	53.5	51.5
OHV Trail Use	1.5	1.5	1.5
FS Haul	145.8	134.6	135.6
New Construction (Closed Road)	0.3	0.3	0.4
Private Road	1.2	1.6	1.5
Temporary Road	10	8.4	0
Total Proposed Road Closures including Seasonal/OHV Trail	19.1	17.3	16.1
Percent Total Roads Closed including Seasonal	8%	8%	8%
Percent Total Roads Closed During Hunting Season	9%	10%	10%

New Open Density Mi/SqMi)	1.5	1.5	1.5
Decommission Roads	5.6	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) (USDA 2012) 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. Unless otherwise stated, these measures apply to the proposed action and all action alternatives.

Direct and Indirect Effects

(Action Alternatives)
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. Alternative 4 proposes no harvest in Class IV RHCA's and therefore no effect to ESA listed species.

Specific design elements and features 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, (4/12/2015, 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

Action Alternatives 2 and 3 (see Alternative Comparison Tables 19-23 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 WQ9, heavy equipment use will be suspended when the soil is too wet and ruts greater than 2-4 inches occur. Alternative 4 would reduce the diameter of harvest trees, and omit harvest in RHCA's.

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.

Action activities for alternatives 2 and 3 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. Alternative 4 omits harvest in Class IV RHCA's and would not lead to increased stream temperature or sedimentation.

The action Alternatives (2 and 3) 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 20). Alternative 3 proposes 657 acres of the same treatments (see Table 21). 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. Alternative 4 would only allow prescribed fire as a thinning agent in Class IV RHCA's.

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 under Alternatives 2, 3, or 4 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. Alternative 4 further reduces risks of sediment inputs and groundwater impacts relative to alternatives 2 and 3 due to no proposed harvest in Category 4 RHCAs. There is an increased risk from project activities relative to alternative 1 but unlikely due to BMPs and activity distance from stream channels.

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. Effects similar under all alternatives.

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 under alternatives 2 and 3 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. Alternative 4 would maintain stream shade and riparian canopy. Effects to stream temperatures and stream flow are expected to be similar under all alternatives.

The harvest combined with the RHCA fuel treatments under alternatives 2 and 3 are expected to make the riparian canopy more resilient to wildfire by reducing or removing intermediate and ladder fuels, and ground fuels. Alternative 4 would maintain current vulnerabilities to wildfire that are present under existing conditions, similar to effects of the No Action alternative.

Prescribed Burning

These Alternatives (Alternatives 2-4) 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. Alternative 4 would allow for prescribed burning in Class IV RHCA's.

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 (Alternatives 2, 3, and 4)

Sediment

The proposed activities (alternatives 2, 3, and 4) 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 alternatives 2 or 3. Alternative 4 would maintain current vulnerabilities to wildfire that are present under existing conditions, similar to effects of the No Action alternative.

Temperature

The proposed activities (Alternatives 2 and 3) would cause a slight reduction in shade casting vegetation. Alternative 4 which allows for no harvest in Class IV RHCA's and would have no impact on stream temperature. 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 any of the action alternatives.

Large Woody Debris (LWD)

The proposed activities (alternatives 2 and 3) 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). Alternative 4 allows for no entry or harvest in Class IV RHCA's would maintain current vulnerabilities to wildfire that are present under existing conditions, similar to effects of the No Action alternative. Only prescribed fire would be used for thinning in riparian areas. Alternative 4 would not change the current status of LWD in Class IV RHCA's.

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 action alternative 2 or 3. Alternative 4 does not allow harvest in RHCA's and would maintain current vulnerabilities to wildfire that are present under existing conditions, similar to effects of the No Action alternative.

Bank Stability

Based on recent stream surveys, bank stability is greater than 89 percent for streams surveyed (see Table 8). 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 action alternative 2, 3, or 4. Under alternative 4 no harvest in Class IV RHCA's would ensure that bank stability is maintained.

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. Alternative 4 would use 1.5 miles of private road, 5.4 miles of temporary roads, and 0.4 miles of newly constructed 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). Under alternative 4 no new temporary roads will be constructed. 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 18 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 17 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 25 shows the estimate for sedimentation of timber harvest by alternative action.

Table 25. Action Alts Sedimentation from Timber Harvest in Tons/mi^2 and Tons/year.

Alternatives 2, 3, and 4 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%
Alt 4 percent above background			0%

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 25). This rate of sedimentation from harvest would end when harvesting activities ended and sediment inputs would decline to background rates from roads and hillslopes (Table 18).

Table 26 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.

Table 26. Action Alts Sedimentation from Prescribed Fire in Tons/mi^2 and Total Tons/year.

Alternatives 2, 3, and 4 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%
Alt 4 percent above background			0%

Notes: 3. WEPP Disturbed Model.

It would begin after the harvest was complete, and occur during the second approximately 5 years of the project.

The 4.3 percent increase in tons per square mile per year of sedimentation for the Kahler Project under alternatives 2 or 3 and zero percent increase for alternative 4 compared with the 71.5 percent increase for the Wheeler Point Fire shows that alternatives 2-4 would produce less

sediment than wildfire. 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. Under alternative 4 there will be no increase in sedimentation beyond background levels.

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 under alternatives 2 and 3.

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

All of these alternatives (Alternatives 2-4) 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 or 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.

Additional Information for Future Fish Passage Restoration Projects

The following description of future fish passage projects in the Tamarack Creek area is independent of the Kahler Dry Forest Restoration Project. The information is included here for future project implementation. Section 7 ESA consultation for instream restoration culvert replacements will occur through the Aquatic Restoration Biological Opinion (on file, Heppner RD), independent of the Kahler Dry Forest Restoration Project.

The first crossing of Tamarack Creek is located at Highway 207 (culvert id #212 in the culvert passage inventory database) and retrofit would provide full year access where there is currently a seasonal lowflow barrier to juvenile steelhead and a spring velocity barrier for adults at certain high flows. Passage improvement at Hwy 207 would improve access to 1.4 mile of fish habitat upstream in Tamarack Creek for steelhead juveniles, resident redband trout and other aquatic species.

A no-name tributary (T8S, R25E, section 1; enters Tamarack Creek 1.4 miles upstream of the Hwy 207 crossing. Juvenile salmonids have been observed in that tributary up to headwater perennial forks (T8S, R25E, section 1), indicating that fish use in Tamarack Creek extends to that confluence in typical water years. No fish were observed in Tamarack Creek or the tributary in a 1991 stream survey. That year was a drought year in the Blue Mountains (k.ramsey, pers. obs.), and Tamarack Creek is naturally flow-limited even in better water years.

A culvert on FR 2406 at that crossing (culvert id#213 in the culvert passage inventory database) also poses a seasonal barrier for juvenile salmonids and would also be improved for the passage of all aquatic organisms. Removal of that barrier would improve access to 0.4 miles of tributary habitat in the unnamed tributary, up to the headwater forks. In above-average water years fish could conceivably move as far upstream as the second culvert crossing of Tamarack Creek on FS 2406 (T8S, R26E, section 6), which is an additional identified passage barrier (culvert id# 214 in the passage inventory database), 0.3 miles upstream of the fishbearing tributary confluence.

Improvement of the 2406 road crossing of Tamarack Creek could potentially provide access to an additional 1.4 miles from that point upstream in good water years, to the confluence of the uppermost perennial forks of Tamarack Creek (T8S, R26E, section 8), though currently the stream sections upstream of the first perennial tributary to Tamarack Creek upstream from Hwy 207 are all categorized as perennial non-fishbearing (Streamclass 3) and current known fish use in Tamarack Creek ends 0.3 miles downstream of the 2406 barrier.

RECOMMENDATION: Once passage is improved at Hwy 207 and on the unnamed fishbearing perennial tributary (T8S, R25E, section 1), the segment of the unnamed tributary should be reclassified as a perennial fish-bearing anadromous stream segment (Streamclass 1) up to the perennial forks, since fish are using habitat up to that point. The streamclass 3 segment of Tamarack Creek downstream of that tributary, should also be reclassified as perennial fish-bearing anadromous (Streamclass 1) from its current designation as perennial non-fishbearing (streamclass 3), based on the assumption that the fish observed in the fishbearing unnamed tributary are juvenile steelhead resulting from occasional adult spawning activity in the tributary or in Tamarack Creek itself. Stream segments upstream of the fishbearing tributary, to the 2406 crossing of Tamarack Creek, should be monitored for fish presence below the barrier in typical lowflow water years, before investing in removal of the barrier, as cost-effectiveness in terms of the amount of habitat to be gained above the barrier is currently undetermined.

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 their designated critical habitat. The project would have no impacts to Chinook salmon which are not found within or near 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, or 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 and 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).

Alternative 4
Under this alternative, there would be no direct, indirect, or cumulative impacts to this species or its habitat from the Kahler Dry Forest Restoration Project. It is expected that the trees and ground fuels in Class IV RHCA's 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.

Chinook salmon and Essential Fish Habitat (EFH)

Alternatives 1, 2, 3, and 4
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, 3, and 4
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, or 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 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.

Alternative 4
Under alternative 4 there would be no harvest in Class IV RHCA's and therefore there would be no direct, indirect, or cumulative impacts to this species and its habitat from the Kahler Dry Forest Restoration Project.

Hells Canyon Land Snail

Alternatives 1, 2, 3, and 4
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, 3, and 4
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, or cumulative impacts to this species and its habitat.

Alternatives 2, 3, and 4
Any effects on sediment, water temperature, pool frequencies, and large woody debris, may indirectly affect Columbia clubtail 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, 3 and 4

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.

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Appendix A

Fire and Fuels and Air Quality		
Project Area	Label	Design Element
All Units	PF1	Burn prescriptions are designed to mimic low intensity fire (under 4 foot flame lengths). Where heavy fuel accumulations exist, adjust timing or method of fuel reduction, or exclude these areas from landscape underburns.
	PF2	As part of the plan for retention of logs and snags, protection measures will be used during prescribed underburning to reduce consumption of these large woody fuels needed for wildlife habitat and hydrologic stability. If slash piling occurs, locate piles at least 25 feet from the drip line of live trees (all species, including large old juniper) and snags (>10 inches DBH). Locate piles at least 10 feet from downed wood (>12 inches DBH). Pull back slash from and do not place piles near archeological sites. Pull burnable material away from and scrape to mineral soil around dendroglyph sites or exclude those areas from burning.
	PF3	Within proposed treatment units, protect large diameter snags and green trees (≥20 inches DBH), where needed, from adverse impacts (consumption, mortality, felling as hazards to operations) associated with burning. This may include scratch lining, raking litter and duff, or pulling harvest-created slash away from these habitat features.
	PF4	Direct lighting may take place in class 4 RHCAs. For RHCA Class 1, 2, and 3 follow the prescribed fire criteria as described in the Umatilla Forest Plan and the Blue Mt. PDC II. Alter prescribed fire ignition methods and holding actions in the RHCA's as needed to maintain ecosystem structure, function and processes.
	PF5	Firelines needed to conduct the proposed treatments shall consist of natural breaks, existing roads, black line or constructed lines. Firelines may be used to keep fire out of sensitive areas such as historic sites or private property.
	PF6	The Forest Service will take steps to notify adjacent landowners in advance of planned burn operations.
	PF7	Conduct prescribed fire treatments, including pile burning for slash disposal, in a manner that encourages efficient burning to minimize soil and smoke impacts while achieving treatment objectives.
	PF8	Burn piled material under conditions that reduce the likelihood of scorch on residual trees
	PF9	In prescribed fire unit 7, FS road 2500-150 is proposed to be decommissioned. Time the decommission to take place after unit 7 has been prescribed burned. In unit 6, a portion of the 2141 and 2141-060 is to be decommissioned. Blackline is the preferred method for fireline control.
	PF 10	Road closures related to Units 3 (2500-068/063/062), 9 (2141), and 14 (2406-040) should receive gates as the preferred method of closure. This will enable use of the roads as control lines for planned burning and wildfire.
	PF 11	Unit 18 contains a rare plant exclosure, constructed to exclude cattle from the rare plant population Take steps to limit damage to the fence. Replace posts following the burn, if necessary.
	AQ1	In compliance with the Clean Air Act, burning of any kind will not occur unless prior approval is granted by the Oregon Department of Forestry.
	AQ2	Burning shall be planned for times when the transport winds and mixing heights are sufficient to displace much of the smoke from the area. Use biomass utilization, if feasible, to reduce emissions from burning.
Botany		
Project Area	Label	Design Element
Units 14, 22, 211	Bot1	"Areas to protect" will be implemented at 4 rare plant population locations in units 14 (proposed henry Creek botanical Area), 22 and 211. All three of these units are proposed for ground-based commercial thinning. These 'areas to protect' are buffered (30 m) rare plant populations.
	Bot2	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. Project related 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 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.'
All Units	Bot3	If any new rare plant populations are located before or during project implementation, a Forest Service Botanist will be notified and the area will be protected until a determination is made. The population will be evaluated and design features shall be developed in consultation with the botanist.
Hydrology		
Project Area	Label	Design Element
All Units	WQ1	Harvest unit design should ensure favorable conditions of water flow, water quality and fish habitat.
	WQ2	Prevent downstream water quality degradation by the timely identification of areas with high erosion potential and adjustment of harvest unit design
	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.
	WQ4	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.
	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 2-2 below.

Table 0-1 Draft Skid Trail Location Key (heavy equipment exclusion zones or buffers, see WQ24).

Average Buffer Slope %				Allowed Activity
Frist 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

WQ6	Erosion control and sediment plans will cover all disturbed areas including skid trails, roads, landings, cable corridors, temporary road fills, water source sites, borrow sites or other areas disturbed during mechanical vegetation treatments.
WQ7	Install sediment and stormwater controls prior to initiating surface disturbing activities to the extent practicable.
WQ8	Avoid ground equipment operations on unstable, wet or easily compacted soils and steep slopes as described per Forest Plan.
WQ9	Use of ground based harvest equipment or log haul will not be permitted if ruts greater than 2-4 inches occur.
WQ10	Implement mechanical treatments on the contour on sloping ground (35% or greater) to avoid or minimize water concentration and subsequent accelerated erosion.
WQ11	Design and locate skid trails and skidding operations to minimize soil disturbance to the extent practicable. Designated skid trails will be reviewed by a soils specialist to the extent practicable. Equipment traffic outside of designated trails will be reviewed by a Soils Specialist before proceeding; unless traffic way can be buffered by >1ft of slash during activity
WQ12	Specify RHCA layout, maintenance, and operating requirements in contracts, design plans and other necessary project documentation.
WQ13	Use mechanical vegetation treatments in the RHCAs only when suitable to achieve long-term desired conditions and management objectives.
WQ14	Modify mechanical vegetation treatment prescription and operations in the RHCAs as needed to maintain ecosystem structure, function and process.
WQ15	Utilize yarding mechanisms or mechanical treatments that avoid or minimize disturbance to the ground and vegetation consistent with project objectives.
WQ16	Avoid felling trees into streams or waterbodies, except to create habitat features. Leave all standing trees on stream banks.
WQ17	Trees may be felled in RHCAs when they pose a safety risk. If possible, keep felled trees on site to 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.
WQ18	Locate landings and skid trails, outside RHCA's to the extent practicable.
WQ19	Do not use drainage bottoms as turn-around areas for equipment.
WQ20	Use suitable measures to disperse concentrated flows of water from road surface drainage features to avoid or minimize erosion and sediment transport to waterbodies.
WQ21	Aquatics specialists would monitor RHCA's whenever possible during mechanical operations to evaluate compliance with prescription and mitigation requirements.
WQ22	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.
WQ23	All skid trails, forwarder trails, and landings which are within RHCA's will be stabilized, by planting, seeding, protection of plants, earthwork, and cultivation practices as necessary to reduce soil erosion and compaction.
WQ24	Heavy equipment will not operate off roads within Class 1, 2, or 3 RHCAs, or the heavy equipment exclusion

		zones (see Table 2-2) in WQ5.
	WQ25	Springs, wetlands, and ponds that are less than an acre will have a minimum of 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 without wetland characteristics, 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.
	WQ26	To reduce the risk of sediment production from equipment traffic in ephemeral draws; no ephemeral draws will be used as skid trails and crossings will be a minimum of 100 feet apart (crossings will be designated by FS personnel). When crossings are allowed if there is opportunity for localized bank instability harvest debris will be used as a way to minimize soil disturbance (i.e. slash mat) with effective ground cover and a buffer for equipment traffic disturbance. Slash should be obtained from harvest debris and not collected from RHCA ground vegetation. Do not cut or drive over shrubs, hardwoods, or trees unnecessarily in RHCA's.
	WQ27	Directionally fell trees to facilitate efficient removal along pre-designated yarding patterns with the least number of passes and least amount of disturbed area.
	WQ28	Landing locations are selected for least amount of excavation and erosion potential. Sidecast will not enter drainages nor damage other sensitive areas.
	WQ29	Locate landings outside of the RHCAs and avoid locating landings on steep slopes or highly erodible soil.
	WQ30	Design roads and trail approaches to minimize overland flow entering the landing.
	WQ31	Existing landings will be used where possible.
	WQ32	Use suitable measures as needed to restore and stabilize the landing after use.
	WQ33	Ensure culverts do not become plugged from logging activities and thereby do not affect the functionality of the roads
	WQ34	Install and maintain suitable erosion control on skid trails prior to spring runoff.
	WQ35	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 treated if funds are available.
	WQ36	Newly created roads would favor lower slope routes when consistent with other environmental protections. They would be located outside of RHCAs
	WQ37	Use of temporary roads will minimize or mitigate adverse effects to soil, water quality and riparian resources.
	WQ38	Maintain the natural drainage pattern of the area wherever practical, apply soil protective cover on disturbed areas.
	WQ39	Temporary roads will be inspected to verify that erosion and stormwater controls are implemented and functioning and are appropriately maintained.
	WQ40	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.
	WQ41	Implement measures to promote infiltration of runoff and intercepted flow and/or desired vegetation growth on the road prism and other compacted areas.
	WQ42	Slash piles will be placed 50 ft. or more from the stream or lopped and scattered within the 50 ft. buffer.
Wildlife		
Project Area	Label	Design Element
All Units	WL1	Downed wood (≥12 inches at the large end) would not be removed from proposed commercial thin or non-commercial thin units. Smaller downed wood may be removed to prepare an area for burning; however, existing Forest Plan standards (minimums and desired levels, based on the best science available, are displayed in the Table 2-3 below) for downed wood would be met after harvest. In the event there are no logs ≥12 inches available, the largest available would be retained to meet desired levels for pieces per acre.

Table 0-2 Forest Plan minimum standards and desired levels for downed wood (pieces per acre) by Forest Plan working group and Plant Community Type.

Working Group/Plant Community Type	Forest Plan (pieces/acre)	Diameter at large end (inches)	Length of individual pieces (feet)	Lineal feet/acre
Ponderosa Pine/Ponderosa Pine	3-6 minimum 6-8 desired	12 minimum	6 minimum Full length desired	18-36 minimum 100-200 desired
South Associated/Mixed Conifer	15-20 minimum 15-20 desired	12 minimum	6 minimum Full length desired	90-120 minimum 400-600 desired

	WL2	Minimize hazard tree felling in units to minimize impacts to standing dead wood habitat, especially large diameter (>20 inches) snags. Work with operators to ensure their safety under these conditions.
	WL3	There will be no snag felling in treatment units, unless they are a safety hazard to operations or are a danger to traffic on roads adjacent to proposed units. Felled hazard trees (dead and live trees) greater than 12 inches should be left in treatment units to provide dead wood habitat. Timber Sale Administrators will consult with the Wildlife Biologist as to the disposition of these downed logs.

	WL4	Where possible, avoid identifying or marking "take" trees within or adjacent to patches of snags and other high value snag habitat (large diameter legacy snags with multiple existing cavities, etc.) especially in areas distant from open roads to minimize impacts to these high value structural features through hazard tree felling. Consider these areas for potential "skips" within treatment units.
	WL5	If a goshawk nest site is located during goshawk surveys or sale preparation, protect the site by eliminating harvest on at least 30 acres of the most suitable nesting habitat around the site (active and historic nests). Identify post fledging areas for active nest sites. A 400 acre post fledging area would be designated around this core nest area. Treatment could occur in this post fledging area if treatments retain late and old structure or move young stands toward a late old structure condition; consult with the district wildlife biologist and silviculturist to ensure that the standards provided in the Eastside Screens would be met.
	WL6	If raptor nest sites are encountered during layout or implementation, they will be protected. The level of protection will vary by species, and will be determined by the District Wildlife Biologist. It is the responsibility of the layout and marking crew to ensure that the District Wildlife Biologist is consulted prior to marking in these areas.
	WL7	In proposed treatment units retain broken top and spike (dead) top green trees at a rate of 1 per acre larger than 15 inches DBH, where they are available, to provide existing and future dead wood habitat features and to promote snag creation in the future. If none are available larger than 15 inches DBH, retain the largest available (minimum of 10 inches DBH).
	WL8	Recognize structural features important to late and old structure-associated wildlife when identifying trees to be retained, regardless of tree size. Providing features indicative of decadence is desired in treated stands in the long term. These features include flat tops, bole damage, broken or dead tops, multiple tops, large limbs, etc.
	WL9	Place skips in high wildlife use areas such as fir thickets, interior cover patches, high-density snag patches, or higher density patches. Skips provide hiding/screening cover for big game, foraging areas for cavity excavators and insect-gleaning birds, areas with locally high tree mortality (through insect and disease activity) that creates standing dead and downed wood habitat, and heterogeneity at the small scale.
	WL10	Protect unique habitats (seeps, springs, wallows, and wet areas including meadows) from harvest activities. Buffer wet meadows, ponds, springs, and wallows a minimum of 100 feet from vegetative treatment activities. If unique habitats (caves, cliff faces, etc.) are encountered during recon or layout, their value to wildlife would be evaluated, and appropriate protection, as determined by the District Wildlife Biologist, would be provided.
	WL11	Prescribed fire would preferably occur during the late summer and fall. If burning in the spring (fuel conditions and weather are appropriate), attempt to burn prior to the peak of migratory songbird breeding, generally May 15.
	WL12	During spring burning operations, attempt to maintain unburned blocks of habitat adjacent to burned habitats to ensure that low-level structure (grasses, forbs, shrubs, and reproduction) for migratory birds is present at some level across the landscape.
	WL13	Leave wildlife habitat clumps of uncut regeneration (small diameter) conifers ranging in size from ¼ acre up to 1 acre in size in non-commercial thin units. Clumps of uncut small diameter conifers would total approximately 2 acres for every 30 acres of treatment.
	WL14	Where hand or machine piling of harvest or thinning-created slash would occur, retain at least one unburned slash pile per acre in noncommercial thinning units.
	WL15	Large diameter, complex structures are a key habitat feature in dry forest habitat. A portion of Douglas-fir and white fire that are larger than 21 inches DBH and that are interfering with a desirable leave tree would be retained to provide large diameter dead wood habitat. A combination of actions, including girdling, topping, inoculation with disease agents, or felling and retaining them on the ground would be used. The number of these structures retained would vary by unit based on the existing availability of large dead wood and wildlife biologist recommendations.
	WL16	In order to provide for connectivity of old forest and designated old growth habitat, identified connectivity corridors lying within proposed treatment units would be marked and harvested such that the upper management limit (basal area) would be retained or a higher proportion of skips provided in these areas when compared to the remainder of units outside mapped connectivity corridors. These corridors would be identified on unit specific data sheets provided to layout and marking crews in order to ensure implementation of this design criterion. Skips would continue to be distributed throughout proposed units and be representative of the available habitat in the entire unit.
	WL17	In order to eliminate potential disturbance at the Dry Creek bald eagle nest (.75 miles east of the project area) associated with project activities (helicopter use/noise, heavy equipment use/noise, and smoke) during the critical spring courting, nesting, and rearing season (approximately January 1 through June 1), activities will be coordinated with the District Wildlife Biologist. Utilize recommendations provided in the National Bald Eagle Management Guidelines (2007), where necessary, to eliminate or minimize potential impacts at the nest site and associated Bald Eagle Management Area (BEMA).
Visuals and Recreation		
Project Area	Label	Design Element
Highway 207 (Management Area A-4)	VQ1	A visual quality objective of Partial Retention will be maintained in the foreground (300 feet from Hwy 207) FLMP page 4-106. This will be accomplished by low cutting stumps and limiting use of skid trails and landings within 300 feet of Highway 207. Slash will not be piled within 300 feet of the highway.
	VQ2	Thinning and planting within 300 feet of Highway 207 will leave irregularly spaced trees. Planting within this area must include at least two tree species, with no more than 65% in a single species. FLMP page 4-109.

	VQ3	Prescribed fire will be of low intensity with minimal scorch within 300 feet of Highway 207. FLMP page 4-110.
Tamarack Cabin	VQ4	Trees within 300 feet (foreground) of Tamarack Cabin will be retained unless identified as a hazard tree. Hazard trees will be felled away from the cabin and their removal is optional.
	VQ5	Landings will be located at least 300 feet away from Tamarack Cabin. Any associated slash piles will be small and treated within one year after use of the landing is completed.
	VQ6	Prescribed fire will be of low intensity with minimal scorch within 300 feet of the cabins.
Fairview Campground	VQ7	Sufficient trees will be retained around campsites 2 and 5 to screen them from roads and provide shade.
	VQ8	Operations will avoid the areas around the spring and water fountain (the spring boxes are located several hundred feet uphill and away from the water fountain).
	VQ9	The use of skid trails will be limited to the extent possible to retain the maximum amount of vegetative coverage.
	VQ10	Any soil disturbance caused by the proposed activities will be repaired to pre-treatment conditions to the extent possible.
	VQ11	No landings will be located within the campground.
	VQ12	Access to the campground will be maintained to the best extent possible during the major big game hunting seasons (from the last week of August through the second week in November).
	VQ13	Prescribed fire will be of low intensity with minimal scorch within 300 feet of the campground.
Dispersed Camping	RC1	Areas around dispersed camps will be treated in a manner that retains a Partial Retention Visual Quality Objective. FLMP page 4-49. Examples include low cut stumps, no slash piles, minimal soil disturbance.
	RC2	Placement of landings will avoid dispersed campsites to the extent possible. If the best location is a dispersed camp from a resource protection standpoint, the landing will be treated after operations are complete to provide a level, debris-free area for camping.
Trails	RC3	Skid trails will avoid crossing system trails. Where no other option is available, a skid trail may cross a trail, but after the skid trail is no longer in use its intersection with the trail will be blocked with debris and the disturbed area repaired to discourage use.
	RC4	Any repair or obliteration of roadbeds that serve as designated OHV trails will retain a 50-inch wide tread that meets OHV standards. Road treatments should not significantly alter existing access or trail characteristics.
Recreational Access	RC5	Ensure that roads and trails are closed as needed during logging and prescribed fire activities and are re-opened as soon as possible after work is completed, especially during the major hunting seasons (last week of August through second week of November).
	RC6	Warning or informational signs will be placed along major travel routes during project operations (thinning, harvest, prescribed fire, etc.) to alert and inform the public. Current information will be posted on associated portal entry kiosks.
Range		
Project Area	Label	Design Element
All Units	RG1	All existing structural range improvements (hard and electric fences, gates, water developments, etc.) will be contractually protected.
	RG2	Fences which are damaged in order to facilitate the proposed action must be repaired to Forest Service standards.
	RG3	If livestock are present on either side of a fence, means will be taken to prevent the movement of livestock to the other pasture. If no livestock are present, gates and fences shall be operable prior to logging and burning activities before changing locations.
	RG4	It will be a contract requirement that all gates will remain closed during work and non-work hours while cattle are in the project area.
	RG5	Fence right of ways and stock driveways and trails will be cleared of slash produced by logging or post sale activities.
Noxious Weeds		
Project Area	Label	Design Element
All Units	NW1	Noxious weed sites will be treated consistent with the 2010 Umatilla National Forest Invasive Plant Treatment Record of Decision, before, during and after project activities.
	NW2	Prior to moving onto the forest, reasonable measures will be taken to insure that all off-road equipment is free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds. In addition, prior to moving off-road equipment from a cutting unit known to be infested with invasive species to any other unit that is believed to be free of noxious weeds, reasonable measures will again be taken to make sure equipment is free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds (timber sale contract provision B/BT 6.35 or equivalent provision).
	NW3	Noxious weed-free straw and mulch will be used for all projects conducted or authorized by the Forest Service on National Forest System Lands.
	NW4	All gravel, fill, sand stockpiles, quarry sites, and borrow material will be inspected for invasive plants before use and transport. Use only gravel, fill, sand, and rock that is judged to be weed free by District or Forest weed specialists.
	NW5	Road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants will be conducted in consultation with District or Forest-level invasive plant specialists. Invasive plant treatment and prevention practices will be incorporated as appropriate.
	NW6	Logging system design will consider the objectives of maintaining ground cover and minimizing ground disturbance. Forest Plan standards and guidelines for ground and soil disturbance will be followed.
	NW7	All soils disturbed by project activities will be revegetated with certified "weed free" native seed, when natural regeneration of the native plant community is likely not to occur

	NW8	Helicopter landings and parking areas will not be located in known areas of invasive plants.
	NW9	Project or contract maps will show currently inventoried high priority noxious weed infestations as a means of aiding in avoidance and/or monitoring.
Roads		
Project Area	Label	Design Element
All Units	RD1	Where existing closed, existing temporary and non-system roads are used for fire lines during landscape or activity fuels burning, minimize clearing of brush and dead wood to reduce the potential for illegal motorized use following treatment. Where feasible, rehabilitate those non-permitted (existing closed, existing temporary, and non-system routes by pulling brush and logs onto the road surface to mask its location, especially where these routes intersect open roads.
	RD2	Effectively close, to the degree possible given topography and available vegetation, closed system roads used to access timber harvest units following implementation to reduce the likelihood of illegal motorized use. To the degree possible given topography and available vegetation, obliterate temporary roads used during implementation. Methods for accomplishing this are described in the timber sale contract.
Vegetation		
Project Area	Label	Design Element
All Units	VG1	On the first day of marking and at several other times throughout the marking, the silviculturist would monitor the marking to ensure that the marking guides are being followed and understood.
	VG2	Protect mountain mahogany and remnant large aspen from harvest disturbance and burning where necessary and where feasible.
	VG3	Where feasible, pull harvest created slash away or refrain from locating slash adjacent to leave trees in order to reduce the risk of fire-related mortality.
	VG4	There will be no cutting of old growth juniper trees or juniper trees that are >21”DBH or juniper that shows old growth characteristics identifiable by canopy decadence, deep furrowed bark, and abundant lichen accumulation. In addition, juniper in all size classes would be retained in those areas historically occupied by this species. This includes rocky areas with shallow soils, rock scabs, rim rocks, and bluffs. Historical aerial photos would be used to aid in identification of these areas, as well as visual assessment on the ground of areas that contain old growth juniper.
	VG5	Outside of designated skips, gaps, or clumps, mistletoe infected trees that are less than 150 years old would be removed if they have a mistletoe rating of 4 or 5. This will help to reduce infection levels within the stands.
	VG6	There will be no cutting of 21 inch DBH or larger ponderosa pine and larch trees or Douglas-fir and white fir (that do not interfere with desirable leave trees) except for occasional administrative trees. Where possible, administratively felled trees ≥ 21 inches DBH would be retained where they are felled to provide downed wood habitat. Timber Sale Administrators will consult with the Wildlife Biologist as to the disposition of these trees.
	VG7	Within non-commercial units (except for aspen) thinning limits are set at 9”DBH. Piling should occur an adequate distance from large snags (>10”DBH) and down wood (>12”DBH).
	VG8	A Qualified Person will assess danger trees along haul routes using the 2008 Field Guide for Danger Tree Identification and Response and 7700 Forest Service Manual. In general, only those trees that rate as “imminent” would be felled along closed and existing temporary roads. Trees that are rated as “likely” would generally be maintained along closed and existing temporary roads.
	VG9	In all commercial units an emphasis shall be placed on a heterogeneous distribution of trees. This heterogeneity will take the form of clumps of trees. Thinning is allowed within clumps in order to reduce competition from late seral species.
	VG10	Along roads used to access proposed units, felled danger trees <20 inches may be removed. All danger trees (dead and live) ≥20 inches DBH should be retained where they are felled to provide large downed woody structure. Timber Sale Administrators will consult with the Wildlife Biologist as to the disposition of these trees.

Appendix D
Fire and Fuels Report

Kahler Dry Forest Restoration Project

Fire and Fuels Report

Prepared by:
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for:

Heppner Ranger District
Umatilla National Forest

April 27, 2015

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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 toward 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 and creating defensible space around Tamarack Rental Cabin, Fire Lookout, and communication sites.
- 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 1: Silvicultural and Fuels activities included in the Proposed Action for Kahler Dry Forest Restoration Project

Proposed Activity	Alternative 2 (Acres)	Alternative 3 (Acres)	Alternative 4 (Acres)	Activity Objectives and Specifications
Upland forest commercial thinning	10,000	9,170	8,230	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	690	845	845	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	5,000	4,580	4,110	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.
Shrub/steppe enhancement	1,540	1,540	1,465	Conifers (including western juniper, ponderosa pine, and Douglas-fir) have encroached into grassland, shrubland, and open woodland vegetation. Where appropriate, given historic conditions, noncommercial and commercial-size conifers that are <21 inches dbh and not showing old growth character would be removed or thinned on these acres to improve grassland and shrubland conditions.
Dry forest Riparian Treatment (Class 4 Buffers)	680	660	0	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	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	820	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	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 al-low this approach to be successful.
Mechanical Line (miles)	6.1	6.1	6.1	Facilitate holding capabilities for activity fuel treatment and landscape burning
Handline (miles)	2.0	2.0	2.0	Facilitate holding capabilities for activity fuel treatment and landscape burning
Activity fuels	1,770	1,680	1,680	Mechanical treatment is planned

treatment (mechanical)				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)	7,000	6,620	5,760	Post-harvest fuel reduction burning; acreage values assume that 70% of CT treatment area will be underburned.
Landscape underburning	31,020	31,020	31,020	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).

Summary of Effects

Alternative 2, 3 and 4 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 slightly more successful in bringing condition class nearer to historic norms, achieving historic stand densities and maintaining fire tolerant species than other alternatives. It is less successful than alternative 4 in achieving acceptable fire behavior directly following treatment.

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.

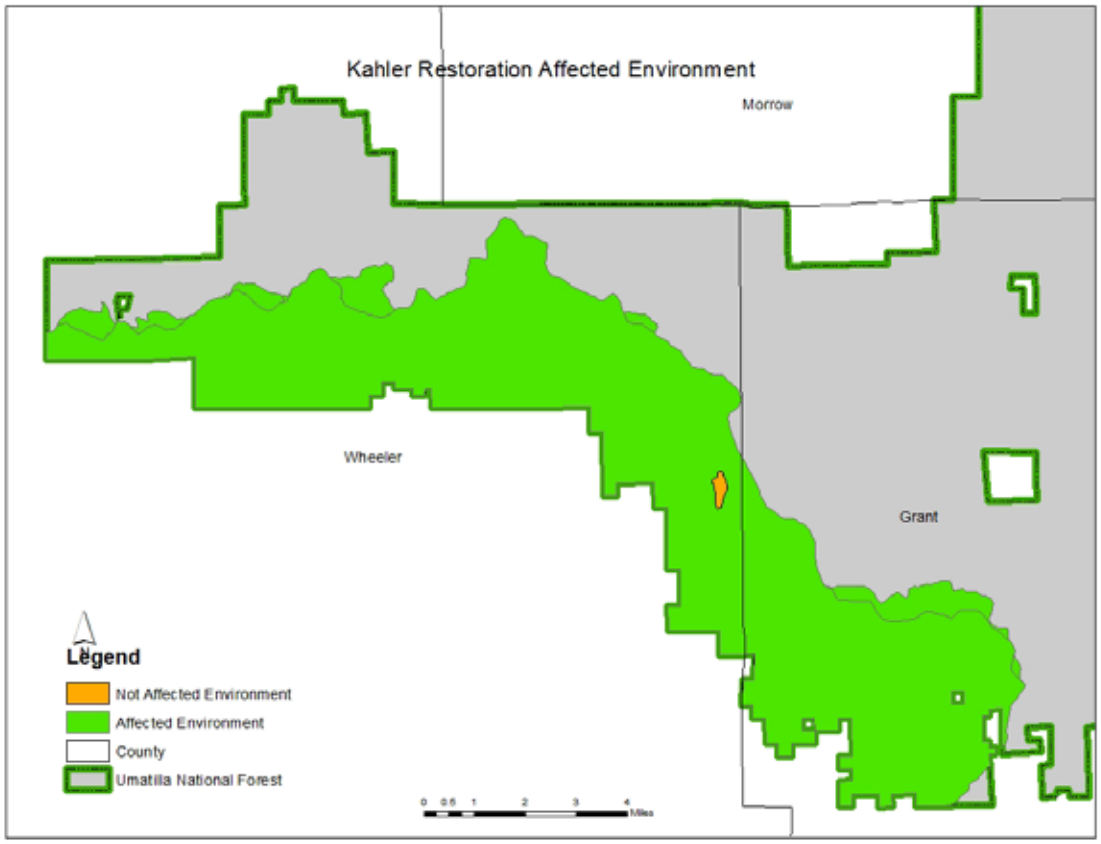


Figure 1: Affected environment for forest vegetation analyses. The orange areas show locations of Forest Plan management areas that are unsuitable for prescribed fire (D2 Research Natural Area); they are not included in the affected environment for the fire and fuels analyses. Private land within and 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.

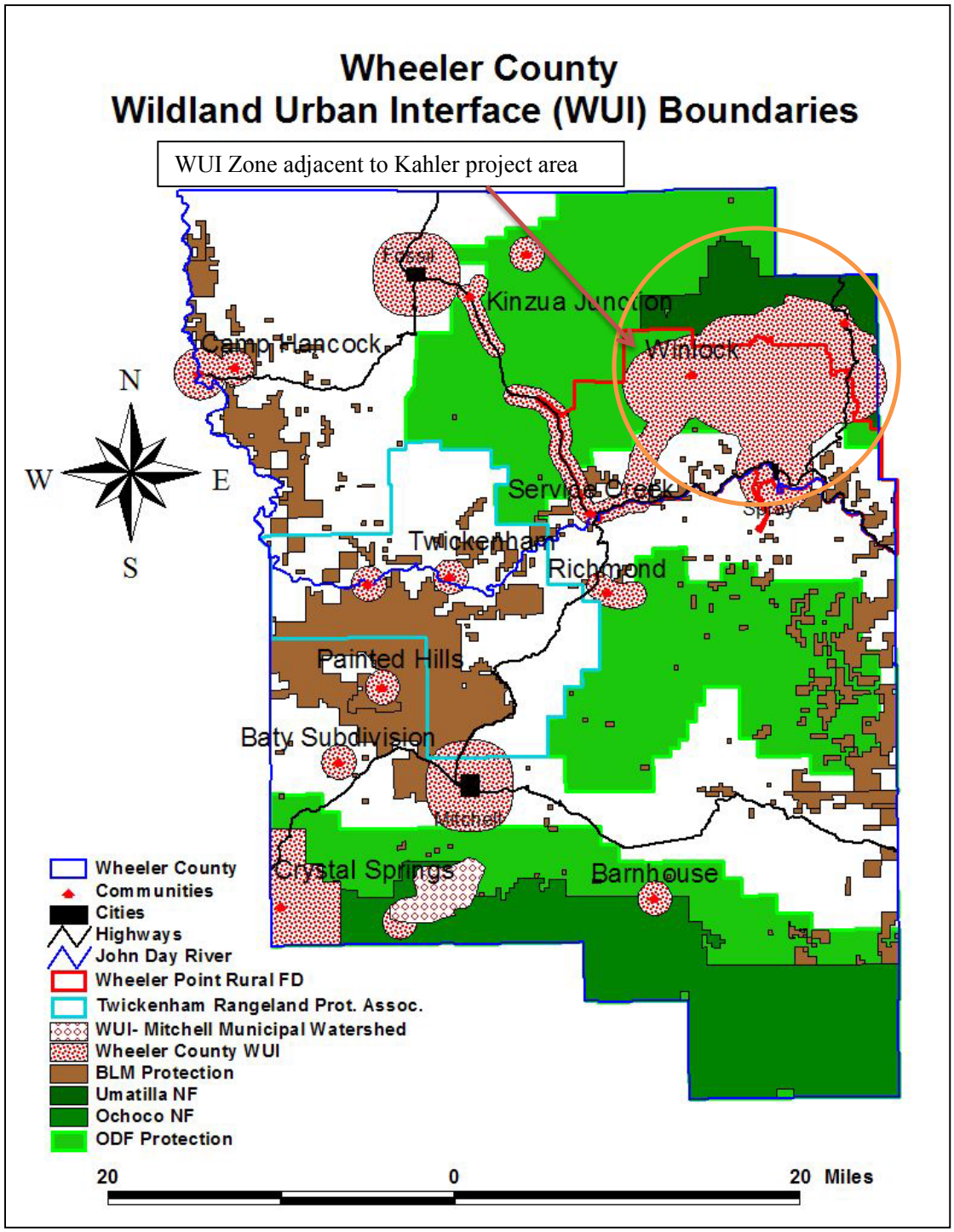


Figure 2: Wildland Urban Interface Zones in Wheeler County (Wheeler Co. 2006)

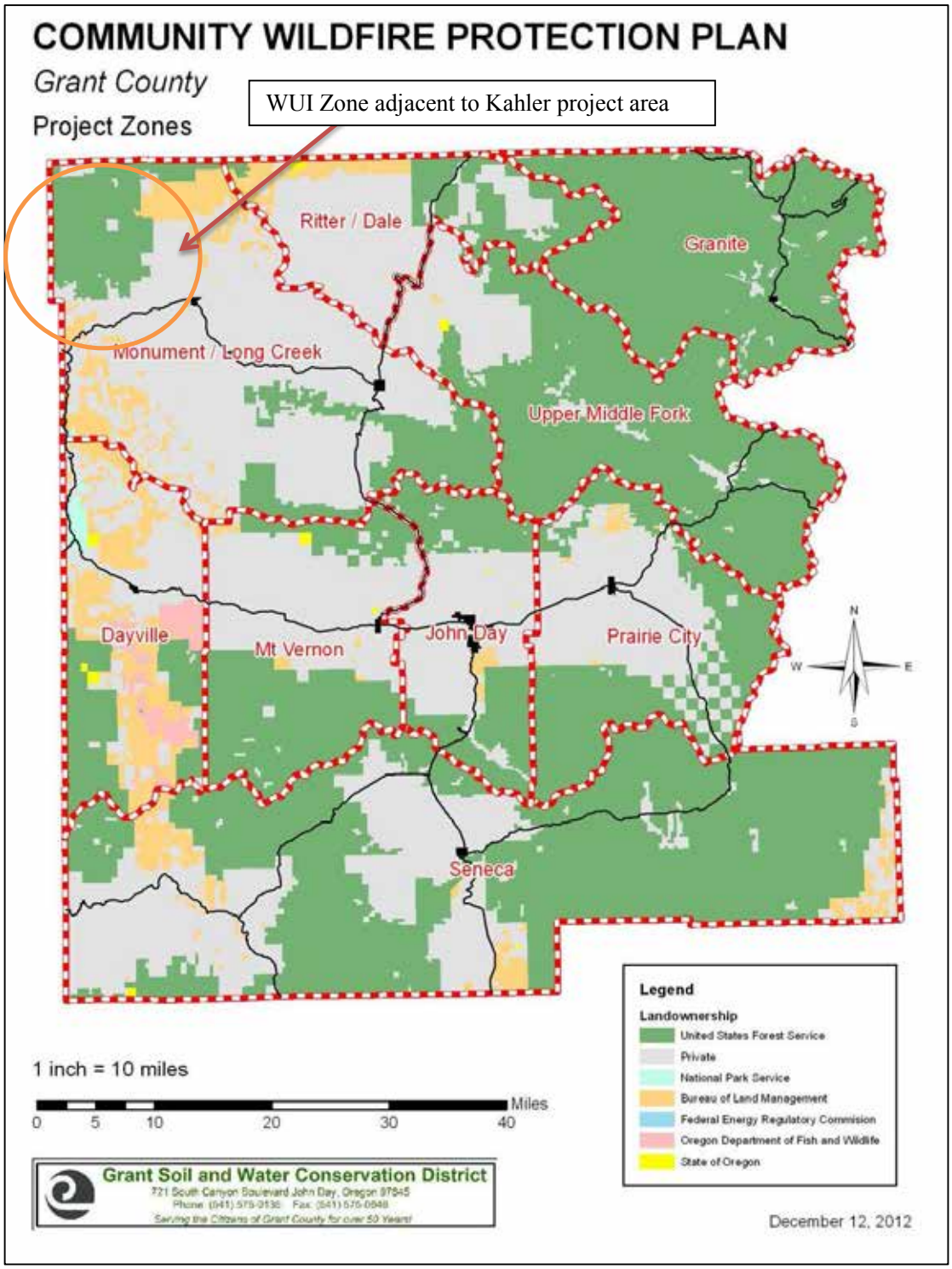


Figure 3: Grant County Wildland Urban Interface Project Zones (Jerome 2013).

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). Ponderosa pine and Dry Mixed-Conifer sites, like the Kahler project, are typically a fine-grained mosaic of individual trees, clumps, and openings. Regeneration typically established in dense thickets that were thinned by fire, insects, and competition. Over time, these thickets became clumps of overstory trees (2-20+ trees). Understory shrubs and grasses, along with conifer needles and cones, provided the fine fuels to carry low-severity fires on frequent return intervals. Moderate to high-severity disturbances did occasionally reset these patterns, but some large old trees typically survived (Hessburg et al, 2007, Franklin, J.F. et al 2013). 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).

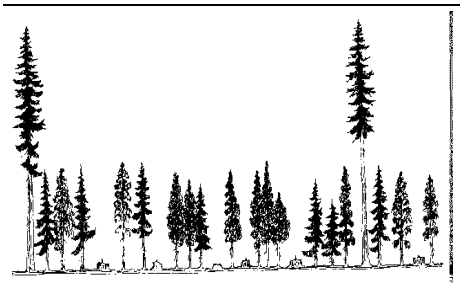
Historical Range and Variability

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.

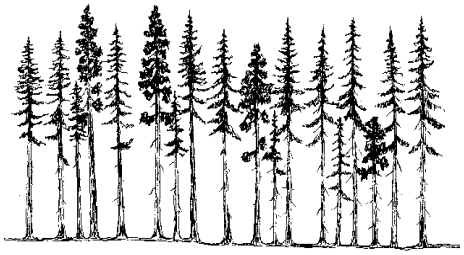
The predominant vegetation type in the Kahler planning area in the mid-1880s was ponderosa pine (66% of the area), followed by mixed-conifer forest containing a mixed species composition (likely including ponderosa pine, Douglas-fir, and grand fir) (20% for the two mixed-conifer types combined), nonforest 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).

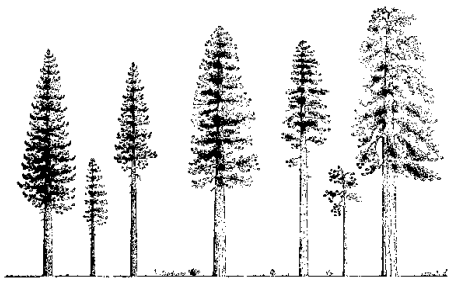


Stand Initiation (SI). Following a stand-replacing disturbance such as wildfire or tree harvest, growing space is occupied rapidly by vegetation that either survives the disturbance or colonizes the area. Survivors literally survive the disturbance above ground, or initiate new growth from their underground 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 2. ***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).

Fire Regime Condition Class
Landscape Report - Reference Fire Regime Summary

Registration Code: 061402 Landscape Code: Kahler Char Date: 06/02/2014

Stratum #	Reference Frequency	Reference Severity	Fire Regime Group
1	8	76	II
2	16	14	I
3	71	35	III
4	7	5	I
5	48	37	III
6	74	41	III
7	5	77	II

Stratum #	Statum Name
1	Bluebunch Wheatgrass
2	Mixed Conifer Eastside Dry
3	Mixed Conifer Eastside Mesic
4	Dry Ponderosa Pine Mesic
5	Ponderosa Pine Xeric
6	Low Sagebrush
7	Marsh

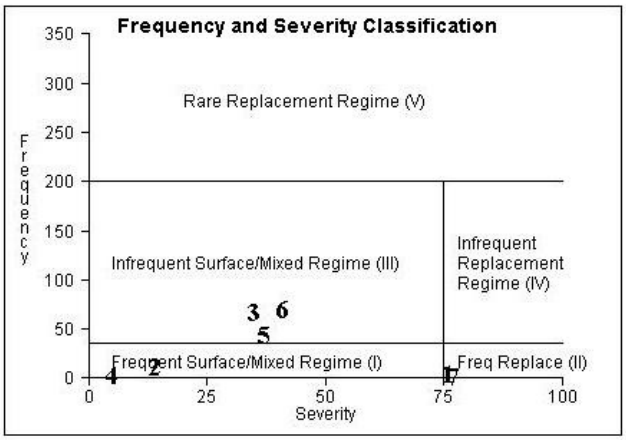


Figure 5: Fire Regime Condition Class (FRCC software application 3.0.3.0) landscape report—reference fire regime summary for the Kahler project area. Fire Regimes present in the Kahler area are: I, II and III, with the majority of the area in Fire Regime I.

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 3: 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 from natural frequencies by multiple return intervals. Dramatic changes occur to one or more of the following: fire size, intensity, severity and landscape patterns.	Species composition and structure have been substantially altered from their historical range. For 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.

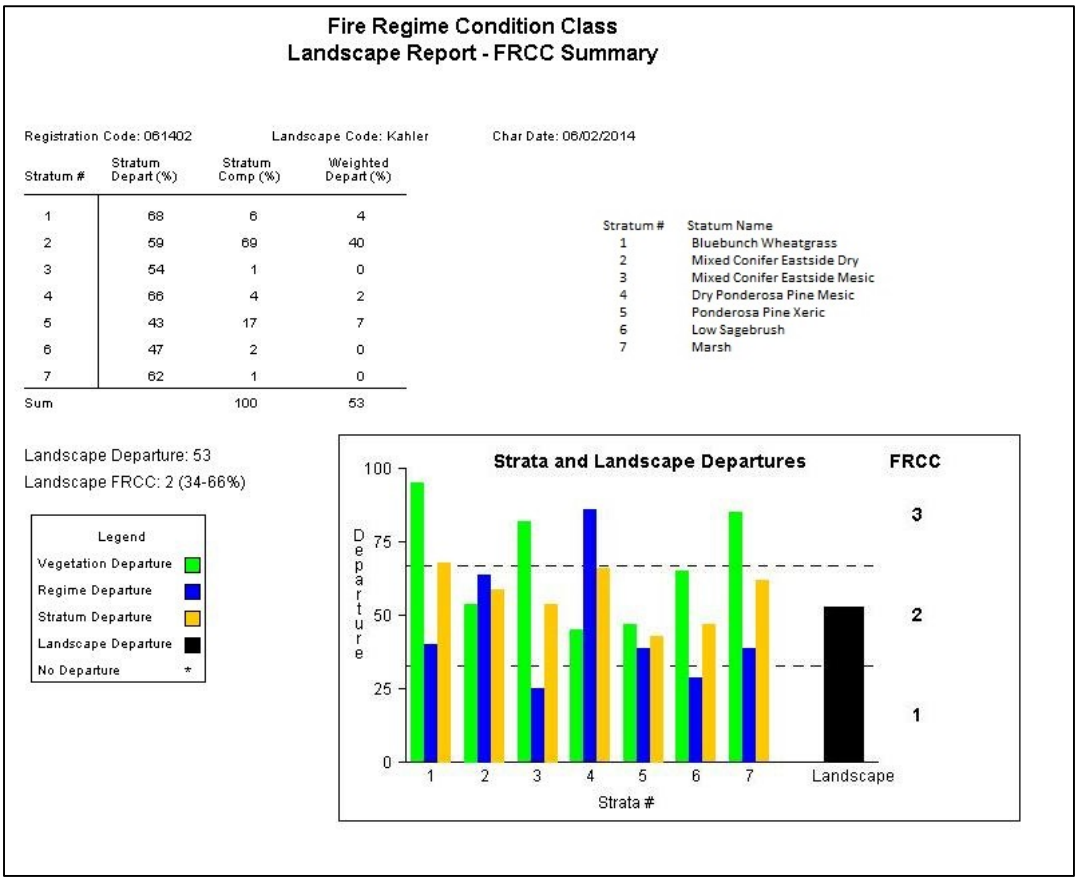


Figure 6: Fire Regime Condition Class (FRCC software 3.0.3.0) landscape report—FRCC summary for the Kahler project area. The Kahler area is 53% (FRCC 2) departed from historic conditions.

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 4. 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, a lower level of height to live crown ratio, and more fire-intolerant species than would have historically occurred.

Fire Occurrence

Fire records indicate that there have been 142 detected and fully suppressed fires from 1970 to 2014 in the Kahler project area (avg. of 3 fires per year) (see 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 area (no fires in 1985, 1993, and 1995).

Table 5. 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
2010-14	15	12

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

Table 6. 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 7. 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

Fuel Model 1 (Short Grass)
Surface fires that move rapidly through the continuous, cured or nearly cured herbaceous fuels. Surface fuel loading, less than 3 inches in diameter, is less than .74 tons per acre. Surface fuel bed depth is 1.0 foot.

Fuel Model 2 (Timber, Grass and Understory)
Fire spread is primarily through the fine fuels, such as grass and pine needles. The stand is open where larger pine and Douglas-fir cover one-to two-thirds of the area. Surface fuel loading, less than 3 inches in diameter, averages 4 tons per acre. Surface fuel bed depth is 1 foot.

Fuel Model 4 (Shrub)
Fires intensity and fast-spreading fires involve the foliage and live and dead fine woody material in the crowns of a nearly continuous secondary overstory. Stands of mature shrubs, 6 or more feet tall. Besides flammable foliage, dead woody material in the stands significantly contributes to the fire intensity. A deep litter layer may also hamper suppression efforts. Total fuel load, < 3-inch, dead and live, tons/acre 13.0. Fuel bed depth, feet 6.0

Fuel Model 5 (Low Brush)
Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and the grasses or forbs in the understory. The fires are generally less intense because surface fuel loads are light. Surface fuel loading, less than 3 inches in diameter, averages 3.5 tons per acre. Surface fuel bed depth is 2.0 feet.

Fuel Model 8 (Timber, Closed Timber Litter)
A typical stand includes a closed canopy of short-needled conifers, such as Douglas-fir. The compact litter layer consists of needles, leaves and occasional twigs. Surface fuel loading, less than 3 inches in diameter, averages 5 tons per acre. Surface fuel bed depth is 0.2 feet.

Fuel Model 9 (Timber, Closed Timber Litter)
Fires that run through surface litter faster than model 8 and have longer flame heights. Long needle conifer stands are typical. Concentrations of dead-down woody material will contribute to possible torching, spotting and crowning. Surface fuel loading, less than 3 inches in diameter, averages 3.5 ton per acre. Surface fuel bed depth is .2 feet.

Fuel Model 10 (Timber, Litter and Understory)
Fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Fuels in this model include greater quantities of dead and down material 3 inches and greater. Crowning, spotting and torching are more frequent in this fuel situation. Surface fuel loading, less than 3 inches in diameter, averages 12.0 tons per acres. Surface fuel bed depth is 1.0 feet.

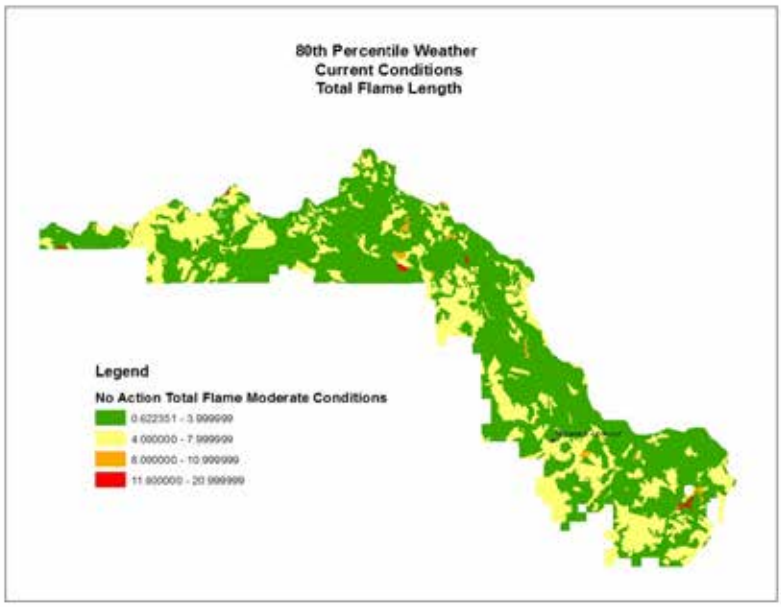
Fuel Model 12 (Logging Slash)
Rapidly spreading fires with high intensities capable of generating firebrands can occur. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered. The visual impression is dominated by slash and much of it is less than 3 inches (7.6 cm) in diameter. The fuels total less than 35 tons per acre (15.6 t/ha) and seem well distributed. Surface fuel bed depth is 2.3 feet.

Figure 7. Explanation of Fire Behavior Fuel Models in the Kahler Analysis Area

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 8. 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%



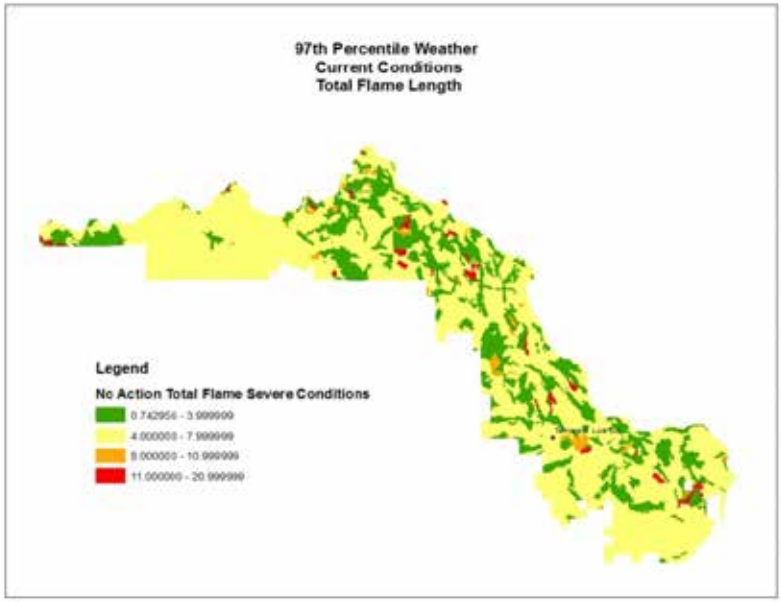


Figure 7: Maps displaying the predicted flame lengths under the current conditions for the Kahler area. Moderate weather (above) shows the majority of the area to be under 4 foot flame lengths. Severe weather conditions show the majority of the area to be above 4 foot flame lengths. This is a prediction of fireline intensity which can hinder firefighter's capabilities to contain a wildfire.

Fire Type as defined by Scott and Reinhardt (2001):

Surface fire: A surface fire is one that burns in the surface fuel layer, which lies immediately above the ground fuels but below the canopy, or aerial fuels. Surface fuels consist of needles, leaves, grass, dead and down branch wood and logs, shrubs, low brush, and short trees (Brown and others 1982).

Crown fire: A crown fire is one that burns in the elevated canopy fuels. Canopy fuels normally consumed in crown fires consist of the live and dead foliage, lichen, and fine live and dead branch wood found in a forest canopy. They have higher moisture content and lower bulk density than surface fuels. We generally recognize three types of crown fire: passive, active, and independent (Van Wagner 1977).

Passive Crown fire: A passive crown fire, also called torching or candling, is one in which individual or small groups of trees torch out, but solid flame is not consistently maintained in the canopy. Passive crowning encompasses a wide range of fire behavior, from the occasional tree torching to a nearly active crown fire. The increased radiation to surface fuels from passive crowning increases flame front spread rate, especially at the upper end of the passive crown fire range. Embers lofted during passive crowning can start new fires downwind (spotting), which makes containment more difficult and increases the overall rate of fire growth.

Active Crown fire: also called a running or continuous crown fire, is one in which the entire surface/canopy fuel complex becomes involved, but the crowning phase remains dependent on heat from the surface fuels for continued spread. Active crown fires are characterized by a solid wall of flame extending from the fuel bed surface through the top of the canopy. Greatly increased radiation and short-range spotting of active crown fires lead to spread rates much higher than would occur if the fire remained on the surface. Medium and long-range spotting associated with active crowning leads to even greater rates of fire growth.

Independent Crown fire: Crown fire that burns in canopy fuels without aid of a supporting surface fire. Independent crown fires occur rarely and are short lived (Van Wagner 1993), requiring a combination of steep slope, high windspeed, and low foliar moisture content. Many apparently independent crown fires may actually be active crown fires in which the canopy phase is momentarily pushed ahead of the surface phase under the influence of steep slope or strong wind.

Figure 8: 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 8 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 9. 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 9: 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 10 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. To accomplish restoration goals, fire should be reintroduced either in combination with mechanical thinning treatments or by itself (Fule`, P.Z. et al. 2012, Franklin, J.F. et al 2013). 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, repeated prescribed fire entries every 10 to 20 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 10-20 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.

For a list of terms and definitions, please refer to the Kahler Forest Vegetation Report.

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

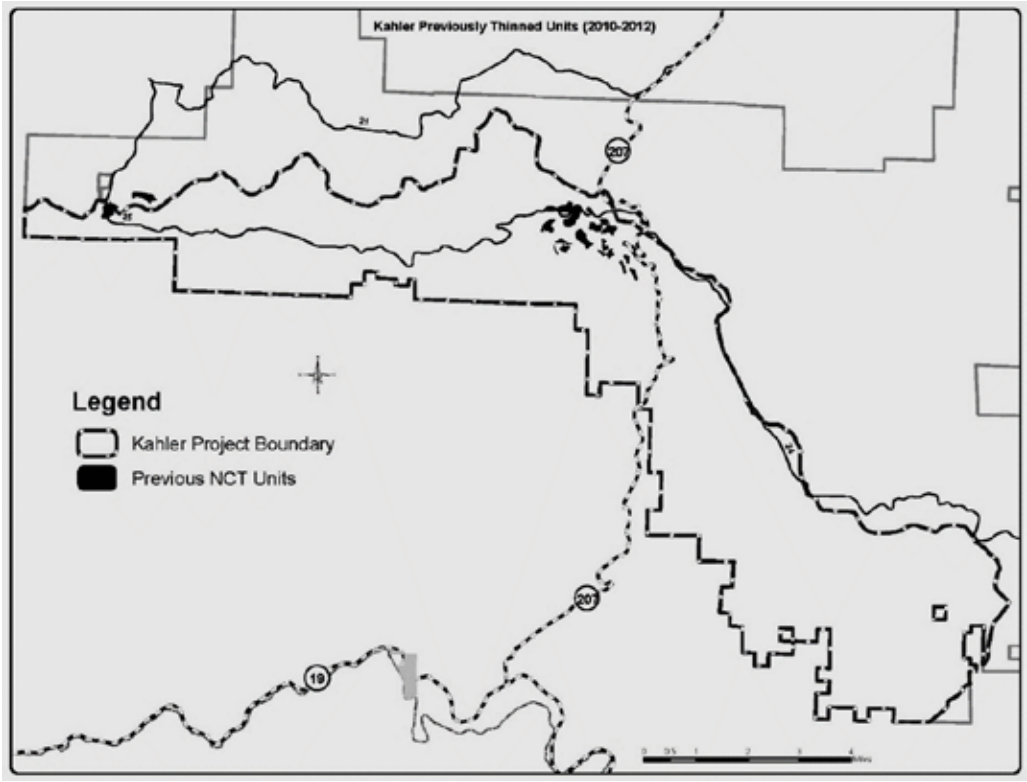
Upon implementation, silvicultural activities included in alternative 2 (proposed action) would directly effect approximately 17,230 acres of the affected environment; fuels activities would affect approximately 31,020 acres for landscape burning (Figure 1). It is estimated that 50-70% of the acres proposed in the landscape underburn will have direct effects from fire.

Upon implementation, silvicultural activities included in alternative 3 would directly effect approximately 16,525 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 4 would directly effect approximately 15,540 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.

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.



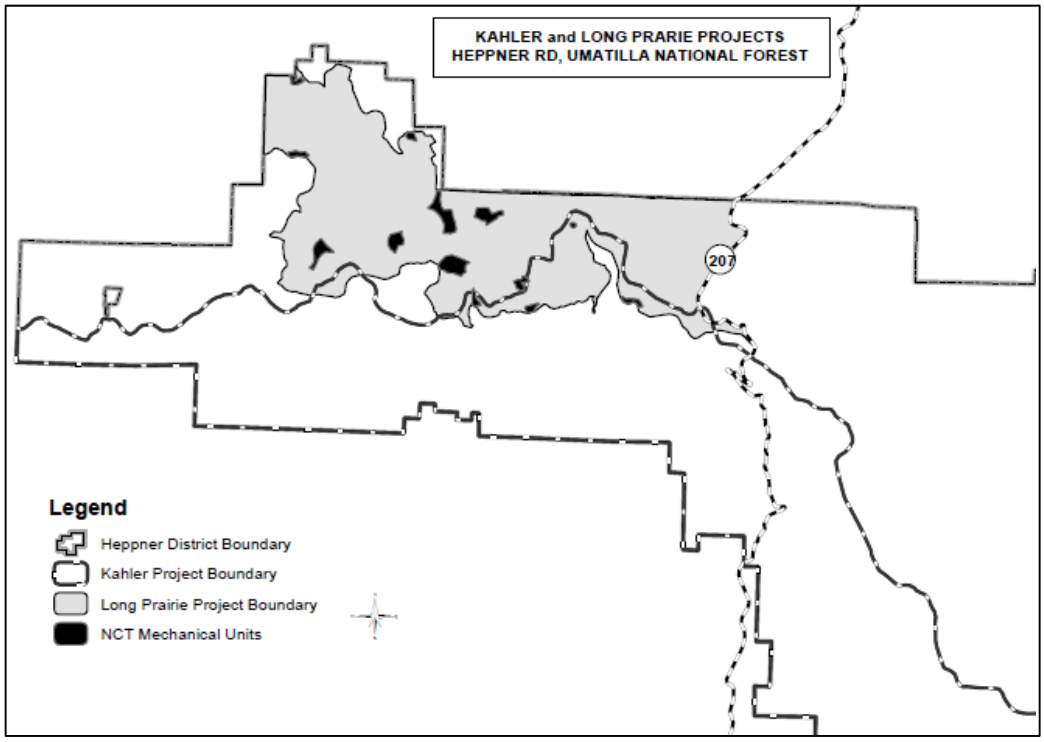


Figure 11: Present (on going) actions in the Kahler planning area- non-commercial thinning authorized by 2009 categorical exclusion (CE) (top) and the Long Prairie fuels reduction project authorized by CE in 2010 (bottom).

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, as directed by Forest policy, 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 model predicts that much of the area transitions to a Fuel Model 2 by 2065.

Table 10. 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)	4,023	12	1,758	5	1,463	4
FM 2 (4 tons/acre)	17,034	52	18,673	57	15,339	47
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)	1,476	4	1,733	5	4,877	15
FM 12 (34.6 tons/acre)	1,761	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 11. Predicted flame lengths for the No Action Alternative (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	79	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	60	30	70	60	40

Table 12. 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		**Severe 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 stands and a change in stand type from open canopy to closed canopy. Increased surface and 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 within a Fire Regime 1 dominated landscape.

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 approximately 10,000 acres of commercial thinning and 5,690 acres of non-commercial thinning. It also includes approximately 1,540 acres of shrub/steppe enhancement treatments. These treatments will temporarily increase surface fuels throughout the units (2-5 years). To reduce the harvest created fuel load, most 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 10-20 years following treatment. Table 13 summarizes the proposed activities for all alternatives.

Table 13: Proposed silviculture and fuels activities for No Action, Alternative 2, 3, and 4

Proposed Activity	No Action Alternative	Alternative 2 (Acres)	Alternative 3 (Acres)	Alternative 4 (Acres)
Upland forest commercial thinning	0	10,000	9,170	8,230
Noncommercial thinning outside of harvest units	0	690	690	845
Noncommercial thinning in harvest units	0	5,000	4,580	4,110
Shrub/steppe enhancement	0	1,540	1,700	1,465
Dry forest Riparian Treatment (Class 4 Buffers)	0	680	660	0
Aspen restoration	0	10	10	10
Reforestation in VDT gaps	0	1,000	920	820
Reforestation in Wheeler Point fire	0	5,000	5,000	5,000
Mechanical Line (miles)	0	6.1	6.1	6.1
Handline (miles)	0	2.0	2.0	2.0
Activity fuels treatment (mechanical)	0	1,770	1,680	1,680
Activity fuels treatment (burning)	0	7,000	6,620	5,760
Landscape underburning	0	31,020	31,020	31,020

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 augment the natural opening surrounding the lookout, improve fire sighting

capabilities, reduce fire severity, and reduce the risk of direct flame reaching the tower (see Figure 13). Treatment at the cabin site would decrease fire severity and 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, allowing for emergency evacuations and improved holding capabilities.

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.

Figure 12: 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 13: 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.

Historical Range and Variability

Composition

An HRV analysis for species composition of treated stands 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 2 was 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. Table 14 displays the harvest treatment effects on species composition by alternatives. Landscape underburning following harvest treatment would effect the Kahler project area by favoring fire tolerant species. 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. In the absence of fire or other disturbance, these stands will remain on their current trajectory in that Douglas-fir and grand fir will continue to develop in the understory (Powell, Forest Vegetation Report, 2014). For additional information on HRV and its effects, refer to the Kahler Forest Vegetation Report.

Table 14: Harvest Effects on Species Composition by Alternative for Dry Upland Forest. Areas in grey depict species outside of HRV.

Forest Cover Type	Dry Upland Forest Potential Vegetation Group									
	Historical Range		Existing Conditions, 2012		ALT 2 Post-Treatment		ALT3 Post-Treatment		ALT 4 Post-Treatment	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Douglas-fir	1,350-5,400	5-20%	7,760	29%	4,310	16%	4,570	17%	5,100	19%
Grand fir	270-2,700	1-10%	1270	5%	790	3%	850	3%	900	3%
Ponderosa pine	13,500-21,600	50-80%	17,200	64%	21,370	79%	21,030	78%	20,460	76%
Subalpine fir and spruce	0	0%	0	0%	0	0%	0	0%	0	0%
Western juniper	0-1,350	0-5%	750	3%	510	2%	530	2%	520	2%
Western larch	270-2,700	1-10%	0	0%	0	0%	0	0%	0	0%
Western white pine	0-1,350	0-5%	0	0%	0	0%	0	0%	0	0%
Total			***26,980***	***100%***	***26,980***	***100%***	***26,980***	***100%***	***26,980***	***100%***

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). Table 15 displays the harvest effects on structural stage by alternative. Landscape underburning following harvest treatment would effect the forest structure in the Kahler analysis area by favoring fire tolerant species, decreasing canopy bulk density, increasing the height to live crown ratio, reducing surface fuel loading, and promoting mature and late successional characteristics. 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 structure is expected to change with a varying degree depending on acres treated. Although SE, UR, and OFSS remain outside historical range post treatment in all alternatives, they are favorable as they trend stands towards old forest dominated by ponderosa pine. Treatment in SE stands will transition the stands towards UR and OFSS, trending SE and OFSS towards historical ranges. The largest increase occurs in the UR stage. It is in the understory reinitiation stage where re-establishment of understory, a shift from density dependent to density independent tree mortality, and the development of decadence in the overstory trees occur (Franklin et al, 2002). From this decadence, stands can develop into old forests.

Table 15: Harvest Effects on Structural Stage by Alternative for Dry Upland Forest. Areas in grey depict species outside of HRV.

Forest Structural Stage	Dry Upland Forest Potential Vegetation Group									
	Historical Range		*Existing Conditions, 2012*		ALT 2 Post-Treatment		ALT3 Post-Treatment		ALT 4 Post-Treatment	
	Acres	Percent	*Acres*	*Percent*	Acres	Percent	Acres	Percent	Acres	Percent
SI: Stand Initiation	4,050-6,750	15-25%	*5,370*	*20%*	5,360	20%	5,360	20%	5,360	20%
SE: Stem Exclusion	2,700-5,400	10-20%	***9,000***	***33%***	***5,590***	***21%***	***5,580***	***21%***	***5,860***	***22%***
UR: Understory Reinitiation	1,350-2,700	5-10%	***8,760***	***32%***	***12,180***	***45%***	***12,190***	***45%***	***11,910***	***44%***
OFSS: Old Forest Single Stratum	10,800-16,200	40-60%	***1,450***	***5%***	***1,830***	***7%***	***1,830***	***7%***	***1,830***	***7%***
OFMS: Old Forest Multi-Strata	1,350-4,050	5-15%	*2,400*	*9%*	2,020	7%	2,020	7%	2,020	7%
Total			***26,980***	***100%***	**26,980**	**100%**	**26,980**	**100%**	**26,980**	**100%**

In all action alternatives, some level of prescribed burning is proposed as a means to restore and maintain ecosystem processes for dry forests. Stands that are currently dominated by shrubs, grasses and/or forbs with a few scattered large trees would be maintained in this structural stage by impacting invading trees in the smaller size classes and rejuvenating new growth that is indicative of dry forests, not to mention beneficial as browse to wildlife. An additional benefit to maintenance burning may be to provide a seed bed for regeneration and establishment of some early seral tree species. Non-forested shrub/grasslands and open-canopy ponderosa pine old forest stands, both single and multi-stratum stands, are important elements in the ecosystem that are currently below the historical levels. Some areas would have saplings cut beneath the large diameter overstory. This is designed to reduce ladder fuels and promote the maintenance of this older age class of trees. In stands with two or more layers (cohorts), the lower layers can functions as ladder fuels.

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%). Table 16 displays the harvest effects on stand density by alternative. Landscape underburning following harvest treatment would reduce stand densities, reduce canopy density, and increase height to live crown ratio. 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).

Even with the moderate and high density classes outside historical range in all alternatives, the densities are favorable post treatment as they restore and promote open stand conditions. Treatment is also valuable because it reduces the vulnerability of forests to drought and similar climate change impacts (D'Amato et al. 2013). Through time, stand densities will continue to increase as long as there is growing space, which allows the low stand densities to transition into higher density classes. Follow-up treatments are needed if an objective is to maintain forest vegetation within its historical range of variation (Smith, Kahler Vegetation Report, 2015).

Table 16: Harvest Effects on Stand Density by Alternative for Dry Upland Forest. Areas in grey depict species outside of HRV.

Stand Density Class	Dry Upland Forest Potential Vegetation Group									
	Historical Range		No Action, 2012		ALT 2 Post-Treatment		ALT3 Post-Treatment		ALT 4 Post-Treatment	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Low	10,800-22,950	40-85%	10,190	38%	20,320	75%	19,820	73%	19,360	72%
Moderate	4,050-8,100	15-30%	4,520	17%	2,380	9%	2,410	9%	2,470	9%
High	1,350-4,050	5-15%	12,270	45%	4,280	16%	4,750	18%	5,150	19%
Total			26,980	100%	26,980	100%	26,980	100	26,980	100%

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 model predicts that the area transitions to a Fuel Model 2 by 2065

Table 17. 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 (0.74 tons/acre)	4,023	4,023	1,758	5,182	1,463	1,463
FM 2 (4 tons/acre)	17,034	17,726	18,673	21,228	15,339	16,690
FM 4 (13 tons/acre)	91	91	91	91	91	91
FM 5 (3.5 tons/acre)	2,936	3,265	2,145	5,653	1,870	1,006
FM 8 (5 tons/acre)	3,354	741	3,637	367	3,019	6,217
FM 9 (3.5 tons/acre)	2,166	0	3,491	0	6,182	6,577
FM 10 (12 tons/acre)	1,476	455	1,733	320	4,877	547
FM 11 (11.5 tons/acre)	0	4,760	0	0	0	0
FM 12 (34.6 tons/acre)	1,761	473	1,313	0	0	0
FM 13 (58.1 tons/acre)	0	643	0	0	0	0
FM 14*	0	664	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 (year 2015 to 2021), it is under moderate fire behavior conditions that the differences between Alternative 1 and 2 can best be discerned. The Kahler area is very likely to experience flame lengths greater than 4 feet in height under severe conditions; however, under moderate conditions the area is less likely (1,642 acres difference) to experience flame lengths over four feet when compared to the No Action alternative. The occurrence 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 9,195 acres (moderate conditions) and 4,925 acres (severe conditions) in 2021.

Over the long-term (2065) flame lengths are decreased under severe conditions across 13% of the landscape (approximately 4,270 acres); under moderate conditions the difference is 1,314 acres. 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. See tables 18 and 19 for a comparison of the No Action alternative and Alternative 2.

Table 18. Comparison table for flame lengths under No Action and Alternative 2 (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 (% of Area)	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
	Severe 2015		**Severe 2021**		**Severe 2065**	
Alternative 2 (% of Area)	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
	15	85	2	98	73	27

Table 19. 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 (% of Area)	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	85	15	88	12*

Alternative 2 (% of Area)	Severe 2015		Severe 2021		Severe 2065	
	Surface	Passive	Surface	Passive	Surface	Passive
	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 non-commercial 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 or 4.

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 approximately 9,170 acres of commercial thinning and 5,425 acres of non-commercial thinning. It also includes approximately 1,540 acres of shrub/steppe enhancement treatments. These treatments will temporarily increase surface fuels throughout the units (2-5 years). To reduce the harvest created fuel load, most 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 20 summarizes the proposed activities for all alternatives.

Table 20. Proposed silviculture and fuels activities for No Action, Alternative 2. 3 and 4

Proposed Activity	No Action Alternative	Alternative 2 (Acres)	Alternative 3 (Acres)	Alternative 4 (Acres)
Upland forest commercial thinning	0	10,000	9,170	8,230
Noncommercial thinning outside of harvest units	0	690	690	845
Noncommercial thinning in harvest units	0	5,000	4,580	4,110
Shrub/steppe enhancement	0	1,540	1,700	1,465
Dry forest Riparian Treatment (Class 4 Buffers)	0	680	660	0
Aspen restoration	0	10	10	10
Reforestation in VDT gaps	0	1,000	920	820
Reforestation in Wheeler Point fire	0	5,000	5,000	5,000
Mechanical Line (miles)	0	6.1	6.1	6.1
Handline (miles)	0	2.0	2.0	2.0

Activity fuels treatment (mechanical)	0	1,770	1,680	1,680
Activity fuels treatment (burning)	0	7,000	6,620	5,760
Landscape underburning	0	31,020	31,020	31,020

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, improve fire sighting capabilities, reduce fire severity, and reduce the risk of direct flame reaching the tower (see Figure 13). Treatment at the cabin site would decrease fire severity and 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, allowing for emergency evacuations and improved holding capabilities.

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 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 (see Table 14). Landscape underburn effects will be the same as alternative 2. 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 (see Table 15). 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). Landscape underburn effects will be the same as alternative 2. 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%)(see Table 16). Landscape underburn effects will be the same as alternative 2. 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 model predicts that much of the area transitions to a Fuel Model 2 by 2065. See Table 21 for a comparison of the predicted acreage change between the No Action alternative and Alternative 3.

Table 21. 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 (0.74 tons/acre)	4,023	4,023	1,758	5,180	1,463	1,463
FM 2 (4 tons/acre)	17,034	17,691	18,673	20,815	15,339	16,661
FM 4 (13 tons/acre)	91	91	91	91	91	91
FM 5 (3.5 tons/acre)	2,936	3,212	2,145	5,470	1,870	1,006
FM 8 (5 tons/acre)	3,354	983	3,637	628	3,019	6,110
FM 9 (3.5 tons/acre)	2,166	80	3,491	205	6,182	6,768
FM 10 (12 tons/acre)	1,476	485	1,733	395	4,877	742
FM 11 (11.5 tons/acre)	0	4,497	0	0	0	0
FM 12 (34.6 tons/acre)	1,761	500	1,313	57	0	0
FM 13 (58.1 tons/acre)	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 (year 2015 to 2021), it is under moderate fire behavior conditions that the differences between Alternative 1 and

3 can best be discerned. The Kahler area is very likely to experience flame lengths greater than 4 feet in height under severe conditions; however, under moderate conditions the area is less likely (1,642 acres difference) to experience flame lengths over four feet when compared to the No Action alternative. 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 8,867 acres (moderate conditions) and 4,598 acres (severe conditions) 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. Under moderate conditions, the difference in flame lengths over four feet between alternatives is 1,314 acres. 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. See tables 22 and 23 for a comparison of alternatives for the years 2015, 2021, and 2065.

Table 22. 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 (% of Area)	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
	Severe 2015		**Severe 2021**		**Severe 2065**	
Alternative 3 (% of Area)	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
	30	70	4	96	73	27

Table 21. Comparison table for fire type under No Action and Alternative 3 (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 (% of Area)	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*
	Severe 2015		**Severe 2021**		**Severe 2065**	
Alternative 3 (% of Area)	Surface	Passive	Surface	Passive	Surface	Passive
	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 and 4.

Alternative 4

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 4. The affected environment includes approximately 8,230 acres of commercial thinning and 4,955 acres of non-commercial thinning. It also includes

approximately 1,465 acres of shrub/steppe enhancement treatments. These treatments will temporarily increase surface fuels throughout the units (2-5 years). To reduce the harvest created fuel load, most 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 24 summarizes the proposed activities for all alternatives.

Table 22. Proposed silviculture and fuels activities for No Action, Alternative 2, 3, and 4

Proposed Activity	No Action Alternative	Alternative 2 (Acres)	Alternative 3 (Acres)	Alternative 4 (Acres)
Upland forest commercial thinning	0	10,000	9,170	8,230
Noncommercial thinning outside of harvest units	0	690	690	845
Noncommercial thinning in harvest units	0	5,000	4,580	4,110
Shrub/steppe enhancement	0	1,540	1,700	1,465
Dry forest Riparian Treatment (Class 4 Buffers)	0	680	660	0
Aspen restoration	0	10	10	10
Reforestation in VDT gaps	0	1,000	920	820
Reforestation in Wheeler Point fire	0	5,000	5,000	5,000
Mechanical Line (miles)	0	6.1	6.1	6.1
Handline (miles)	0	2.0	2.0	2.0
Activity fuels treatment (mechanical)	0	1,770	1,680	1,680
Activity fuels treatment (burning)	0	7,000	6,620	5,760
Landscape underburning	0	31,020	31,020	31,020

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, improve fire sighting capabilities, reduce fire severity, and reduce the risk of direct flame reaching the tower (see Figure 13). Treatment at the cabin site would decrease fire severity and 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, allowing for emergency evacuations and improved holding capabilities.

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 4 was effective in 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 (see Table 14). Landscape underburn effects will be the same as alternative 2. 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). In the absence of fire or other disturbance, these stands will remain on their current trajectory in that Douglas-fir and grand fir will continue to develop in the understory.

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 4 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 (see table 15) Landscape underburn effects will be the same as alternative 2.

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 4 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 4), whereas the moderate and high density classes are both outside of their historical ranges (but high is above its range by just 4%)(see Table 16). Landscape underburn effects will be the same as alternative 2. 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 4, refer to the Forest Vegetation Report, Alternative 4 (Smith 2015).

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 52% 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 4 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 (65%) 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 11% of the landscape reflecting a Fuel Model 5. An increase in Fuel Model 1 (16%) 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 4, 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 4 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, but not as well as Alternatives 2 or 3. The resultant down woody increase reflected in Fuel Model 10 is likely a due to the change in proposed silvicultural treatment by leaving all trees 21’ dbh and over. For more information on the difference in timber stand treatment between alternatives, refer to the Silviculture Report in the Kahler EIS. The loss of open grassy, shrub areas occurs due to ingrowth in Fuel Model 1; the model predicts that much of the area transitions to a Fuel Model 2 by 2065.

Table 23. Caparison table of Fuel Models for No Action and Alternative 4 in acres (years 2015, 2021, and 2065)

Fuel Model (Anderson 1982)	Year 2015 No Action	Year 2015 Alternative 4	Year 2021 No Action	Year 2021 Alternative 4	Year 2065 No Action	Year 2065 Alternative 4
FM 1 (0.74 tons/acre)	4,023	4,023	1,758	5,182	1,463	1,463
FM 2 (4 tons/acre)	17,034	19,943	18,673	21,227	15,339	15,055
FM 4 (13 tons/acre)	91	91	91	91	91	91
FM 5 (3.5 tons/acre)	2,936	3,342	2,145	3,762	1,870	1,006
FM 8 (5 tons/acre)	3,354	2,999	3,637	2,259	3,019	4,480
FM 9 (3.5 tons/acre)	2,166	0	3,491	0	6,182	8,685
FM 10 (12 tons/acre)	1,476	2,443	1,733	320	4,877	2,061
FM 11 (11.5 tons/acre)	0	0	0	0	0	0
FM 12 (34.6 tons/acre)	1,761	0	1,313	0	0	0
FM 13 (58.1 tons/acre)	0	0	0	0	0	0
FM 14*	0	0	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 (year 2015 to 2021), it is under moderate fire behavior conditions that the differences between Alternative 1 and 4 can best be discerned. The Kahler area is very likely to experience flame lengths greater than 4 feet in height under severe conditions; however, under moderate conditions the area is less likely (5,910 acres difference) to experience flame lengths over four feet when compared to the No Action alternative. The likelihood of passive crown fire in both moderate and severe conditions is significantly decreased by 2021 (see Table 26). In comparison to the No Action alternative, the proposed treatment decreases the likelihood of a passive crown fire by 9,195 acres (moderate conditions) and 4,926 acres (severe conditions) 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. The change in the landscape under moderate conditions results in a predicted difference in flame lengths of 5,255 acres. The likelihood of passive crown fire is reduced, as well (see Table 27). 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 26. Comparison table for flame lengths under No Action and Alternative 4 (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
	81	19	84	16	95	5
Alternative	**Severe 2015**		**Severe 2021**		**Severe 2065**	
4	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
(% of Area)	14	86	11	89	73	27

Table 24. Comparison table for fire type under No Action and Alternative 4 (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
	59	41	85	15	88	12*
Alternative	**Severe 2015**		**Severe 2021**		**Severe 2065**	
4	Surface	Passive	Surface	Passive	Surface	Passive
(% of Area)	49	51	68	32	87	13

*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 4 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 4 are considered to be mostly positive (because present/ongoing actions also utilize design criteria similar to those for alternative 4's proposed activities).

The estimated cumulative effects for alternative 4 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 and slightly more positive than alternative 3.

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.

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.

Attachment A

Table 28: Fuels Treatment Table by Harvest Unit

Unit	Acres	Fuels treatment Alt 2	Fuels treatment Alt 3	Fuels Treatment Alt 4
43	42	JP/UB	JP/UB	JP/UB
201	129	JP/UB	JP/UB	JP/UB
202	131	JP/UB	JP/UB	JP/UB
205	98	JP/UB	JP/UB	JP/UB
207	319	JP/UB	JP/UB	JP/UB
208	141	JP/UB	JP/UB	JP/UB
209	25	JP/UB	JP/UB	JP/UB
210	60	JP/UB	JP/UB	JP/UB
212	161	JP/UB	JP/UB	JP/UB
205b	391	JP/UB	JP/UB	JP/UB
4	20	MP/BP	MP/BP	MP/BP
72	143	MP/BP	MP/BP	MP/BP
96	42	MP/BP	MP/BP	MP/BP
97	25	MP/BP	MP/BP	MP/BP
3b	63	MP/BP	MP/BP	MP/BP
28	34	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
32	51	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
33	16	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
34	13	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
35	69	MP/BP/JP/UB	MP/BP/JP/UB	UB
36	26	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
37	60	MP/BP/JP/UB	MP/BP/JP/UB	UB
38	20	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
39	17	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
40	24	MP/BP/JP/UB	MP/BP/JP/UB	UB
41	75	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
42	25	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
43	32	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
44	14	MP/BP/JP/UB	MP/BP/JP/UB	UB
47	7	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
48	10	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
49	31	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
50	26	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
56	31	MP/BP/JP/UB	MP/BP/JP/UB	UB
57	12	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
62	37	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB

63	48	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
78	10	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
79	65	MP/BP/JP/UB	MP/BP/JP/UB	UB
80	27	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
82	40	MP/BP/JP/UB	UB	UB
83	50	MP/BP/JP/UB	MP/BP/JP/UB	UB
85	13	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
86	82	MP/BP/JP/UB	MP/BP/JP/UB	UB
36a	24	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
36b	29	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
40c	47	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
41a	59	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
42c	9	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
42e	9	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
49b	20	MP/BP/JP/UB	MP/BP/JP/UB	UB
53c	22	MP/BP/JP/UB	UB	UB
53d	22	MP/BP/JP/UB	UB	UB
60a	58	MP/BP/JP/UB	MP/BP/JP/UB	UB
60b	10	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
61a	11	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
68a	17	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
68b	49	MP/BP/JP/UB	MP/BP/JP/UB	MP/BP/JP/UB
68c	27	MP/BP/JP/UB	UB	UB
70a	80	MP/BP/JP/UB	UB	UB
2	38	MP/BP/UB	MP/BP/UB	MP/BP/UB
3	49	MP/BP/UB	MP/BP/UB	MP/BP/UB
5	32	MP/BP/UB	UB	UB
6	86	MP/BP/UB	UB	UB
7	54	MP/BP/UB	UB	UB
8	31	MP/BP/UB	MP/BP/UB	MP/BP/UB
9	37	MP/BP/UB	MP/BP/UB	MP/BP/UB
10	14	MP/BP/UB	MP/BP/UB	MP/BP/UB
12	59	MP/BP/UB	MP/BP/UB	MP/BP/UB
13	42	MP/BP/UB	MP/BP/UB	MP/BP/UB
14	258	MP/BP/UB	MP/BP/UB	MP/BP/UB
15	87	MP/BP/UB	MP/BP/UB	MP/BP/UB
16	100	MP/BP/UB	MP/BP/UB	MP/BP/UB
17	245	MP/BP/UB	MP/BP/UB	MP/BP/UB
18	150	MP/BP/UB	MP/BP/UB	MP/BP/UB
19	250	MP/BP/UB	MP/BP/UB	MP/BP/UB
20	31	MP/BP/UB	MP/BP/UB	MP/BP/UB

21	72	MP/BP/UB	MP/BP/UB	MP/BP/UB
22	331	MP/BP/UB	MP/BP/UB	MP/BP/UB
23	123	MP/BP/UB	MP/BP/UB	MP/BP/UB
24	71	MP/BP/UB	MP/BP/UB	MP/BP/UB
25	25	MP/BP/UB	MP/BP/UB	MP/BP/UB
26	116	MP/BP/UB	MP/BP/UB	MP/BP/UB
27	209	MP/BP/UB	MP/BP/UB	MP/BP/UB
30	17	MP/BP/UB	MP/BP/UB	MP/BP/UB
31	96	MP/BP/UB	MP/BP/UB	MP/BP/UB
45	37	MP/BP/UB	MP/BP/UB	MP/BP/UB
46	69	MP/BP/UB	MP/BP/UB	MP/BP/UB
51	16	MP/BP/UB	MP/BP/UB	MP/BP/UB
52	58	MP/BP/UB	MP/BP/UB	MP/BP/UB
53	172	MP/BP/UB	MP/BP/UB	MP/BP/UB
54	80	MP/BP/UB	MP/BP/UB	MP/BP/UB
55	23	MP/BP/UB	MP/BP/UB	MP/BP/UB
58	106	MP/BP/UB	MP/BP/UB	MP/BP/UB
59	27	MP/BP/UB	MP/BP/UB	MP/BP/UB
60	19	MP/BP/UB	MP/BP/UB	MP/BP/UB
61	64	MP/BP/UB	MP/BP/UB	MP/BP/UB
65	89	MP/BP/UB	MP/BP/UB	MP/BP/UB
69	43	MP/BP/UB	MP/BP/UB	MP/BP/UB
70	176	MP/BP/UB	MP/BP/UB	MP/BP/UB
71	281	MP/BP/UB	MP/BP/UB	MP/BP/UB
74	25	MP/BP/UB	MP/BP/UB	MP/BP/UB
75	44	MP/BP/UB	MP/BP/UB	MP/BP/UB
76	60	MP/BP/UB	MP/BP/UB	MP/BP/UB
77	21	MP/BP/UB	MP/BP/UB	MP/BP/UB
81	17	MP/BP/UB	UB	UB
84	71	MP/BP/UB	MP/BP/UB	MP/BP/UB
87	21	MP/BP/UB	MP/BP/UB	MP/BP/UB
92	34	MP/BP/UB	MP/BP/UB	MP/BP/UB
93	62	MP/BP/UB	MP/BP/UB	MP/BP/UB
94	86	MP/BP/UB	MP/BP/UB	MP/BP/UB
98	25	MP/BP/UB	UB	UB
99	165	MP/BP/UB	MP/BP/UB	MP/BP/UB
10b	24	MP/BP/UB	UB	UB
11b	120	MP/BP/UB	MP/BP/UB	MP/BP/UB
12a	74	MP/BP/UB	UB	UB
13a	15	MP/BP/UB	MP/BP/UB	MP/BP/UB
13b	36	MP/BP/UB	MP/BP/UB	MP/BP/UB

18b	54	MP/BP/UB	MP/BP/UB	MP/BP/UB
21b	82	MP/BP/UB	MP/BP/UB	MP/BP/UB
21d	11	MP/BP/UB	MP/BP/UB	MP/BP/UB
21e	50	MP/BP/UB	MP/BP/UB	MP/BP/UB
21f	32	MP/BP/UB	MP/BP/UB	MP/BP/UB
21f	37	MP/BP/UB	UB	UB
23a	53	MP/BP/UB	MP/BP/UB	MP/BP/UB
23b	46	MP/BP/UB	UB	UB
23c	79	MP/BP/UB	UB	UB
24b	24	MP/BP/UB	MP/BP/UB	MP/BP/UB
28a	190	MP/BP/UB	MP/BP/UB	MP/BP/UB
30a	29	MP/BP/UB	UB	UB
31a	47	MP/BP/UB	MP/BP/UB	MP/BP/UB
40a	15	MP/BP/UB	MP/BP/UB	MP/BP/UB
40b	18	MP/BP/UB	MP/BP/UB	MP/BP/UB
42a	22	MP/BP/UB	MP/BP/UB	MP/BP/UB
43a	424	MP/BP/UB	MP/BP/UB	MP/BP/UB
49a	16	MP/BP/UB	MP/BP/UB	MP/BP/UB
51a	24	MP/BP/UB	MP/BP/UB	MP/BP/UB
53a	27	MP/BP/UB	MP/BP/UB	MP/BP/UB
53b	28	MP/BP/UB	MP/BP/UB	MP/BP/UB
56a	110	MP/BP/UB	MP/BP/UB	MP/BP/UB
57b	32	MP/BP/UB	MP/BP/UB	MP/BP/UB
5a	0	MP/BP/UB	MP/BP/UB	MP/BP/UB
65a	49	MP/BP/UB	MP/BP/UB	MP/BP/UB
65b	47	MP/BP/UB	UB	UB
69a	94	MP/BP/UB	MP/BP/UB	MP/BP/UB
7a	8	MP/BP/UB	MP/BP/UB	MP/BP/UB
CG-1	18	MP/BP/UB	MP/BP/UB	MP/BP/UB
LO-1	12	MP/BP/UB	MP/BP/UB	MP/BP/UB
LO-2	18	MP/BP/UB	MP/BP/UB	MP/BP/UB
LO-3	3	MP/BP/UB	MP/BP/UB	MP/BP/UB
1	83	MST/JP	MST/JP	MST/JP
3a	78	MST/JP	MST/JP	MST/JP
4b	103	MST/JP	MST/JP	MST/JP
11	128	MST/UB	MST/UB	MST/UB
29	68	MST/UB	MST/UB	MST/UB
68	243	MST/UB	MST/UB	MST/UB
73	59	MST/UB	MST/UB	MST/UB
88	54	MST/UB	MST/UB	MST/UB
89	56	MST/UB	MST/UB	MST/UB

90	130	MST/UB	MST/UB	MST/UB
91	79	MST/UB	MST/UB	MST/UB
95	7	MST/UB	MST/UB	UB
10a	18	MST/UB	UB	UB
18a	74	MST/UB	MST/UB	MST/UB
20a	16	MST/UB	MST/UB	MST/UB
21a	40	MST/UB	MST/UB	MST/UB
21c	14	MST/UB	MST/UB	MST/UB
24a	50	MST/UB	MST/UB	MST/UB
26a	48	MST/UB	MST/UB	MST/UB
27a	27	MST/UB	MST/UB	MST/UB
27b	61	MST/UB	MST/UB	MST/UB
27c	17	MST/UB	MST/UB	UB
2a	74	MST/UB	UB	UB
31b	60	MST/UB	MST/UB	MST/UB
42b	46	MST/UB	MST/UB	MST/UB
42d	13	MST/UB	MST/UB	MST/UB
57a	122	MST/UB	MST/UB	MST/UB
67	29	UB	UB	UB
100	17	UB	UB	UB
200	38	UB	UB	UB
205a	107	UB	UB	UB
68d	48	UB	UB	UB
69b	8	UB	UB	UB
69c	76	UB	UB	UB
71a	403	UB	UB	UB

The Fuels Treatment column provides estimated fuels treatment methods directed primarily toward reduction of activity fuels created by forest vegetation treatments such as commercial or noncommercial thinning. These fuels treatment assignments are based on the best information available when this environmental analysis was conducted (primarily on preliminary unit layout and project reconnaissance activities), and they are subject to minor modification during final project design and layout. Alt 2, 3, and 4 treatments are shown with these codes: MP=machine pile; BP=burn piles; JP=jackpot burn; UB=underburn; MST=mastication. For a definition of terms, refer to the Kahler Vegitation Report Glossary (Powell, 2014).

Attachment B

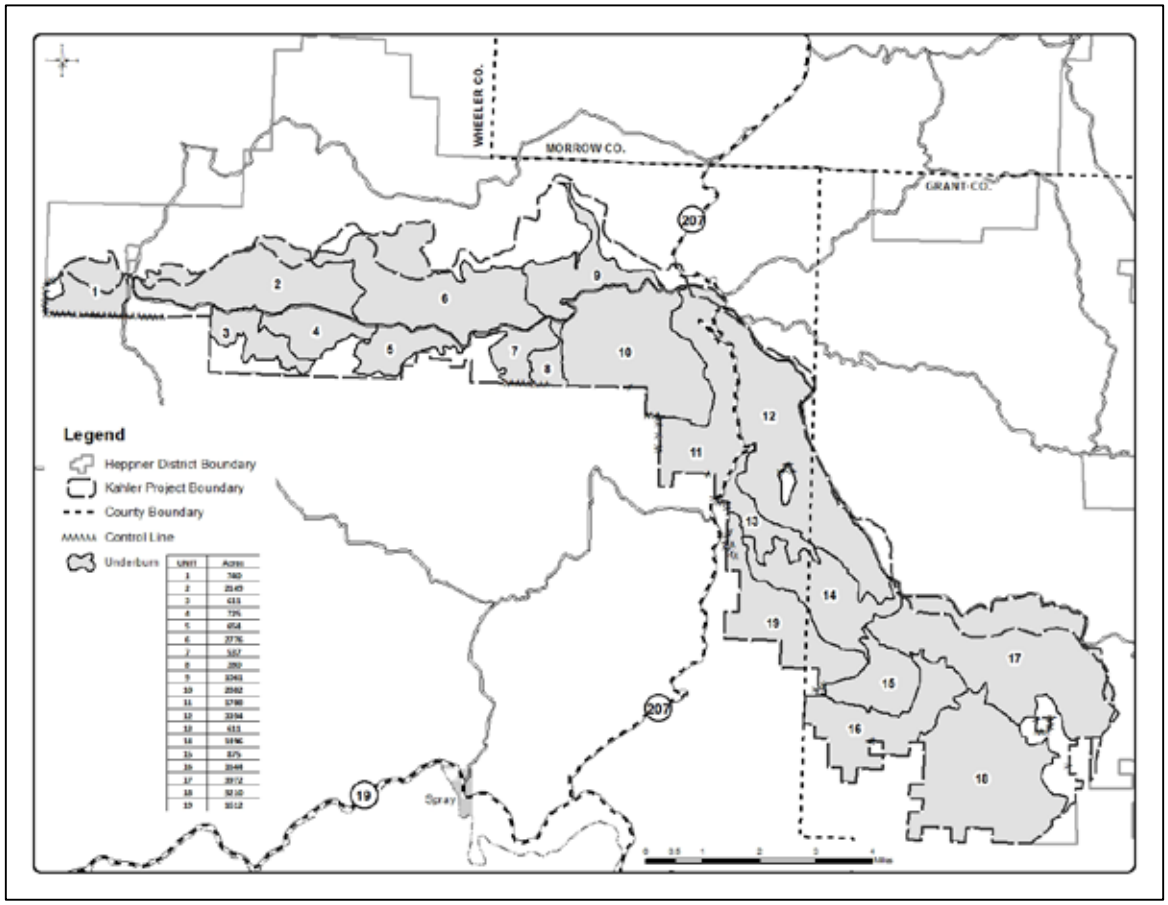


Figure 14: Proposed prescribed burn unit boundaries and associated acreage for Kahler Dry Forest Restoration

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Appendix E
Air Quality Report

Kahler Dry Forest Restoration Project

Air Quality Report

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for:

Heppner Ranger District
Umatilla National Forest

May 4, 2015

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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.

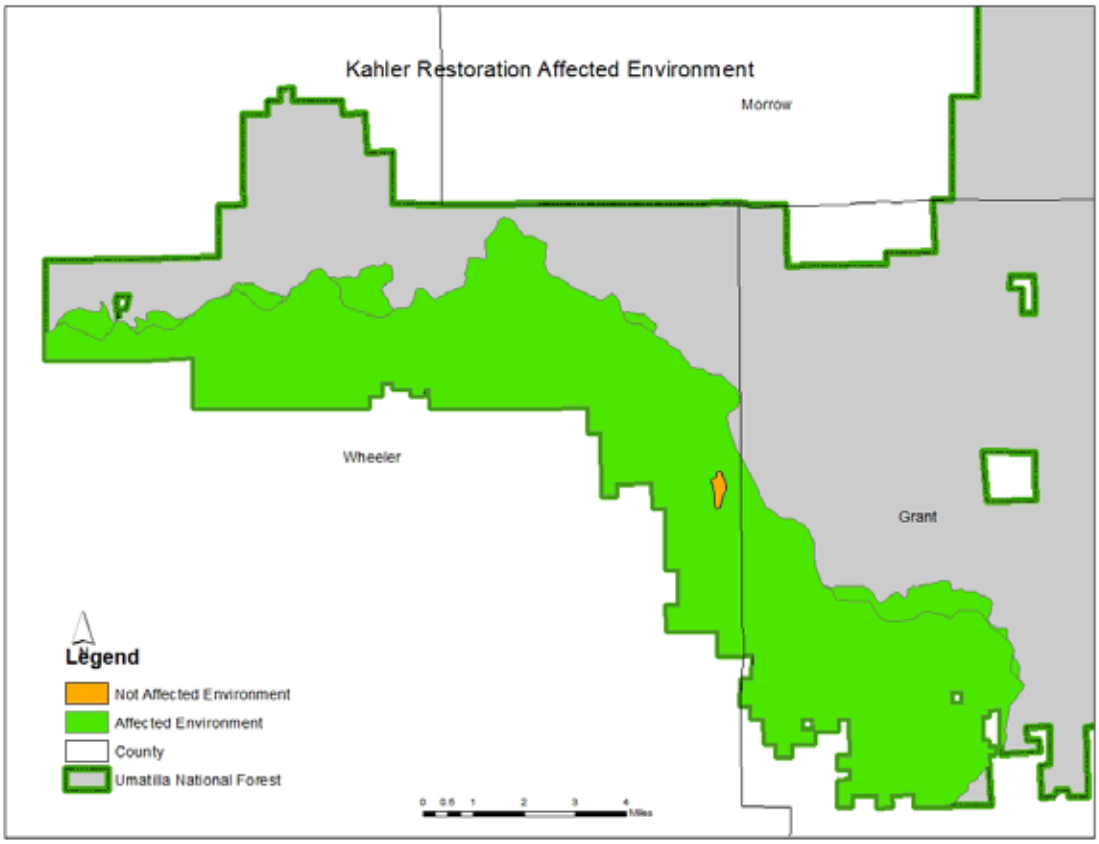


Figure 1: Affected environment for forest vegetation analyses. The orange areas show locations of Forest Plan management areas that are unsuitable for prescribed fire (D2 Research Natural Area); they are not included in the affected environment for the fire and fuels analyses. Private land within and 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.

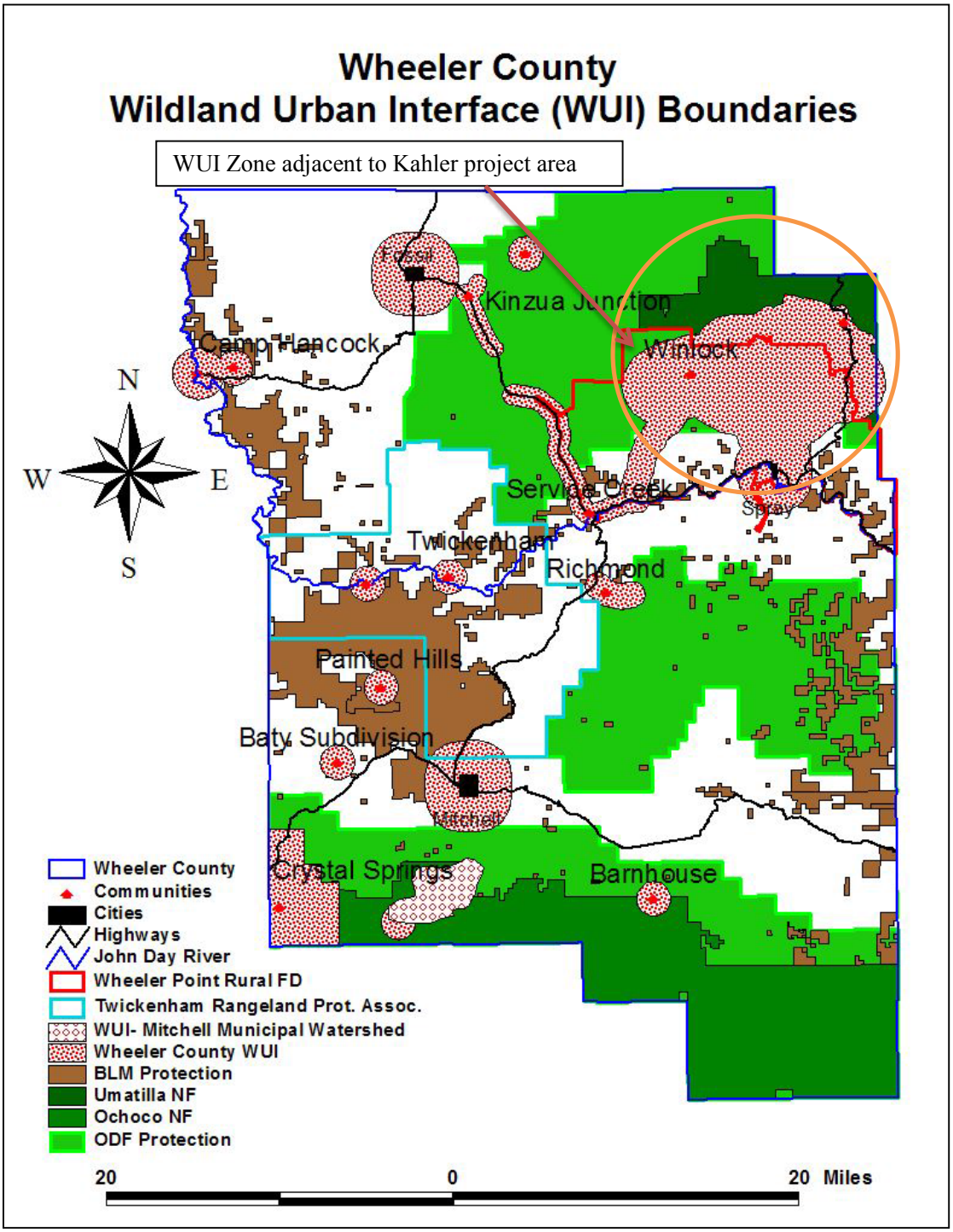


Figure 2: Wildland Urban Interface Zones in Wheeler County (Wheeler Co. 2006)

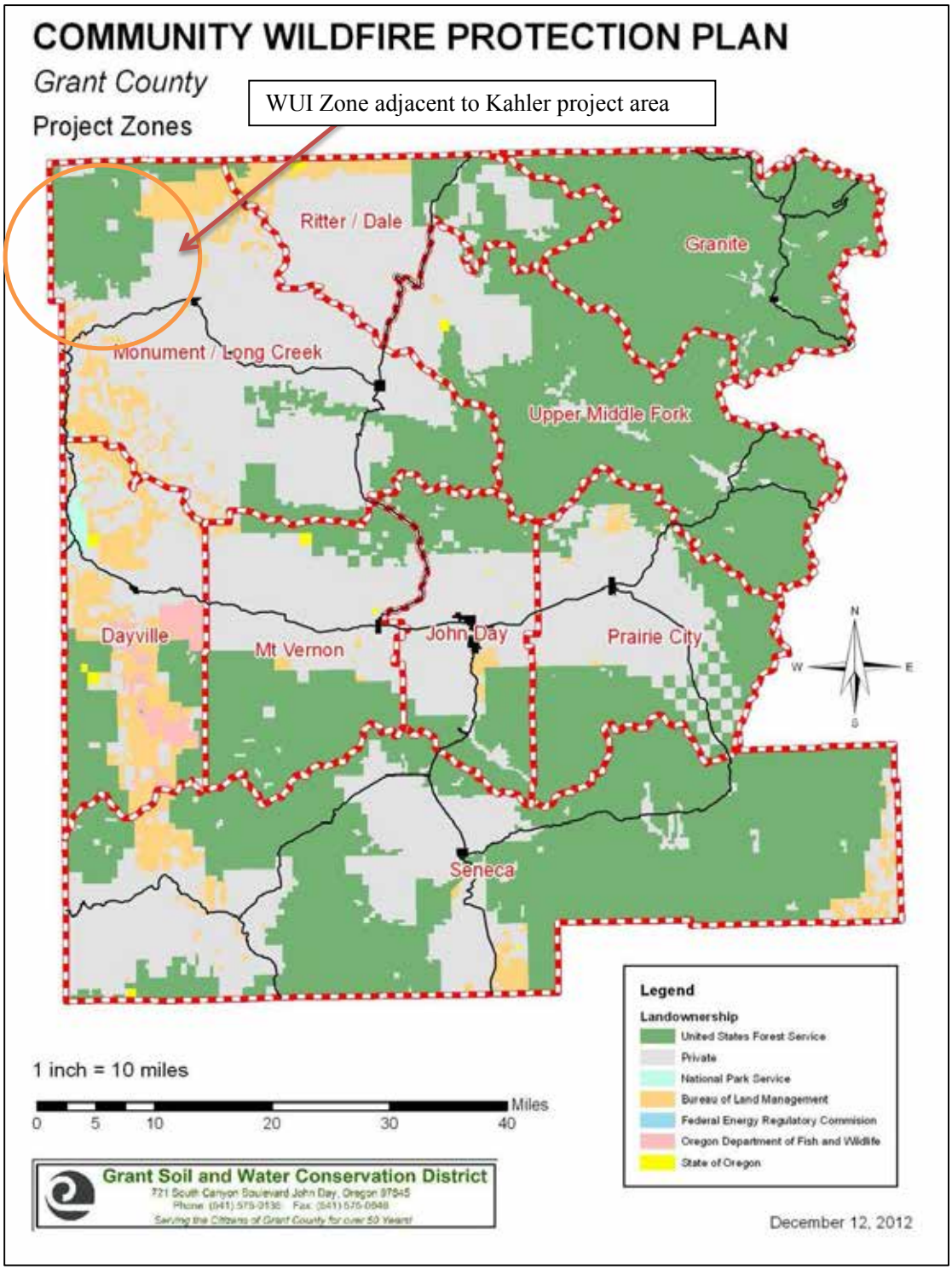


Figure 3: Grant County Wildland Urban Interface Project Zones (Jerome 2013).

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*

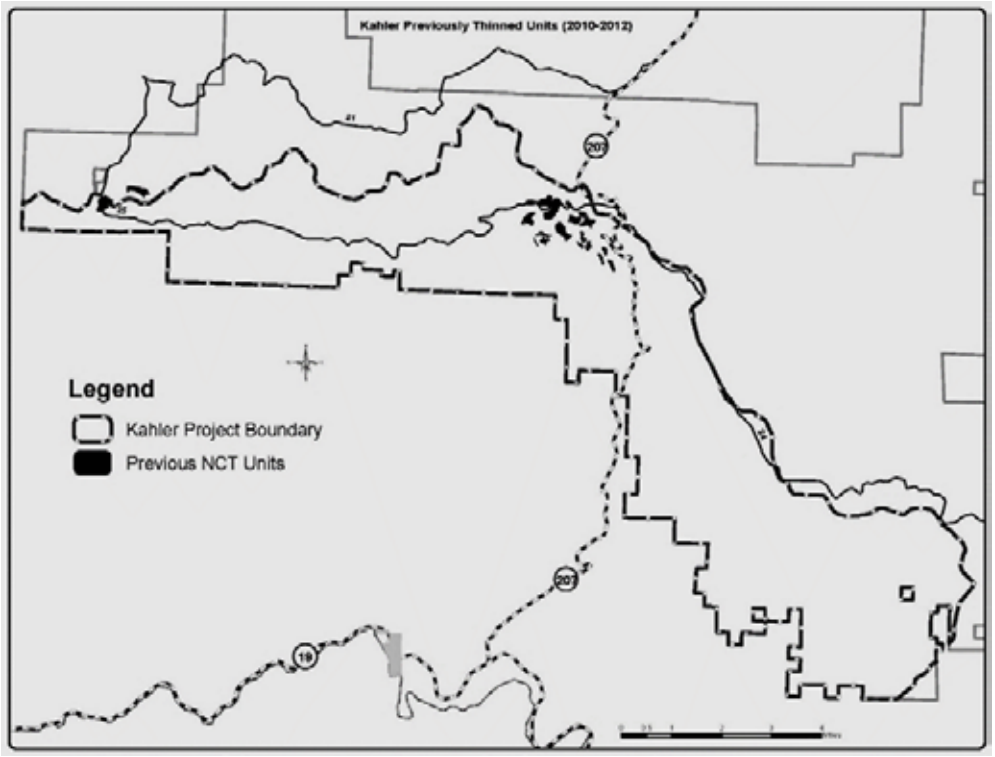
Spatial and Temporal Context for Effects Analysis

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.



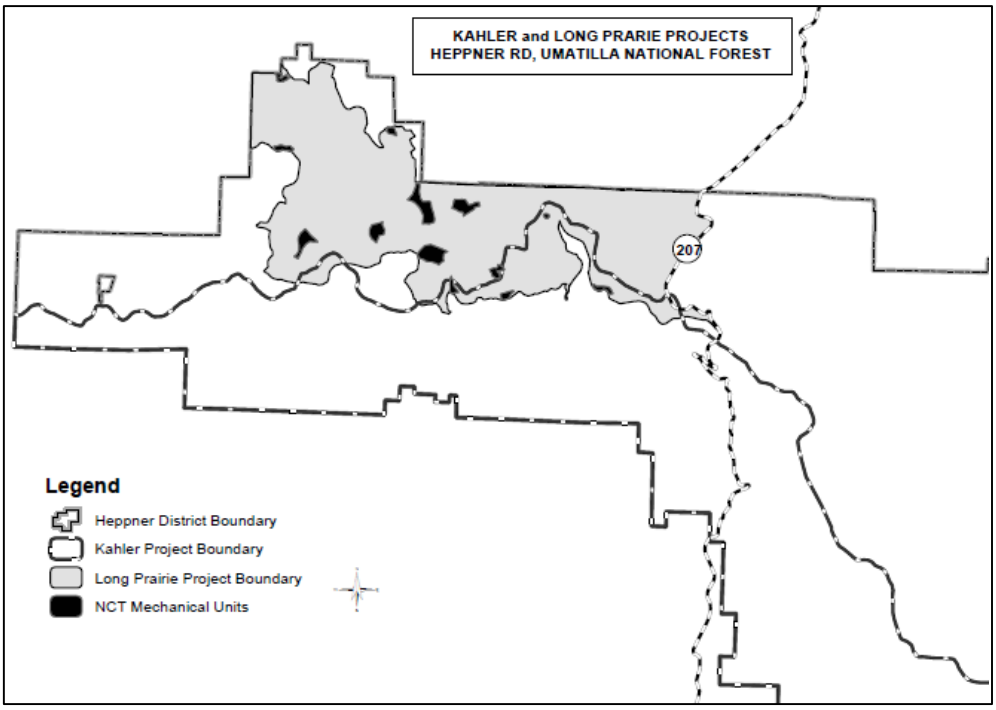


Figure 4: Present (on going) actions in the Kahler planning area- non-commercial thinning authorized by 2009 categorical exclusion (CE) (top) and the Long Prairie fuels reduction project authorized by CE in 2010 (bottom).

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 10,000 acres of commercial thinning and 5,690 acres of non-commercial thinning. These treatments will temporarily increase surface fuels throughout the units (2-5 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 21,710 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: Silvicultural and Fuels activities included in the Proposed Action for Kahler Dry Forest Restoration Project

Proposed Activity	Alternative 2 (Acres)	Alternative 3 (Acres)	Alternative 4 (Acres)	Activity Objectives and Specifications
Upland forest commercial thinning	10,000	9,170	8,230	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	690	690	690	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	5,000	4,580	4,110	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.
Shrub/steppe enhancement	1,540	1,700	1,620	Conifers (including western juniper, ponderosa pine, and Douglas-fir) have encroached into grassland, shrubland, and open woodland vegetation. Where appropriate, given historic conditions, noncommercial and commercial-size conifers that are <21 inches dbh and not showing old growth character would be removed or thinned on these acres to improve grassland and shrubland conditions.
Dry forest Riparian Treatment (Class 4 Buffers)	680	660	0	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	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	820	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	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 al-low this approach to be successful.
Mechanical Line (miles)	6.1	6.1	6.1	Facilitate holding capabilities for activity fuel treatment and landscape burning
Handline (miles)	2.0	2.0	2.0	Facilitate holding capabilities for activity fuel treatment and landscape burning
Activity fuels treatment (mechanical)	1,770	1,680	1,680	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)	7,000	6,620	5,760	Post-harvest fuel reduction burning; acreage values assume that 70% of CT treatment area will be underburned.
Landscape underburning	31,020	31,020	31,020	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).

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):

1. 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).
2. Reduce fuel load via mechanical removal, mechanical processing, firewood sale, biomass utilization, ungulate grazing
3. Reduce fuel consumed by burning under moist conditions, prior to precipitation, or prior to the curing of large fuels.
4. Burn prior to spring green-up or in the fall
5. 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)
6. Burn when dispersion is good
7. Share the airshed
8. Avoid sensitive areas
9. Burn smaller units over multiple days
10. 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.

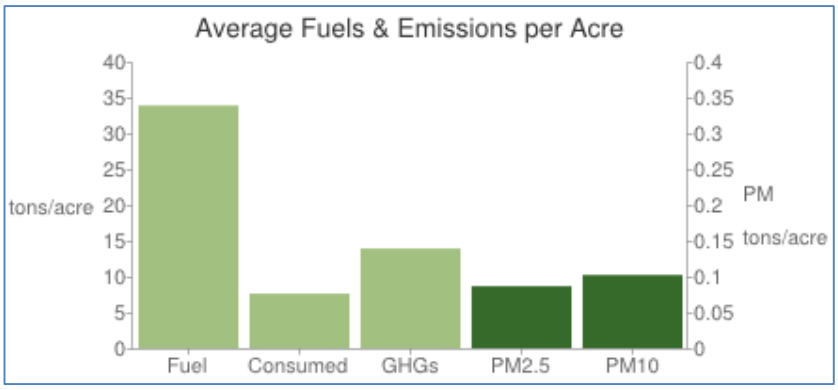


Figure 5: Average fuels and emissions per acre for the predicted 4,000 acre prescribed fire. Green House Gasses (GHGs), $PM_{2.5}$ and PM_{10} are predicted to be less than 0.15 tons/acre.

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.

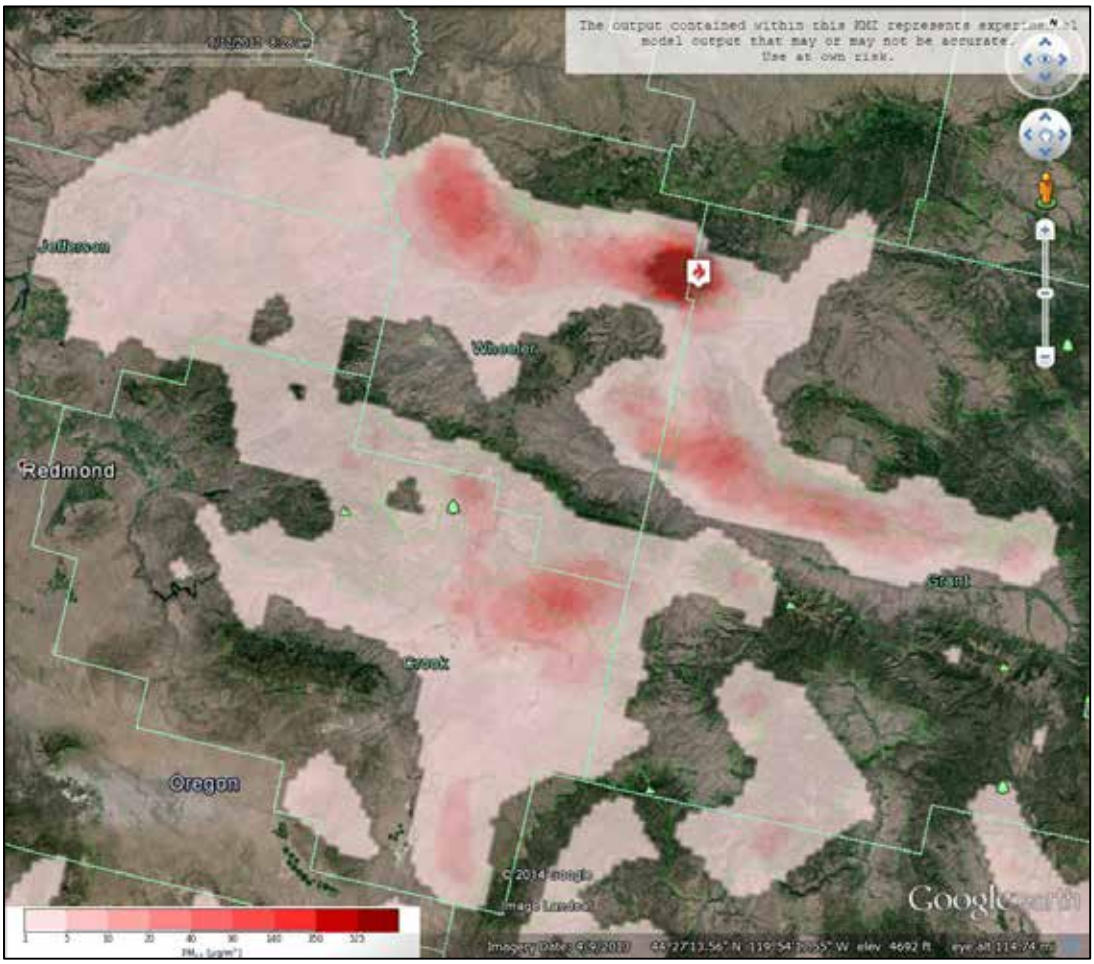


Figure 6: Smoke dispersion scenario under typical fall burn conditions for a 4,000 acre prescribed fire. Heavy smoke is displayed in dark red at the ignition source and moves south into the John Day river valley. Smoke impacts to communities will be of short duration (2-3 days).

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

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 9,170 acres of commercial thinning and5,270 acres of non-commercial thinning. These treatments will temporarily increase surface fuels throughout the units (2-5 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 21,710 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.

Alternative 4

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 4. The affected environment includes 8,230 acres of commercial thinning and4,800 acres of non-commercial thinning. These treatments will temporarily increase surface fuels throughout the units (2-5 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 21,710 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 4 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.

<u>A4 Viewshed 2</u>

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.

<u>A6 Developed Recreation</u>

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.

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Appendix F
Hydrology Report

Kahler Dry Forest Restoration Project

Final Hydrology Report

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for:

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Umatilla National Forest

3/23/2015

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Introduction

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 disclose the expected effects of this project, and whether they are likely to accumulate with the past effect at the Watershed Scale. Attachments include a bibliography, a Harvest System Soil and Hydrology Prescription for Water Bodies (referred to as the Hydrologic Prescription), and a photographic appendix.

The Kahler Project includes commercial thinning within Riparian Habitat Conservation Areas (RHCAs). The work is proposed along intermittent Class 4 streams. Surveys were conducted during field season 2013 to confirm 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 (BMPs) and Design Criteria (see Table 12 and Hydrology Prescriptions).

Summary of Effects

The rationale for treatments in Class 4 RHCAs is described. The fact that the Class 4 streams stop flowing during the July to October period is stated. Effects to 3 Water Quality indicators (stream temperature, biological criteria, and dissolved oxygen) are expected to be limited by Design Criteria 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 Criteria 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 the 1996 Wheeler Point Fire. Measurable effects to sedimentation at the reach scale from the Kahler Project are unlikely. 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 or organization to use the public water and obtain a water right, 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.

Affected Environment

Existing Condition

Water Quality Standards

The Oregon Department of Environmental Quality (DEQ) has identified water quality limited streams throughout the State of 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 2003. 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

*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 approved
Kahler Creek	10.6 - 13.8	Jan 1 to May 15	Spawning, see definition	303 (d), TMDL approved
Tamarack Creek	0 - 1.3	Year Around	Spawning, see definition	303 (d), TMDL approved

*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 main stem John Day River downstream of the Kahler Project area is also listed for 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, biological criteria, and dissolved oxygen TMDL for the John Day Basin was completed in 2010. A sediment TMDL is 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 have been approved by the Oregon Department of Environmental Quality as part of the TMDL process.

Best Management Practices

The general practices that the Forest Service uses to maintain water quality are called Best Management Practices (BMPs). The Forest Plan (USDA, 1990) 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 Criteria (see Chapter 2, Table 1-2), Hydrology Prescriptions, 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 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 South Zone Interdisciplinary Team developed a structured approach for insuring that mitigation measures and design features are carried through to project implementation. The Design Criteria are listed in Table 12. Each Design Element is referenced to the Forest Plan, National BMP Handbook, or the Timber Sale Contract. Where applicable, IDT notes on implementation are included.

Monitoring and Evaluation

Background Temperature Monitoring

Temperature monitoring would continue in the Kahler Watershed until a background range is established. Recent data on stream temperatures are shown in Table 6.

Analysis Area Soil And Water Quality Evaluation

Soil evaluations of the units have been conducted. See the Soil Report. 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 Kahler Project.

PACFISH-INFISH Biological Opinion (PIBO) Monitoring

PIBO monitoring began in 2001. It is conducted by the Forest Services' Rocky Mountain Research Station. Monitoring in the Kahler Project Area began in 2003, and is conducted on a 5 year rotation at 4 sites. Two sites are on Henry Creek and 2 sites are on Wheeler Creek. There is an Integrator Site and a Designated Monitoring Area Site on each stream.

Integrator sites are the most downstream stream segment within a randomly selected ICBEMP 6th field hydrologic unit with less than 3% gradient (ideally), no tributaries, and no beaver activity when sites are established. Data on in-stream habitat, stream temperature, aquatic macroinvertebrate, and riparian vegetation are collected. Designated Monitoring Area (DMA) sites are identified by local field unit personnel as locations utilized for livestock grazing implementation monitoring (IM). Riparian vegetation data and a subset of in-stream habitat data are collected. The two sites on Henry Creek have been monitored three times. One of the sites on Wheeler Creek has been monitored twice, and the other has been monitored once. The data sets are complete for most but not all of the variables, but the information has not been analyzed as of this writing.

The data has been analyzed for the adjacent North Fork John Day River subbasin. That report found that;

> Overall, average index scores indicate that stream habitat conditions in the integrator reaches across the NFJD subbasin on the Umatilla NF are generally poorer than eco-region reference conditions. This is not unexpected given past land use impacts and the time needed for channels to respond to changes in management emphasis since PACFISH (1995). (Day and others, 2015).

Riparian Area Health-Stream Temperature, Biological Criteria, Dissolved Oxygen, Sedimentation, Peak Flows

Current Condition

The Project 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. Groundwater may be low in dissolved oxygen when it is released on the surface, because it is not necessarily exposed to oxygen underground. Once on the surface, oxygen begins to dissolve in the water. The amount of free oxygen (O2) that water is able to contain is determined by water temperature. Colder water is able to hold more oxygen than warmer water. 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. Dissolved oxygen levels tend to move inversely compared to water temperature. . Recent 7 day maximum moving average temperatures are 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.

The headwater streams in the Kahler Project area that are proposed for harvest are intermittent. They stop flowing between approximately July 1 and October 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 (Photo 10). 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 11).

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 natural background sedimentation rate from hillslopes and stream banks was approximated at the Skookum Barometer Watershed, approximately 18 miles to the northeast. This is the assumed rate for the current condition of the Kahler Project Area. See Table 7.

Table 7: Natural Background Sedimentation Rate for Kahler Project Area (Harris and others, 2007).

	Alt 1		
Source	tons/mi^2	area mi^2	area tons
slope, banks[1]	5.35	51.30	274.46

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 Class 4 stream channels associated with the Project appear to be gravel/silt bottomed with pool/riffle morphology. Many channels are wide and shallow, with some deeper, more incised channels. Channel banks were generally stable, except in the vicinity of a few road crossings. Most reaches appear to be zones of transportation. The few zones of deposition were associated with lower gradient topography and wood in the channel and floodplain. Many streams in the lower gradient areas lacked wood (Photo 1). The riparian canopy in the units is almost exclusively conifers, and varies between open (Photo 2) and dense (Photo 3).

Table 8: Existing road densities in miles per square mile and number of road crossings.

Existing perm road density	3.9
Existing RHCA road density	3.7
Existing crossings	277

There are approximately 202 miles of motorized routes in the Project Area. These include roads and OHV trails managed by the Forest Service, Grant and Wheeler Counties, and the State of Oregon. The total road density is approximately 3.9 miles of road per square mile of Project Area. There are 25 miles of roads in riparian areas, and the riparian road density is 3.7 miles per square mile (Table 8). The total road density is higher than 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 195 miles of streams in the Project Area, and approximately 277 road crossings of streams. The road system has increased the drainage density by approximately 5 percent.

Early Riparian Impacts

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 (cottonwood, willow, aspen) are much less common. There are a few isolated riparian and upland 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 (Photo 4). 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 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 2014, there were approximately 77 wolves in 9 packs, 5 breeding pairs, and 2 individual animals in NE and SW Oregon (ODFW, 2015). The Walla Walla and Umatilla River packs, and the Desolation pair spend part of their time on 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. See Winlock AMP Project Soil and Water Photo Monitoring Report, 2008.

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 because conifer forest covers most of these 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. Generally, hardwood and meadow 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 stop flowing 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 since the early European settlement observations were made.

- 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 between 1916 and the 1980s. It has been reduced 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 195 miles of streams in the Project Area, and approximately 277 road crossings of streams, the road system has increased the drainage density by approximately 5 percent.

Desired Condition

The Desired Future Condition in the 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 Future Condition includes decreased sediment production and stream channel stability maintained (Forest Plan, p. 4-8). It also states that "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)."

Environmental Consequences

Issues Addressed and Indicators for Assessing Effects

The Resource Element is Riparian Area Health. It includes effects to stream temperature, biological criteria, and dissolved oxygen. These parameters will be analyzed using changes to stream canopy and temperature. Riparian area health also includes effects to stream sedimentation. Effects to sedimentation will be analyzed using assumed natural background sedimentation, and the effects of the 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.

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 and temperature.	Key Issue 1, watershed integrity	Forest Plan, FSM, BMP, MOU with DEQ, 303(d)
	Biological Criteria			
	Dissolved Oxygen			

	Stream 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.			
	Peak Flows	Past and proposed harvest, roads, and burning.			

Methodology

The Project Area includes lands managed by the Forest Service in the Kahler Creek Watershed of the John Day River (HUC1707020401), as well as small upland portions of the Upper Rock Creek, Wall Creek, and Lower North Fork John Day Watersheds, for a total of approximately 32,840 acres. 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. 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. 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.

The Kahler Project area is the approximately 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 and is based on a GIS database. 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 of the different Alternatives.

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 and high intensity precipitation 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 approximately 32,840 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	32,840	17%
Other	165,106	83%
total	197,946	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 low summer stream flows and base flows.

Spatial and Temporal Context for Effects Analysis

Direct and indirect effects of project activities are expected to take place over approximately 10 years, and be limited to the units, burn blocks, and roads used in this project. Cumulative effects of European-Americans have impacted the area for approximately 200 years. Cumulative effects will be analyzed at the Watershed Scale.

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 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.

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. In addition, high severity fire is capable of heating the stream water enough to kill all aquatic species.

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 Kahler Project Area is the Analysis Area for cumulative effects. Past Management

The background assumptions for this Alternative are listed in the Scope of the Analysis section.

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 32,840 acre 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 existing condition ECA is approximately 6.8 percent. This level of ECA indicates that most of the previous impacts to the canopy have recovered. Also, this level of ECA is below the threshold associated with changes to peak flows. 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, relatively dense, and appears to be deficient in hardwoods. Also, several of the recently surveyed stream reaches are deficient in woody material (see Fisheries Report).

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 5).

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. The current condition for stream sedimentation includes the approximated natural background and the modeled existing low use road system. The background sedimentation rate is shown in Table 11. The natural background rate is approximately 5.35 tons per square mile, and the combined rates for the existing gravel, native surface, and paved roads was modeled at approximately 0.07 tons per square mile. The current condition background sedimentation rate

is 5.42 tons per square mile per year, and the total sediment yield for the Project Area is approximately 278.3 tons per year.

Table 11: Current Condition Background Sedimentation rate in tons per square mile per year.

Source	miles	tons/mi^2	area tons
slope, banks[1]		5.35	274.5
ex. grav rds[2]	6 mi	0.01	0.6
ex nat rds[2]	18 mi	0.06	2.9
ex paved[2]	2 mi	0.01	0.4
totals	25 mi	5.42	278.3

Notes: 1. Harris and others, 2007. 2. WEPP Road Model. (Some columns do not sum correctly because of rounding.)

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.

The physical attributes, processes, and conditions of riparian areas would continue under this Alternative. However, because of past fire suppression, the biological components (wood, vegetation, fish, and wildlife) are increasingly threatened by the risk of uncharacteristically severe wildfire. The risk would continue under this Alternative. In the Project Area, approximately 1135 acres of RHCAs out of approximately 4334 acres (26 percent) have burned since 1944.

Table 12: Modeled sedimentation for first year after the 1996 Wheeler Point Fire.

Source	acres	tons/mi^2	area tons
high severity fire[3]	5560	22.80	197.9
totals			197.9
fire increase above background after first year			71%

[3] WEPP Disturbed Model.

By far the largest fire was the 1996 Wheeler Point Fire. Burn severity records exist for that fire (Table 12). It burned a total of 22,727 acres, including 6950 acres on the Umatilla National Forest. Of the 6950 acres on National Forest, approximately 80 percent (5560 acres) burned with high severity. All of the canopy was killed in the high severity burn, , and shade was reduced to near zero. The reduction in shade is very likely to have increased temperatures in the affected streams, and is likely to have affected biological criteria and dissolved oxygen. The likely sedimentation increase was modeled at 197.9 tons in the project area (Table 12), a 71 percent increase over background sedimentation in the first year. This rate of sedimentation would sharply decrease in the second year and approach background in the third, because of the regrowth of forest vegetation and the fall of forest litter (Elliot and others, 2000).

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 Direct and Indirect Effects, and that they would be quantitatively similar to the 1996 Wheeler Point Fire.

Action Alternatives

Design Features and Mitigation Measures

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[1] and Best Management Practices (BMP's)[2] that were chosen to apply to the proposed action and action alternative. This list also includes Kahler Project design criteria[3] 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 concerns4

SL- Soils

[1] 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).

[2] 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

[3] Design criteria are measures applied to the development of the proposed action and alternatives, which are based on IDT specialist expertise.

[4] 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.

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?
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

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?
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
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.

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?
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-	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?
			2, p. C-10		
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 before the rainy season each year, usually by 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

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?
					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
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

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?
WQ28	Equipment crossing swales or ephemeral draws that do not classify as Class IV will be confined to designated crossings approved by the Forest Service, and may not otherwise operate within the swale. The reason is to minimize soil disturbance and sedimentation. There will be minimum 100 foot spacing between designated stream crossings. Skidding up and down ephemeral draws will be prohibited. 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, as long as they are not bank supporting trees. 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
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

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?
					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	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?
	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.				
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
SL4	Roads (RD2) Effectively close, to the degree possible given topography and available vegetation, closed system roads used to access timber harvest units following implementation to reduce the likelihood of illegal motorized use. To the degree possible given topography and available vegetation, decommission (obliterate) temporary roads used during implementation. Methods for accomplishing this are described in the timber sale contract.	N/A	Forest Plan p. 4-86 Transportation Goal	National BMP Guide (2012) RD-2	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.					

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?
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	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?
			SG's for Water; 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 or damage shrubs, hardwoods, or trees unnecessarily.	Yes	N/A	N/A	N/A

Table 14: Criteria for equipment trails in or around Class 4 stream RHCA. Limits are based on WEPP results.

	No Mechanical Equipment Zone		Activity Area		Max Trail distance or activity allowed
A	First 100ft from stream edge has a slope between 0%-20%	Yes	Activity Area Slope < 35% or >35%?	<35%	600ft*
				>35%	Only Non-Ground Based Harvest and Prescribed Fire
		No	Go to B or C		
B	First 75ft from stream edge has a slope between 21%-35%	Yes	Activity Area Slope < 35% or >35%?	<35%	225ft*
		No		>35%	Only Non-Ground Based Harvest and Prescribed Fire
C	35% or more	Yes			Only Non-Ground Based Harvest and Prescribed Fire

***If the slope is broken by topography or water bars before the maximum trail length; potential sediment to the stream is reduced.**

Table 15: Possible near stream thinning 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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Purpose and Need

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."

PACFISH

The rationale for treating in Class 4 Riparian Habitat Conservation Areas (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 Goals and Standards and Guidelines, including:

> 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 (p. C-10)
>
> FM-1, Design fuel treatment … strategies … and identify instances where … fuel treatment actions … could perpetuate … long term ecosystem functions (p. C-15).
>
> FM-4, Design prescribed burn projects and prescriptions to contribute to the attainment of the Riparian Management Objectives (p. C-16).

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. 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. Stream temperatures would be maintained in the short and long term. 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.

Specific design criteria were developed in order to avoid retarding the attainment of RMOs. See Tables 14, 15, and 16 in this report, and the Hydrology Prescription. They are discussed below.

Project Activities

Descriptions of the proposed silvicultural, mechanical fuel, and prescribed burning treatments in the Kahler Project are located in Table 1 of the Fire and Fuels Report.

See the Alternative Comparison Tables in Chapter 2 of the Environmental Assessment) for descriptions of the 3 Action Alternatives. They propose commercial thinning harvest, non-commercial thinning, possibly biomass harvest, and mechanical fuel treatments. Harvest systems would be ground based, helicopter, cable/ground based, cable/helicopter, and cable only. All harvest systems would include falling and bunching of timber. Heavy equipment which would operate outside of the 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 mechanically treated and/or burned 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, road maintenance, re-opening of closed roads, and re-commissioning of previously decommissioned roads, new temporary road construction, re-closing, decommissioning, and closing of open roads (see Roads Report). 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. The activities outside the RHCAs generally do not affect streams or water quality, because they are physically removed from streams by a buffer (Belt, 1992). 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 to them would be a reduction in the risk of fire spreading into the Class 1, 2, and 3 RHCAs.

Two of the Action Alternatives propose activities within RHCAs. Alternative 2 proposes approximately 680 acres of commercial and/or non-commercial thinning, mechanical fuel treatments (outside of heavy equipment exclusion zones), combustion fuel treatments, and shrub/steppe treatments in the RHCAs (FVR, Table 1). Alternative 3 proposes 660 acres of the same treatments. Alternative 4 would not treat in RHCAs. Thinning treatments would use a variable-width, no-mechanical-equipment zone adjacent to the stream channels (see Table 14 and Hydrology Prescription). The no-mechanical equipment zone width would vary depending on slope. 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 into streams in skyline units to mitigate for skyline corridors (see Hydrology 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, re-opening, and re-closing activities. The Highway 207 retrofitting and passage improvements would take place within existing road prisms and possibly upstream and downstream if required by stream simulation analysis. Thinning and burning treatments follow prescriptions designed by the silviculture and fuels staffs. Individual unit prescriptions include input from soils, hydrology, and fisheries staffs. Their implementation is overseen by the timber and fuels staffs. The retro-fitting and passage improvements would be designed and implemented by hydrologists, fish biologists, and civil engineers, with input from the other staffs. Applicable BMPs and design criteria are included in all prescriptions, designs, and implementation plans.

Direct and Indirect Effects

The Class 4 intermittent streams stop flowing between approximately July and October. For this reason, it is unlikely that the silvicultural treatments and burning would have an effect on stream temperature during the critical low flow, high temperature season. It is possible that biological criteria or dissolved oxygen may be locally affected if a tree is cut that shades an isolated pool or spring. However, springs are protected from harvest and ground disturbance within 75', so it is unlikely that shade casting trees would be cut (Hydrology Prescription).

There would be log hauling on existing roads in 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, or dissolved oxygen

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. The reduction in riparian canopy and stream shade is not expected to contribute to stream temperatures during the critical hot weather/low flow period for creeks in the project area or downstream, because the Class 4 intermittent streams proposed for treatment in the 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.

The 3 Action 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 31,020 acres. Included in this total are 154 acres in the Wall Creek Watershed and 47 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. All of the Action Alternatives propose 6.1 miles of mechanical fire line and 2.0 miles of hand fire line to facilitate control of activity fuel prescribed burns in the units. Hand fire line would be used in RHCAs to reduce impacts to sedimentation from 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. The fire trails would be rehabilitated with water bars and seeding as needed after the burns.

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.

Alternative 2 contains approximately 680 acres of Class 4 RHCAs which would contain activity fuels and would be burned as units, and later underburned as part of a burn block. Alternative 3 contains approximately 660 acres of Class 4 RHCAs with the same activities. Alternative 4 would not generate activity fuels in RHCAs. These burns would be expected to produce small areas of moderate severity burning in locations with fuel "jackpots," and would be expected to kill many small trees. However, the prescriptions would not allow the fire to spread very far from the points of ignition if jackpots were not present.

There are additional 1910 acres of Class 4 RHCAs in the Kahler project area which would be landscape underburned in Alternative 2 and 1930 acres in Alternatives 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. Alternative 4 proposes to underburn approximately 2590 acres. Since this area contains the dense stands of timber that were proposed for units, additional mitigations would be included in the burn prescriptions to limit burn severity (see BMP Effectiveness section above and in following paragraphs).

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 intensities, trees 12 inches and larger are expected to have from less than 1 percent to 3 percent mortality. (see prescribed burning section in next paragraphs). Grass, forb, and hardwood vegetation is expected to re-sprout 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 stop flowing 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 of July through October 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 underburning proposed by the Action Alternatives 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 travel-way, 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.

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 Prescriptions).

There would be log haul on approximately 25 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.

1. Newly constructed roads would be located on the lowest feasible slope and be located outside of RHCAs.
2. Grading (blading) should be done only when necessary.
3. Ditches should not be routinely bladed.
4. Exposed soil in steep areas would be seeded as needed.
5. 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 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.

Peak flows are discussed in the Cumulative Effects Section.

Cumulative Effects

The background assumptions for these Alternatives are identical to the assumptions for Alternative 1.

The Direct and Indirect Effect Analysis concluded that while the Kahler Project may cause effects to the riparian canopy, it was unlikely to measurably affect stream temperatures, biological criteria, dissolved oxygen, or sedimentation at the sub-watershed scale.

The Kahler Project Area contains approximately 202 miles of motorized routes, including Forest Service, state, and county roads and OHV trails (Table 8). Alternative 2 would use 109 miles of existing roads and build 3.0 miles of temporary roads for a total of approximately 112 miles of haul routes. Alternative 3 would use 102 miles of existing roads and build 3.0 miles of new temporary roads for a total of approximately 105 miles of haul routes. Alternative 4 would use 103 miles of existing roads for haul. . None of the new temporary roads would be located in RHCAs, and there would be no new stream crossings. The addition of the new temporary roads would temporarily increase the total road density slightly, but because of rounding, it would remain at 3.9 miles per square mile (see Roads Report). In addition to the new temporary roads, the Action Alternatives propose to decommission 5.6 miles of existing roads. This would reduce the total road density to 3.8 miles per square mile after the project. Also, a subset of skid trails would be assessed after project activities as candidates for subsoiling and advanced rehabilitation activities. Alternatives 2 and 3 would use 25.3 miles of haul routes in RHCAs. Alternative 4 would use 24.8 miles of haul routes in RHCAs.

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 and temporary roads in the RHCAs and their rehabilitation are not expected to cause stream sedimentation at the reach scale, 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, unless there is a timber sale or wildfire. 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 11 shows the current condition approximated natural background sedimentation and the modeled existing road system sedimentation rates. The two rates combined equal 5.42 tons per square mile per year for the Kahler Project Area. 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. Table 11 shows the modeled sedimentation for the year after the Wheeler Point Fire, an additional 197.9 tons in the project area, which is a 71 percent increase over background. It is expected that the Wheeler Point Fire returned to background levels of sedimentation by the third year after the fire. ,

Table 16: Alt 2 Sedimentation per year for estimated 5 years harvest.

Source	miles/acres	tons/mi^2	area tons
slope, banks[1]		5.35	274.46
grav haul[2]	6 mi	0.03	1.52
nat. haul[2]	18 mi	0.13	6.77
paved haul[2]	2 mi	0.01	0.47
ct, nct, mcfuel[3]	136 ac	2.82	0.60
totals		8.34	283.81
Alternative 2 increase over background			3.4%

Notes: [1]Harris, et al, 2007. [2]WEPP Road Model. [3]WEPP Disturbed Model.
(Some columns do not sum correctly because of rounding).

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 5.5 tons per year in the area (3.4 percent). This increase would continue through the harvest period of the project, approximately 5 years (Table 16). It would end when harvesting activities ended.

The Action Alternatives all propose to use approximately the same miles of haul routes in RHCAs (25 miles). Alternatives 2 and 3 propose roughly the same amounts of harvest and mechanical fuel treatments in RHCAs. Alternative 4 does not propose harvest in RHCAs, and mechanical fuel treatments would be very limited. The harvest sedimentation per year in the Project Area for Alternative 2 would be 283.81 tons, for Alternative 3 283.79 tons, and for Alternative 4 would be 283.21 tons. The rounded increase over the background sedimentation for the 3 Alternatives would be 3.4 percent per year.

Table 17. Alt 2 Sedimentation per year for estimated 5 years of prescribed burning.

Source	miles/acres	tons/mi^2	area tons
slope, banks[1]		5.35	274.46
ex. grav rds[2]	6	0.01	0.59
ex nat rds[2]	18	0.06	2.86
ex paved[2]	2	0.01	0.35
landscape[3]	519	2.82	2.28
act fuel[3]	136	2.82	0.60
totals			281.14
Alternative 2 increase over background			1.0%

Notes: [1]Harris, et al, 2007. [2]WEPP Road Model. [3]WEPP Disturbed Model.

Table 17 shows Alternative 2 prescribed burning sedimentation in total tons per year during the estimated 5 years of prescribed burning for the Kahler Project. The burning would take place after all the harvest was completed. The increase would total approximately 2.84 tons per year in the Project Area. This would be an increase of approximately 1.0 percent above background. The increase from Alternative 3 would be minutely less than Alternative 2 at 2.82 tons per year in the Project Area. The increase from Alternative 4 would be 2.24 tons per year in the Project Area.

The Action Alternatives all propose landscape underburning in the Class 4 RHCAs in the Project Area, approximately 2590 acres. Alternatives 2 and 3 propose roughly the same amount of activity fuel burning, 680 and 660 acres. Alternative 4 does not propose activities in the RHCAs, and would not generate activity fuels. The activity fuels would be burned first, followed by the landscape underburning. Assuming the burning would take 5 years, there would be approximately 519 acres of landscape burning and 136 acres of activity fuels burning per year if Alternative 2 or 3 were selected. There would be approximately 519 acres of burning per year if Alternative 4 were selected.

Compare the proposed 3.4 percent increase in tons per year of sedimentation for the first 5 years, and the 1.0 percent increase for the second 5 years, for the Kahler Project with the 71 percent increase in the first year for the Wheeler Point Fire (Table 12). The sedimentation modeled for the Kahler Project is limited to approximately 10 years, and is well below the total background levels for the Project Area. It is unlikely to be measurable at the watershed scale. The modeled sedimentation from the 1996 Wheeler Point Fire would be greatest during the first year, approximately half during the second year, and approaching background during the third year. For the first and second years, it would be likely to be measurable at the watershed scale. By completing one of the Action Alternatives of the Kahler Project, the risk of another high severity fire would be greatly reduced. The effects of the Kahler Project would be considerably less intense than the effects of another high severity fire.

The Kahler timber harvest, prescribed burning, non-commercial thinning, and connected road activities proposed inside and outside of RHCAs would be expected to immediately begin to 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.

Peak Flows

Alternative 2 is modeled to increase ECA from 6.8 to 17.6 percent. Alternative 3 is modeled to increase ECA to 16.8 percent, and Alternative 4 is modeled to increase ECA to 15.9 percent. The modeled ECAs are slightly more than the 15 percent threshold for detectable changes in peak flows on the maximum effect line in transient snow zones derived by Grant, et al, 2008 (Figure 1). However, the data that this line represents originated from large clear-cut units without mechanical equipment exclusion zones. The Kahler Project does not propose clear-cuts, and all units in RHCAs would have no mechanical equipment zones. Treatments within buffers would have Design Criteria to protect streams.

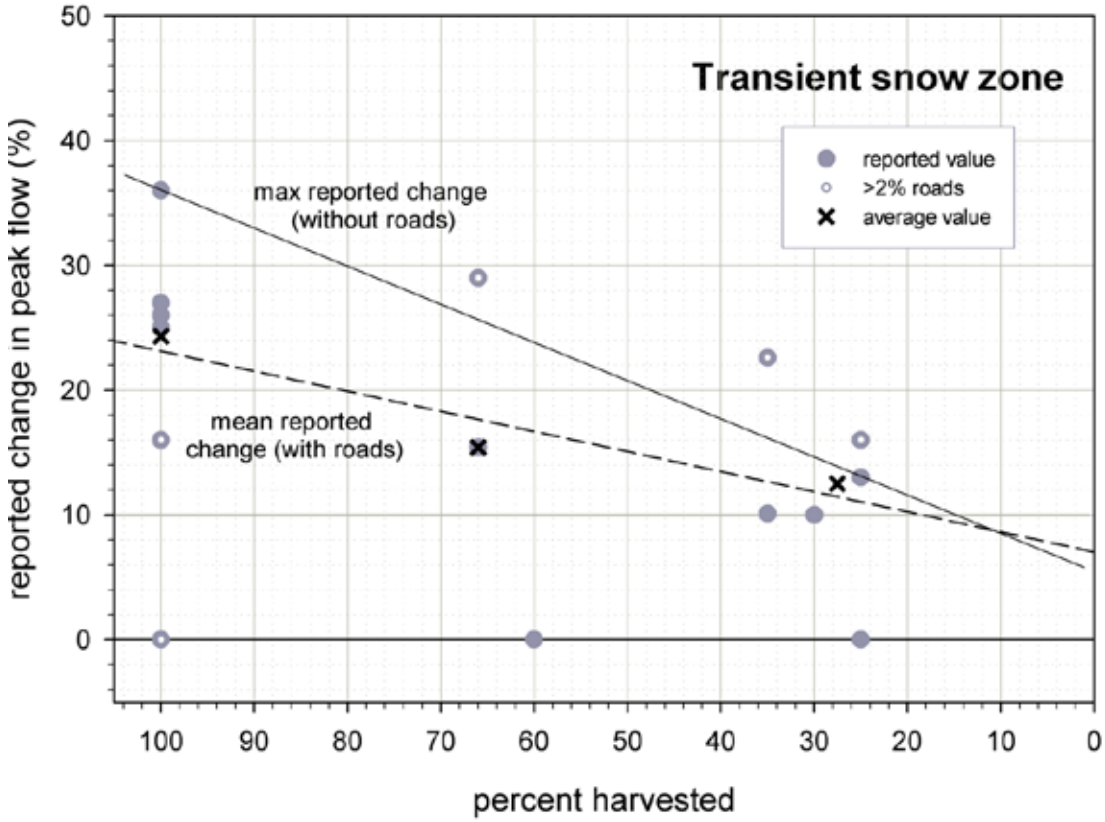
Grant et al, 2008 state that projects like Kahler which propose lower intensity harvests and and no mechanical equipment zones should be tracked using the mean response line. This line intersects the threshold for detectable changes at 19 percent harvest (Figure 1).

Roads are also a consideration when determining effects to peak flows. Road density on lands managed by the Forest Service is higher than the Forest Average. Road area would increase slightly in the three Action Alternatives, but would be lower than the previous area after rehabilitation of temporary roads at the end of the project. No new temporary roads would be constructed in RHCAs.

The number of road stream crossings, increase in drainage efficiency, and unit size would remain the same. The action alternatives have Design Criteria which are designed to mitigate activities that might affect peak flows. The mitigations include reforestation in areas where the canopy was reduced by fire, no new temporary road construction in RHCAs, and placing wood in streams.

Because Kahler proposes harvests that are less intense than the clear-cut harvests surveyed by Grant et al, 2008, it is reasonable to use the mean response line threshold for detectable change. Using this procedure results in the finding that the effects of possible peak flow increases in the Kahler Project Area would be expected to be small, of short duration, and localized, and would not be expected to measurably change channel geometry, planform, or bedload sediment transport at the reach scale.

Figure 1: Maximum Effect Line for Transient Snow Zone, Grant, et al, 2008.



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 (Little Wall Kahler 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. Cattle and wildlife also make trails along fences, at salt sites, and to access water (Photo 6). 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 Watershed Integrity at the reach 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 Watershed Integrity 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 (Photo 7). 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 (Photo 8 and 9), 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

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 17: 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 18: 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 19: 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

Photos

(All Photos by Edward C. Farren)

Photo 1

Lower gradient stream lacking in wood, unit 17, 2/9/2015).

Photo 2

Open stand (5/7/2013).

Photo 3

Dense stand (6/12/2013).

Photo 4

Post fire aspen response, 8/14/2013.

Photo 5.

Sediment moving out, without being retained (5/21/2013).

Photo 6.

Cow and wildlife trail crossing stream (6/11/2013).

Photo 7

2500-067 wetland (8/13/2013).

Photo 8

Unit 23 spring, developed as a pond (photo 6/13/2013).

Photo 9.

Unit 14 springbrook (11-3-2011).

Photo 10

Steep ground with low cover has potential for erosion. Unit 11, (8/22/2013).

Photo 11.

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Appendix G
Invasive Plants Report

Kahler Dry Forest Restoration Project
Invasive Plant Report
March 2015

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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 1: 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
Cynoglossum officinale	Houndstongue	New Invader
Linaria dalmatica	Dalmation Toadflax	New Invader
Taeniatherum caput-medusae	Medusa-head	New Invader
Cytisus scoparius	Scotch broom	New Invader

Table 2: Current Weed Presence

Species Code	Common Name	Number of Sites	Avg. Plants/Acre	Acres
Centaurea diffusa	Diffuse Knapweed	119	10-20+	319
Cynoglossum officinale	Houndstongue	1	20+	.5
Linaria dalmatica	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) with existing invasive plant sites

Treatment	Alt. 1	*Alternative 2	*Alternatives 3/4	Total Harvest Acres Proposed Alt 2.	Total Harvest Acres Propose d Alt 3.	Total Harvest Acres Proposed Alt 4.
Ground Base	0	496 acres on 64 sites	450 acres on 56 sites	10484	9119	8680
Helicopter	0	3 acres on 5 sites	3 acres on 5 sites	661	490	273
Cable/ Ground Base	0	96 acres on 6 sites	96 acres on 6 sites	431	431	405
Cable/Helicopte r	0	5 acres on 4 sites	5 acres on 4 sites	395	395	240
Cable	0	42 acres on 10 sites	51 acres on 10 sites	477	380	206

*Acres on numbers of sites is calculated by combining multiple species of high priority noxious weeds that occur within a single noxious weed polygon. This will inflate the actual acreage affected 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 effects 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 recreationists 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 consistent 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.

1) 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.
2) 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.
3) 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.
4) The Forest Service will provide necessary seed using seed certified noxious weed seed free (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).
5) 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.
6) Forest Service personnel will spot check activities during implementation to determine whether noxious weed mitigation measures and project risk management plans are implemented.
7) After activities are completed, the District noxious weed personnel will conduct an inventory of the treatment area and access routes to determine if existing noxious weed populations have spread or if new infestations have become established.
8) 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.
9) Known high priority infestations will be treated prior to proposed activities to prevent seed production.

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). Alternatives 3 and 4 also propose the use of ground base equipment. Proposed ground base treatments in alternatives 3 and 4 are reduced by approximately 1365 acres and 1804 acres respectively when compared to Alternative 2. Alternatives 3 and 4 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).

Alternatives 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. Alternatives 2 and 3 propose the use of temporary roads. These temporary roads can be conduits for invasive plants and should be placed in areas where there are no

infestations of noxious weeds. Alternative 4 poses less risk for noxious weed spread/invasion with decreased miles of road and no new temporary road construction. Closed roads that are opened to implement this project will 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 effects 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 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. 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 ***03/08/2015***

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 B: SERA RISK ASSESSMENTS DO NOT WARRANT CHANGES TO 2010 WEED EIS.

SUPPLEMENTAL INFORMATION REPORT FOR UMATILLA NF 2010 INVASIVE PLANT FEIS UPDATED HERBICIDE RISK ASSESSMENTS

Rochelle Desser January 29, 2015

I prepared this supplemental information report for the Umatilla National Forest to help the Forest respond to public comments about whether or not the updated glyphosate herbicide risk assessment changed conclusions from the Umatilla 2010 Invasive Plant Treatment FEIS. Forest Service regulations (36 CFR 220) require the Forest Service to stay alert for new information that may influence the way an ongoing project is implemented. Updated risk assessments have been prepared for four herbicides discussed in the Umatilla 2010 FEIS.

The updated herbicide risk assessments are available online at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml and herbicide labels are available at http://www.fs.fed.us/foresthealth/pesticide/labels.shtml

Herbicide Active Ingredient	Date	Reference Number
Glyphosate	March 25, 2011	SERA TR-052-22-03b
Imazapyr	December 16, 2011	SERA TR-052-29-03a
Picloram	September 29, 2011	SERA TR-052-27-03a
Triclopyr BEE and TEA	May 24, 2011	SERA TR 052-25-03a

While hazard quotient values for similar exposures were greater or smaller in the updated risk assessments, compared to disclosures in the Umatilla 2010 FEIS, overall conclusions about impacts remain valid and no changes to the project design criteria are needed. The cautious approach in the Umatilla 2010 project has accounted for any increased HQ values and additional exposure scenarios discussed in the updated risk assessments.

Beyond the HQ values, the updated risk assessments do not indicate new risks or differences in relative risk between the herbicides. Some new exposure scenarios for wildlife and human health are addressed in the updated risk assessments but the results do not indicate any need to change the project or supplement the EIS.

The following sections discuss updated risk assessment and findings in the Umatilla 2010 FEIS for wildlife, fish and people. The updated risk assessments do not change findings for botany, soil and water, recreation, economic or heritage resources.

WILDLIFE

The 2011 updated risk assessments included in some new exposure scenarios and changes in HQ values for some existing exposure scenarios however the effects disclosures in the Umatilla 2010 FEIS remain valid.

New Wildlife Exposure Scenarios

New acute exposure scenario: A new scenario has been developed for a small bird feeding on sprayed vegetation. Under this scenario, exposure to triclopyr sprayed at the typical rate had HQ values greater than 1, assuming typical rates. At maximum rates only, picloram and glyphosate HQ values for this scenario also exceed 1.

New chronic exposure scenario: The updated risk assessments address chronic exposure to small birds and mammals from eating contaminated vegetation. HQ values for glyphosate and picloram sprayed at the highest rate exceeded 1 (no exceedances were predicted for the typical rate). No herbicide would be spot or broadcast sprayed at the highest rate so this exposure scenario is not plausible.

The updated risk assessment also predicted greater risks to small birds and mammals associated with chronic exposure to triclopyr sprayed at typical and maximum rates. Triclopyr would not be applied by broadcast (spot and selective treatments only), which would reduce risks from exposure. Chronic exposure to triclopyr is implausible given the relatively low extent of use on and off the Forest. The Umatilla 2010 FEIS estimated that triclopyr would be an effective herbicide on fewer than 200 acres Forest-wide. The Umatilla 2010 FEIS addressed the potential risks associated with triclopyr use and included appropriate design criteria for wildlife.

Changes in HQ values associated with existing exposure scenarios

Minor changes in HQ values were predicted in the updated risk assessments for existing acute exposure scenarios related to mammals and birds consuming contaminated vegetation.

- Glyphosate – Updated risk assessment resulted in HQ values greater than 1 only at highest application rates; these are implausible for the Umatilla project
- Imazapyr – No change in evaluation of risk, no scenarios over HQ = 1
- Picloram – HQ values for acute exposures have gone down for mammals and up for birds (acute consumption of contaminated vegetation). However, no HQ values greater than 1 are associated with use of picloram at typical rates.
- Triclopyr – HQ values for acute scenarios have increased for large and small mammals (acute consumption of contaminated vegetation). However, these scenarios are unlikely to actually occur given the design criteria, herbicide use buffers and relatively low extent of use.

The following table summarizes herbicide risk assessment scenarios that 1) are associated with HQ values greater than 1 for wildlife and 2) differ from the Umatilla 2010 FEIS results. Results in red reflect values that are new or changed in the updated risk assessment.

Symbol meanings for the following table are as follows:

-- Exposure scenario results in a dose below or equivalent to the toxicity index at typical and highest application rates.

★ Exposure scenario results in a dose that exceeds the toxicity index at typical and highest application rates.

♦ Exposure scenario results in a dose that exceeds the toxicity index at highest application rates only (implausible for this project).

Animal/Scenario	Glyphosate	Imazapyr	Picloram	Triclopyr
Acute, consumption contaminated vegetation				
small mammal	♦	--	♦	★

large mammal	♦	--	--[2]	*[1]
large bird	--	--	--	*
small bird (new scenario)	♦	--	♦	*
Chronic veg consumption				
small mammal (new scenario)	♦[1]	--	*[1]	*[1]
small bird (new scenario)	♦[1]	--	*[1]	*[1]

- 1 – New scenario or increased HQ value compared to Umatilla 2010 FEIS findings.
- 2 – The FEIS showed the toxicity index was exceeded at the highest application rate; *Lower* HQ in updated risk assessment

SOILS AND WATER

The findings related to direct and indirect impacts to soils and water have not changed since the release of the 2010 FEIS. The updated risk assessments and changes in invasive plant inventory do not result in changes to findings about soil and water.

AQUATIC ORGANISMS

The findings related to direct and indirect impacts to fish and aquatic organisms have not changed since the release of the 2010 FEIS. Changes in risk assessments resulted in some increases in HQ values. The toxicity threshold for glyphosate (without surfactant) for effects to fish has changed from 0.5 to 0.1mg/l, due to findings in a paper regarding potential impact on salmon olfactory sensitivity. This increases the HQ values given the same exposure, however this does not change the overall impact analysis or findings about non-lethal impacts.

HUMAN HEALTH

The pre-2005 risk assessments are compared to the 2011 risk assessments in the table below:

Glyphosate Risk Assessment (2003)	**Glyphosate Risk Assessment (2011)**	**Changed Condition Findings**
No operational worker exposures over a threshold of concern.	No operational worker exposures over a threshold of concern.	No change.
No public health exposures over a threshold of concern (non-accidental).	A new public health scenario was modeled in the 2011 risk assessment: acute consumption of contaminated vegetation (not fruit) by a woman immediately after spraying. The 2011 glyphosate risk assessment indicates that the HQ value would equal 1.4 at the "upper bound" estimate for the herbicide application rate of 2lb per acre. No other non-accidental human health exposures exceeded the reference dose.	The new scenario of consumption of contaminated vegetation is implausible because a woman would have to consume 1 pound of vegetation immediately after spraying. The HQ = 1.4 is a slight exceedance over the threshold of concern. The threshold of concern is several orders of magnitude below the level thought to cause a human health impact. Therefore, this change does not substantially affect the findings in the Umatilla 2010 FEIS.
For an accidental spill of 200 gallons of herbicide into a small pond, the HQ = 2 for a small child drinking water out of the pond immediately after the spill.	No change. Because of the herbicide handling and transportation safety PDFs that limit the amount of herbicide that could be transported, and the low plausibility of a child drinking from a pond immediately after a spill, the risk associated with this scenario remains low in all alternatives for the Umatilla project.	No change. Because of the herbicide handling and transportation safety PDFs that limit the amount of herbicide that could be transported, and the low plausibility of a child drinking from a pond immediately after a spill, the risk associated with this scenario remains low in all alternatives for the Umatilla project.
	Additional exposure scenarios have been added to the updated risk assessment (for example, a woman swimming in a stream that has been contaminated with herbicide for one hour). The amount of herbicide that is modeled to reach the stream is based on the GLEAMS estimate	No change in findings.

Glyphosate Risk Assessment (2003)	Glyphosate Risk Assessment (2011)	Changed Condition Findings
	of 10 acres of broadcast spray along 1.6 miles of stream. All exposure estimates were below a threshold of concern for dermal exposure or water consumption.	

Imazapyr Risk Assessment (2004)	Imazapyr Risk Assessment (2011)	Changed Condition Findings
No human health exposures scenarios (worker, public or accidental) exceeded the threshold of concern.	No human health exposures scenarios (worker, public or accidental) exceeded the threshold of concern. Additional exposure scenarios have been added to the updated risk assessment (for example, a woman consuming contaminated vegetation or swimming in a stream that has been contaminated with herbicide for one hour). The amount of herbicide that is modeled to reach the stream is based on the GLEAMS estimate of 10 acres of broadcast spray along 1.6 miles of stream. All exposure estimates were below a threshold of concern for dermal exposure or water consumption.	No change.

Picloram Risk Assessment (2003)	Picloram Risk Assessment (2011)	Changed Condition Findings
No worker exposure scenarios exceeded the threshold of concern.	No worker exposure scenarios exceeded the threshold of concern.	No change.
No non-accidental public	A new public health exposure	The new scenario of

Picloram Risk Assessment (2003)	**Picloram Risk Assessment (2011)**	**Changed Condition Findings**
exposures over a threshold of concern.	scenario modeled in the 2011 risk assessments: chronic consumption of contaminated vegetation (not fruit) by a woman immediately after spraying. The HQ value of 2 was calculated at the upper bound (the central estimate was 3 orders of magnitude below 1). This indicates a slight exceeding of the reference dose, however, the reference dose is orders of magnitude below the level thought to cause an effect. This scenario is unlikely because a woman would have to consume 1 pound of vegetation immediately after spraying, which is unlikely. No other non-accidental human health exposures exceeded the reference dose (including new exposure scenarios such as swimming).	consumption of contaminated vegetation is implausible because a woman would have to consume 1 pound of vegetation immediately after spraying. The HQ = 2 is a slight exceedance over the threshold of concern. The threshold of concern is conservation and is several orders of magnitude below the level thought to cause a human health impact. Therefore, this change does not substantially affect the findings in the Umatilla 2010 FEIS.
For an accidental spill of 200 gallons of herbicide into a small pond, the HQ = 3 for a small child drinking water out of the pond immediately after the spill.	The 2011 accidental spill scenario for a child drinking water after 200 gallons are spilled into a pond went down from HQ =3 to HQ =1. This appears to be because the reference dose (threshold of concern) for this scenario was increased in 2011.	No change. This is an extreme and implausible exposure scenario, especially given the project design criteria associated with the Umatilla project that restrict the amount of herbicide that would be transported to the field. Nor is it plausible that a child would drink water out of a pond immediately after a spill.

Triclopyr (2003)	**Triclopyr (2011)**	**Changed Condition Findings**
Triclopyr TEA – HQ = 1.6 for general worker exposure.	Triclopyr TEA - HQ = 1.6 for general worker exposure	No change. There appears to be an error in the R6 2005 FEIS that uses a value of 16 for chronic worker exposure, and this is referenced in the Umatilla 2010 FEIS. The risk assessment value, based on an application rate of 1 lb per acre, for backpack spraying was 1.6 (not 16), at the upper bound. This indicates a lower level of risk than was reported in the Umatilla FEIS.

Triclopyr (2003)	**Triclopyr (2011)**	**Changed Condition Findings**
Triclopyr TEA - Several acute public health exposures exceeded a threshold of concern for TEA. These included: HQ = 3 for direct spray of a child at the upper bound estimate, HQ = 7 for direct spray of a woman at the upper bound estimate, and HQ = 1.3 for a woman brushing up against contaminated vegetation at the upper bound estimate. No HQ values exceeded 1 at central estimates.	Triclopyr TEA - Reduced HQ values for some of the upper bound, implausible exposure scenarios (HQ reduced from 3 to 0.2 for direct spray of a child, HQ reduced from 7 to 0.5 for direct spray of a woman). For a woman eating 1 lb of contaminated fruit directly after spraying, the upper bound HQ value increased from below 1 to 4. The increase in HQ is due to a reduction in the toxicity threshold because of potential additional sensitivity of a woman of child bearing age. However, the central bound remains below an HQ of 1. A new exposure scenario was included in the 2011 risk assessment that was not in the 2003 risk assessment, for a woman eating about a pound of contaminated vegetation (not fruit) resulted in an upper bound HQ of 27 and a central estimate of HQ = 3 for acute exposures. Upper bound chronic estimates for a woman eating contaminated fruit or vegetation over a long period time also increased in the 2011 risk assessment, with respective upper bound HQ values calculated at 3 and 6, respectively. No other non-accidental scenarios (including swimming) exceed a threshold of concern.	The changes in the values in the risk assessment do not change the interpretations of risk in the Umatilla FEIS. This is because the scenarios described in the risk assessment are unlikely to actually occur. Triclopyr use is limited to spot or selective application. Direct spray of a person is implausible with these methods. Consumption of contaminated fruit is implausible both because the amount of fruit that would have to be consumed and the project design criteria that require posting of treated areas and use of dye to mark treated areas. It is even less likely that someone would eat a pound of contaminated vegetation after it has been sprayed. Upper bound estimates also are extreme; central estimates are more realistic, especially given the project design criteria associated with the Umatilla project.

Triclopyr (2003)	**Triclopyr (2011)**	**Changed Condition Findings**
Triclopyr TEA - For an accidental spill of 200 gallons of herbicide into a small pond, the HQ = 2 for a small child drinking water out of the pond immediately after the spill.	Triclopyr TEA - For an accidental spill of 200 gallons of herbicide into a small pond, the HQ = 2 for a small child drinking water out of the pond immediately after the spill.	No change.
Triclopyr BEE - Worker exposures over a threshold of concern included: HQ = 1.6 for general exposure; HQ = 4 for a worker wearing gloves saturated with herbicide for one hour (upper bound estimates)	Triclopyr BEE - Worker exposures over a threshold of concern included: HQ = 6 for general exposure (upper bound estimate); HQ = 7 for a worker wearing gloves saturated with herbicide for one hour (upper bound estimates). Central estimates are below a threshold of concern.	There appears to be an error in the R6 2005 FEIS that uses a value of 16 for chronic worker exposure, and this is referenced in the Umatilla 2010 FEIS. This indicates a lower level of risk than was reported in the Umatilla FEIS. The increase in the upper bound estimates for accidental worker exposure do not indicate a greater level of risk than disclosed in the Umatilla 2010 FEIS. The upper bound estimate is extreme and assumes no project design criteria are followed. Standard worker precautions are requiring licensed applicators supervise projects make upper bound accidental exposures unlikely to actually occur.

Triclopyr (2003)	**Triclopyr (2011)**	**Changed Condition Findings**
Triclopyr BEE: Public health exposures over a threshold of concern included: HQ = 6 for direct spray of a child at the upper bound estimate, HQ = 11 for direct spray of a woman at the upper bound estimate. None of the central estimates for these scenarios exceeded an HQ = 1. The HQ = 1.7 was calculated for a woman brushing up against contaminated vegetation at the upper bound estimate. Under this same scenario, HQ values were 1.3 at the central estimate. No other public exposure scenarios exceeded a threshold of concern.	Triclopyr BEE: Direct spray of a child at the upper bound estimate is below 1; HQ for direct spray of a woman at the upper bound estimate is 1.4. HQ values for consumption of 1 lb of fruit contaminated with triclopyr BEE increased from an HQ below 1 to an HQ of 4 (at the upper bound). The new scenario of a woman eating 1 lb of contaminated vegetation resulted in an HQ value of 27 at the upper bound, and 3 at the central estimates. Chronic consumption of contaminated fruit and vegetation included HQ values = 3 for fruit and 6 for vegetation. No other non-accidental scenarios (including swimming) exceed a threshold of concern.	The changes in the values in the risk assessment do not change the interpretations of risk in the Umatilla FEIS. This is because the scenarios described in the risk assessment are unlikely to actually occur. Triclopyr use is limited to spot or selective application. Direct spray of a person is implausible with these methods. Consumption of contaminated fruit is implausible both because the amount of fruit that would have to be consumed and the project design criteria that require posting of treated areas and use of dye to mark treated areas. It is even less likely that someone would eat a pound of contaminated vegetation after it has been sprayed. Upper bound estimates also are extreme; central estimates are more realistic, especially given the project design criteria associated with the Umatilla project, including avoiding use of triclopyr (especially BEE) in areas of high public use and forest product gathering.

Triclopyr (2003)	**Triclopyr (2011)**	**Changed Condition Findings**
Triclopyr BEE - For an accidental spill of 200 gallons of herbicide into a small pond, the HQ = 2 for a small child drinking water out of the pond immediately after the spill.	Triclopyr BEE - For an accidental spill of 200 gallons of herbicide into a small pond, the HQ = 2 for a small child drinking water out of the pond immediately after the spill.	No change.

Worker Exposure to Herbicides

The glyphosate risk assessment (SERA 2011) stated that "some recent studies raise concern that glyphosate and some glyphosate formulations may be able to impact endocrine function through the inhibition of hormone synthesis (Richard et al. 2005; Benachour et al.2007a,b), binding to hormone receptors (Gasnier et al. 2009), or the alteration of gene expression (Hokanson et al. 2007)" (all references as cited in SERA 2011). Evaluation of the studies indicates that endocrine disruption effects were indicated for surfactants in the formulations rather than glyphosate itself. The current project requires the use of the aquatic formulation of glyphosate which does not contain the types of surfactants implicated in concern over endocrine effects. A commercial surfactant would be added to glyphosate when preparing the solution for application, but the surfactant type of choice is methylated seed oil/crop oil concentrate, which is typically a corn oil derivative and not implied in causing endocrine effects. PDFs reduce the application rate for NPE surfactants and address this concern.

Public Exposure to Herbicides

The updated risk assessments increased some HQ values, and reduced others, however the overall findings in the 2010 FEIS remain valid. The 2011 risk assessments included a new exposure scenario of a woman eating 1 1b. of contaminated vegetation immediately after spraying. This leads to higher HQ values than consumption of contaminated fruit. Actual adverse effects are still not expected due to the unlikely nature of the scenario occurring.

Appendix H
Recreation Report

Kahler Project Recreation Report

Janel Lacey, South Zone Recreation Manager

March 20, 2015

Kahler Project Recreation Report

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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 all 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. The desired future condition for A4 states “Forest stands will occasionally be logged in order to maintain long-term health and vigor, and to encourage a park-like, near natural appearance with big trees in the immediate foreground.” Visual quality standards for each of the management areas within the Kahler analysis area are listed in Table 2.

Table 2. Visual Quality Objectives within the Kahler 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

The A4 viewshed within the Highway 207 corridor runs approximately 10 miles from the northern Forest boundary to its southern Forest boundary. All is within the Kahler analysis area. From the summit (mile post 27) south to the Forest boundary (around m.p. 33), the terrain is steep and the highway winding. On the downhill side of the highway is a dense mixed conifer riparian area, while the uphill side is Ponderosa pine and juniper of varying tree densities and with scattered, rocky openings. Distant views are periodically revealed through the trees and there is a prominent viewpoint near milepost 32. At least one location (near Fairview Campground) had evidence of past harvest. From the summit north to the Forest boundary (m.p. 23), terrain gradient of highway is gradual and trees are predominantly Ponderosa pine with some patches of mixed conifer. There are many natural, rocky, scattered openings. There is more evidence of harvest on this side of the summit, and many stumps along the highway due to

Oregon Department of Transportation right-of-way clearing. Once off the Forest heading north, the area along the highway is predominantly harvested and the numerous tall stumps reduce scenic integrity. Residual trees are of medium size (~16 inch diameter) with scattered young trees below. Densities are very open with many small scattered natural openings and rocky outcrops. Riparian shrubs (6-8 feet tall) border both sides of the highway from around m.p 19 to the edge of the trees just north of m.p. 13. The landscape character for the 10 miles of Highway 207 that run through National Forest is natural appearing, while the 10 miles north of the Forest boundary are a combination of pastoral and natural appearing. Scenic attractiveness for the entire length inventoried is typical of the west side of the Heppner Ranger District and scenic integrity (the degree of deviation from the desired landscape character) is moderate along much of the route and high along portions south of milepost 27.

Fairview Campground is adjacent to Highway 207. The forest is a combination of mixed conifers and openly spaced Ponderosa pine. Around campsites 2 and 5, the trees are densely spaced, while around sites 1, 3, and 4 the area is very open with scattered pine and juniper. There is a small aspen stand in the drainage just below site 2 that has a lot of ingrowth of conifers. Landscape character is recreation in a natural setting and scenic attractiveness is typical of sites on the southern portion of the Umatilla National Forest. Scenic integrity within the campground is high.

Tamarack Lookout and cabin are at the top of a ridge. The lookout is in a small opening (1-2 acres) and the cabin is within the edge of the treeline. The forest is mixed conifer with moderate tree density and mixed age classes. Trees block any distant views except from the top of the lookout. Landscape character is recreation in a natural setting and scenic attractiveness is typical of the west side of the Heppner Ranger District. Scenic integrity within the administrative site is moderate.

Effects of No Action Alternative

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. Travelers of Highway 207 would experience a diversity of views, from open Ponderosa pine and rocky openings to dense mixed conifers and riparian areas. Harvest within the road right-of-way and on private land north of milepost 23 would continue to be apparent to viewers. There would be no changes to scenic integrity along Highway 207m Fairview Campground, or Tamarack Lookout as a result of implementing this alternative.

Effects Common to All Action Alternatives

Direct and Indirect Effects: There are no activities proposed within the D2 or C1 management areas, although a Forest Plan amendment would swap 12 acres of C1 around the Tamarack Lookout to E1, replacing it with 16 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 would 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 would be retained around sites 2 and 5 to retain privacy and shade. . A higher density of trees would also be retained along Highway 207 to shield the campground from traffic noise. Treatments would avoid the area directly adjacent to the spring that feeds the water fountain. Mitigation directs that stumps would be low-cut and/or chipped 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 ponderosa pine with a thick ground cover of grass. Visual quality would be reduced for up to three years following harvest until harvest debris 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 soil disturbance has recovered, the visual quality objective of Partial Retention would be achieved. In other words, the landscape character of the campground would appear slightly altered, but noticeable deviations would remain visually subordinate to the landscape character being viewed. Scenic integrity would appear modified.

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). Thinning would result in variable tree densities with up to 15% of each unit remaining in untreated skips of half an acre or larger. The use of a skip and gap harvest approach would maintain visual diversity throughout the harvested area by blending with natural openings and tree clumps as 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 (units CG-1, 42 a, 43, 43a, and 99) would cause soil disturbance that would be evident for 1-3 seasons, depending on seeding of disturbance and growing conditions. Treatment using helicopter systems (units 36, 36a, 36b, 37, 41, and 80) 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 (40 and 79) 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 for the A4-Viewshed corridor (VQ2) would retain visual diversity by requiring that thinning and planting leave irregularly spaced trees and that any planting include at least 2 tree species with no more than 65% in a single species. Mitigation also directs that stumps within 300 feet of the highway would be low-cut or chipped to reduce their visibility. Thinning should allow more sunlight to reach the forest floor, which would increase the amount of grass and herbaceous cover that could hide stumps from view. No harvest debris would be piled

within 300 feet of the highway; beyond that distance harvest debris would be piled and burned and the burned areas should blend with the surrounding landscape 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 Retention (equivalent to a moderate scenic integrity level) in the Foreground and Modification Modification (equivalent to a low scenic integrity level) in the middle and background.

Harvest is proposed around the Tamarack lookout and 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, still consistent with the objective for E1. Mitigation to low cut/chip stumps would help minimize this effect. The landscape character of the administrative site would appear very altered and dominate the landscape being viewed. Scenic integrity would appear low within the area cleared to improve the site-line from the lookout.

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 3). 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 features, harvest would meet the Visual Quality Objective of Partial Retention adjacent to all affected dispersed sites.

Table 3. Dispersed campsites within 300 feet of a proposed unit

		Alternatives		
		2	**3**	**4**
Unit #	**Unit Prescription**	**# Sites**	**# Sites**	**# Sites**
65	Commercial thin	1	1	1
57a	Commercial thin	1*	1*	1*
89	Commercial thin	2*	2*	2*
88	Commercial thin	1*	1*	1*
52	Commercial thin	1*	1*	1*
202	Shrub/steppe	1*	1*	1*
28a	Commercial thin	1	1	1
19	Commercial thin	1	1	1
17	Commercial thin	1	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 features described in Chapter 2 of the FEIS would meet the visual quality objectives for these two management areas.

Effects Unique to Alternative 4

The two skyline/helicopter units (40 and 79) and one helicopter unit (unit 37) along Highway 207 would be dropped from this alternative. The visual quality objective (VQO) of Partial Retention Retention (equivalent to a moderate scenic integrity level) would still be met in the Foreground. The VQO would slightly improve in the middle and background to Partial Retention with periodic views of Modification due to the dropped units. Consequently scenic integrity would be moderate with occasional views with low integrity. Cumulative effects would remain as described for the action alternatives.

Cumulative Effects Common to All Action Alternatives

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 80 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 (see Table 4).

Table 4. 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

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 (2-4)

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 9.0 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 9.9 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.

Effects Unique to Alternative 4

Direct and Indirect Effects: Alternative 4 would close 10.0 miles of road to mitigate effects of

harvest on wildlife. Twelve dispersed camps lie on proposed haul routes and would experience increased traffic, dust, and noise in addition to smoke related to prescribed burning. 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 the action alternatives, 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. Mixed-use travel is allowed on all open roads 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

Direct and Indirect Effects: Trail use and dispersed recreation would continue unchanged by management activities.

Effects Common to All Action Alternatives (2-4)

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.

Effects Unique to Alternative 4

Alternative 4 would close two roads seasonally and 10 roads permanently, totaling 10.0 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, there would be no harvest in RHCAs or of trees 21 inches in diameter or greater. These changes together with the road closures would retain the most cover for big game while reducing disturbance from motorized vehicles. Of the three action alternatives, Alternative 4 would have the least impact on elk and consequently on the quality of big game hunting.

Cumulative Effects of All Action Alternatives

In the long-term, the proposed harvest and thinning together with past harvest and prescribed burning would benefit some recreationists and discourage others. The open forest environment that would be created by harvest, thinning, and prescribed burning would provide easier cross-country access and a broader view into the forest. While wildlife and birds would be easier to spot, the type of species viewed would be different than those found in dense forest habitats. Some wild foods and mushrooms would proliferate in the open forest, while others would decline. Improved roads and new road construction would provide easier access for motorized recreation, dispersed camping and firewood collection. Recreationists that prefer solitude and a natural-appearing landscape would likely visit other areas. However, since solitude is already limited in this area by past management, few of these recreationists would be displaced—the Inventoried Roadless Areas and A1-Nonmotorized Dispersed Recreation management area on the District would continue to provide this niche. 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.

/s/ *Janel Lacey* 9/10/15

JANEL LACEY DATE
South Zone Recreation Manager

ATTACHMENTS:

Appendix: Inventory of Potential Wilderness Areas and Identification of Other Undeveloped Lands.

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Appendix I
Wilderness, Inventoried Roadless Areas, Lands with Wilderness Characteristics, and Other Undeveloped Lands Report

Report on Wilderness, Inventoried Roadless Areas, Lands with Wilderness Characteristics, and Other Undeveloped Lands as related to the Kahler Project

By Janel Lacey, South Zone Recreation Manager

June 23, 2015

Kahler Project Wilderness, Inventoried Roadless Areas, Lands with Wilderness Characteristics, and Other Undeveloped Lands Report

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WILDERNESS AND INVENTORIED ROADLESS AREAS

There is no congressionally designated Wilderness or Inventoried Roadless Areas (IRA) 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.

There are 19,908 acres of inventoried roadless areas within the Heppner Ranger District (9.3% of District). However, the nearest IRA to the Kahler project area is the Skookum IRA located approximately 9.5 miles southeast of the project area. Due to their distances from the project area the proposed Kahler project would have no direct, indirect or cumulative effects on designated Wilderness or IRA areas.

LANDS WITH WILDERNESS CHARACTERISTICS AND OTHER UNDEVELOPED LANDS

Introduction

This section of the report discloses the affected environment and environmental consequences for lands with wilderness characteristics (LWCs) and remaining other undeveloped lands. This resource topic has a complicated set of terminology and interrelated history. Appendix I 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 Areas. 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 23,564 acres of lands that had no substantially noticeable development and were subsequently classified using the criteria discussed later in this section.

Kahler Project Wilderness, Inventoried Roadless Areas, Lands with Wilderness Characteristics, and Other Undeveloped Lands Report

Table 5. Contextual Display of Wilderness and Roadless Areas in PNW Region, Umatilla NF, Heppner RD and Kahler analysis 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%
Kahler Analysis Area	39,059	18%[4]
• **Wilderness**	0	0%
• **Inventoried Roadless Area**	0	0%
• **Lands with wilderness characteristics**	7,989	20%
• **Other undeveloped lands**	15,575[5]	40%

[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 Kahler analysis 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 the topic of undeveloped lands.

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 the 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.

Kahler Project Wilderness, Inventoried Roadless Areas, Lands with Wilderness Characteristics, and Other Undeveloped Lands Report

To address this situation, a 2006 amendment to the Forest Service handbook 1909.12 Chapter 70, section 71 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. A 2015 amendment to the 1909.12 Chapter 70, section 71 handbook abandoned the potential wilderness area term. The 2015 amendment to section 71 provided created a new inventory criteria to guide the identification of areas with wilderness characteristics.

In the early 2000s some local interest groups began creating their own inventories, including lands on the Umatilla National Forest, using inventory criteria they developed for their purposes. Polygons on their maps are referred to as 'inventoried roadless areas' or 'roadless areas' or 'unroaded', or 'un-inventoried roadless areas', or 'vast roadless expanses'. Confusion ensued again on this issue because there are conflicts between the Forest Service maps and maps presented by these interest groups. Each map appears to be based on different definitions and inventory criteria.

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 to identify lands with wilderness characteristics are found in Forest Service Handbook 1909.12, Chapter 70, section 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.

1. **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).

2. **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.

3. **Lands with wilderness characteristics**: The project-level application of the FSH 1909.12, Chapter 70, section 71 inventory criteria is conducted only to disclose project-level impacts to wilderness characteristics of lands affected by a site-specific project. The identification process and resulting polygons (if any) themselves do not result in a land designation decision and do not imply or impart any particular level of forest plan management direction or protection (FSH 1909.12 at 70.62a). The identification of lands with wilderness characteristics does not change the administrative boundary of any congressionally established wilderness or inventoried roadless areas (IRAs) and does not change or amend any plan component or management area within a land management plan (forest plan). The project-level application of the section 71 criteria and the disclosure of site-specific impacts to wilderness characteristics of lands affected by a site-specific project does not initiate or conduct a forest plan revision evaluation and wilderness recommendation process at Chapter 70; sections 72, 73, and 74.

   Typically, lands with wilderness characteristics substantially overlap, and/or are contiguous with inventoried roadless areas. Lands with wilderness characteristics may also be contiguous with designated wilderness. Some newly identified lands may be stand-alone areas (polygons) that were not inventoried 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. Lands with wilderness characteristics overlap inventoried roadless areas only where those acres of land are consistent with criteria in section 71 and may extend beyond IRA and wilderness boundaries consistent with such criteria.

   An inventory is conducted and a map created by the Forest Service during forest plan revision as the first step in a four step wilderness recommendation process with the purpose of identifying all lands that may be suitable for inclusion in the National Wilderness Preservation System (FSH 1909.12 at 70.62). Areas identified in the forest plan revision process using inventory procedures found in FSH 1909.12, Chapter 70, section 71 are called areas with wilderness characteristics. The agency would then conduct the remaining three steps in the wilderness recommendation process (FSH 1909.12, Chapter 70, sections 72, 73, and 74).

4. **Other undeveloped lands**: The term "other undeveloped lands" is presented and used in this document to provide a consideration for the balance of remaining undeveloped lands that are not consistent with Section 71 criteria. They do not overlap with designated wilderness, an inventoried roadless area, or lands with wilderness characteristics.

Appendix I of this document describes the methodology and rationale used to identify lands with wilderness characteristics within and directly adjacent to the Kahler project planning area. Maps included in Appendix I (maps I-2 to I-5) show a visual progression of the analysis process, final results, and proposed project activity, if any, that would occur in these areas.

The effects to wilderness, inventoried roadless areas (IRAs), lands with wilderness characteristics, and other undeveloped lands were based on maps created using agency procedures (Appendix I) and are considered and disclosed below.

Kahler Project Wilderness, Inventoried Roadless Areas, Lands with Wilderness Characteristics, and Other Undeveloped Lands Report

Scale of Analysis

The scale of this analysis includes all acres contained within the Kahler project planning area and adjacent USFS and other federal lands, as appropriate, sufficient to consider and identify affected lands with wilderness characteristics (39,059 acres). Where areas that lacked substantially noticeable management abutted the project boundary, lands outside the boundary were also analyzed to the extent that the next area with substantially noticeable management was encountered. The scale of analysis is appropriate because it considers all lands within and adjacent to the Kahler project that are bounded by non-conforming improvements such as roads, past harvest activity and private land (Appendix I, Maps I-1 through I-5).

Methodology and Assumptions

The identification of lands with wilderness characteristics process was conducted through a sequence of GIS and database analyses, field verification, and application of professional judgment. The judgment applied was situational and instance by instance.

The first step in determining areas with substantially noticeable management involved creating a map that depicts past management activities from the FACTS database together with an orthophoto of the project area. This information was viewed both in terms of type of management and year of implementation.

Where the orthophoto did not clearly indicate substantially noticeable management (i.e. a uniform change in tree crown size and height, consistently open tree spacing, etc.) a sample of that management type or year was verified on the ground. This involved walking through representative areas, taking photographs, and using professional judgement to determine whether or not management was substantially noticeable. Often there are areas within a management unit intentionally left unmanaged in order to provide wildlife habitat, protect riparian areas, avoid rocky outcrops, etc. This was observed during field verification; however the determination whether to consider that type or year of management as substantially noticeable was based on the condition of the unit as a whole. As a result of this field verification step, all single tree selection harvest from the late 1960s was determined to not be substantially noticeable as a management type.

Indicators for Comparison

The measures used to compare between alternatives lands that may have wilderness characteristics are:

- Intrinsic biophysical values (soils, water, fisheries, plants, wildlife)
- Intrinsic social values (recreation, apparent naturalness, remoteness, scenic quality, cultural resources)
- Other locally identified unique characteristics
- Change in acres of lands with wilderness characteristics
- Effect on availability for future wilderness evaluation in Forest Plan revision

Kahler Project Wilderness, Inventoried Roadless Areas, Lands with Wilderness Characteristics, and Other Undeveloped Lands Report

Affected Environment

The table below is a summary of all the acres evaluated for lands with wilderness characteristics for this project. Information summarized in this table can be found in Appendix I, Tables I-1, I-2 and I-3. Maps I-1, I-2, I-3, I-4 and I-5 are a visual representation of this analysis process.

Table 6. Lands with Wilderness Characteristics Summary

	Approximate Acres Kahler Analysis Area
Total acres considered within analysis area*. (Map I-1)	39,059
Acres of non-conforming 'other improvements' excluded consistent with 71.22b(1-12). e.g. Acres of substantially noticeable timber harvest and prior road construction (3), developed campgrounds (7) etc. (Map I-2)	25,054
Acres of non-conforming 'road improvements' excluded consistent with 71.22a(2a,b,c1-4). e.g. roads maintained to level 2, 3, 4, or 5. (Map I-3)	11,540**
Acres of land remaining to consider and compare to size criteria at 71.21. (Map I-4)	23,564
Acres of land identified with wilderness characteristics consistent with all criteria in Chapter 70, section 71. (Map I-5)	7,989
Acres of other undeveloped lands that did not meet criteria at FSH 1909.12 Chapter 70, section 71. (Map I-5)	15,575***

* This includes all acres contained within the Kahler project planning area and other adjacent USFS and federal lands, as appropriate, sufficient to consider and identify affected lands with wilderness characteristics.
** Some of these acres may overlap with acres of substantially noticeable harvest.
*** This number does not include polygons less than one acre in size.

Approximately 7,989 acres were identified within the analysis area as lands with wilderness characteristics (identified as an orange polygon in associated maps), which are located in the southern portion of the Kahler analysis boundary. This area lies within a dry, south-facing portion of the Kahler analysis area and is primarily grass and shrub/steppe, with trees in drainages (mixed conifer) and on north-facing slopes (juniper and pine). Approximately 2,300 acres of the polygon are comprised of grassland, shrubland, and open juniper woodland habitat; the remaining 5,700 acres are comprised of forested habitat. High density forested stands occur in drainages and other "wet" areas. The area is long and somewhat narrow, bounded on the south and west by private land (primarily shrub/steppe and grassland).

The northeastern boundary of the polygon is very ragged and dissected due to numerous adjacent units with substantially noticeable management. Within the polygon, there are areas of conforming harvest that is no longer substantially noticeable as a whole, though there may be localized spots where harvest is evident. There are also maintenance level 1 roads within the lands with wilderness characteristics. In addition, open Road 2408 accesses an area of substantially noticeable harvest nearly bisecting the area. Open roads 1407040 and 2406040 make incursions into the northern portion of the area as well. There are two pinch points in the

middle of this 7,989 acre polygon where private land and substantially noticeable harvest almost meet. The area predominantly appears natural, although numerous closed roads access much of the timbered portions in the north. For the most part, these roads are disguised by trees when looking at the landscape as a whole. Similarly, a sense of naturalness and remoteness are also present in the wider, interior sections of the polygon where there are no adjacent open roads or substantially noticeable harvest. In these parts of the polygon, scenic integrity is very high with only brief glimpses of closed roads on the landscape. Where the polygon narrows, substantially noticeable management is within view (reducing apparent naturalness and scenic integrity) and the sense of remoteness is diminished. Grazing and past suppression of fires has led to an overabundance of juniper and pine in the shrub/steppe ecotone as compared with historic levels.

Regarding wildlife habitat, the lands with wilderness characteristics polygon encompasses approximately 5,600 acres of the Monument Elk Winter Range, which includes approximately 60,000 acres of similar habitat on the Heppner and North Fork John Day Ranger Districts. The Forest Plan goals for winter range habitat is to provide high quality forage for wintering big game and provide a high level of habitat effectiveness (primarily through high quality forage and road closures during the winter use period). The remaining 2,400 acres is considered summer range or transition range. Overall, there are currently 1,756 acres of elk cover (satisfactory and marginal) within the polygon. There are also approximately 1,000 acres of Late and Old Structure (LOS) habitat, representing 12.2% of the polygon. (In the larger Kahler analysis area, LOS habitat occupies a similar proportion—12.6% of the landscape.) There are currently 884 acres of pileated woodpecker source habitat within the lands with wilderness characteristics. The polygon also provides potential habitat for the intermountain sulphur butterfly, which tends to occur at the ecotone between forested stands and grassland/shrub-steppe. Shrubland habitats in the polygon include mountain mahogany, bitterbrush, and some sagebrush communities. A number of the mountain mahogany stands in the polygon have good to excellent recruitment of young shrubs; the majority of the District is experiencing very low upland shrub recruitment.

Within the polygon, there are approximately 2.7 miles of Class 1 streams, 5.2 miles of Class 3 streams, and 32.6 miles of Class 4 streams. There are also 30 mapped springs. The Class 1 and 3 streams and most springs have perennial flow, while Class 4 streams stop flowing each summer. All streams and springs are important to watershed integrity, but perennial streams provide their services during the hot, dry summer months when they are most needed by the environment. The lands with wilderness characteristics contain the headwaters of Bologna, Haystack, and Tamarack Creeks. East Bologna Canyon is 303(d) listed by the State of Oregon for water quality impairments to biological criteria and sedimentation. Tamarack Creek is listed for dissolved oxygen. The beneficial uses associated with the listings are salmonid rearing and spawning and aquatic life.

There are 2.7 miles of fish-bearing streams (Class I) within the polygon. The fish species present include steelhead. East Bologna Canyon Creek has 1.86 miles of steelhead designated critical habitat (although only 1.16 miles of this stream are identified as Class I). Kahler Creek has limited steelhead designated critical habitat from the forest boundary to 0.13 miles upstream.

The polygon contains approximately 28 Water Right Certificates in the name of the Umatilla National Forest. These certificates authorize the development of springs and streams for the beneficial use of livestock and wildlife watering. The developments generally consist of metal

boxes with pipe outlets that are buried in the springs, with fencing to protect the spring's source area. Water is piped from the metal box to a nearby watering trough. Some springs appear to have been developed by excavating a pond in the spring or in the channel of an intermittent stream. All of the water developments are used each year by livestock. In addition, the water systems and fences are maintained annually as needed. The water developments are necessary for operation of the grazing permits, as most streams stop flowing from July to October. Perennial springs and streams are the only water sources during summer months. The developments are also necessary for wildlife in the area. Because of the lack of summer precipitation in the Kahler area, the springs and their associated wetlands are unique features and provide important ecosystem functions.

Environmental Consequences

No Action Alternative

Direct and Indirect Effects: All 7,989 acres of lands with wilderness characteristics would remain as described in the Affected Environment section. The area would continue to appear predominantly natural. Scenic integrity within much of the area would remain very high, with only brief glimpses of closed roads on the landscape. The encroachment of juniper and pine in the shrub/steppe ecotone would continue to change the landscape character from historic conditions. There would be no changes to Late Old Structure wildlife habitat or pileated woodpecker source habitat. There would also be no changes to fisheries habitat and streams would remain unaffected by forest treatments within the polygon. Therefore, selecting this alternative would not affect any future wilderness decision associated with a forest plan revision.

Effects Common to All Action Alternatives (2-4)

Table 7: Activities proposed in Lands with Wilderness Characteristics (LWC) in the Kahler Analysis Area by Alternative

Alternative	Commercial Thinning	Closed Road Reopened	Temporary Road Constructed	Acres of LWC Remaining After Implementation
1	0 acres	0 miles	0 miles	7,989
2	2,385 acres	16.5 miles	0.2 miles	5,604
3	2,164 acres	15.9 miles	0.2 miles	5,825
4	1,936 acres	15.1 miles	0 miles	6,053

Direct and Indirect Effects: Table 7 displays the treatments proposed within lands with wilderness characteristics by alternative and how much of the polygon would remain unaffected by non-conforming activities. Most of the proposed harvest would occur along the northern edge of the polygon, although unit 68 would bisect the polygon at its most narrow point. Units 93 and 94 would also bisect the polygon between Forest Road 2408 and the private land. These units would cut the original polygon into three smaller polygons, none of which would be of sufficient size to make practicable their preservation in an unimpaired condition (71.21). The areas where harvest activities occur would no longer appear natural; numerous stumps would be apparent and spacing would be much more open. Reopening of closed roads and temporary road construction

would expose soil and remove shrub and tree cover, making them more noticeable as well. The sense of remoteness would be reduced as the sights and sounds of management would intrude, particularly within the grassland areas as there is no vegetation tall enough to provide visual screening. Scenic integrity on the forested portion of the polygon would be reduced to a moderate level due to the heavy concentration of activities. This would last for several decades until soils are re-vegetated, stumps substantially deteriorate, and tree regrowth blends with the remaining forest. Therefore, selecting any of these action alternatives would affect a future wilderness decision associated with a forest plan revision. None of these acres would be brought forward for consideration in a future wilderness analysis.

Table 8: Changes in wildlife habitat associated with each alternative

Habitat	Alternatives			
	1	2	3	4
Reduction in elk cover	0 acres	986 acres	797 acres	725 acres
Reduction in Late Old Structure Habitat	0 acres	500 acres	401 acres	311 acres
Change from pileated woodpecker source habitat to non-source habitat	0 acres	523 acres	399 acres	354 acres
Shrub/Steppe habitat enhancement*	0 acres	653 acres	653 acres	609 acres

* This would remove most encroaching conifers (not including juniper) from the shrub/steppe habitat.

There would be a reduction in elk cover under all three of the action alternatives (see Table 8). These losses would be cumulative with past losses resulting from timber harvest, wildfire, and other factors. There would also be a direct and cumulative loss in late old structure habitat under the action alternatives. Some treatment within the lands with wilderness characteristics would occur in late and old structure stands on north-facing slopes that have a high proportion of Douglas-fir and grand fir. This portion of the polygon currently provides a large block of pileated woodpecker foraging habitat (based on structure, composition, and other factors); treatment under all of the action alternatives would impact the size and suitability of pileated woodpecker habitat in this portion of the analysis area. Alternative 4 would be the most likely to provide for the continued presence of this species in the lands with wilderness characteristics due to the post-harvest quantity, quality, and distribution of source habitat. Shrub steppe enhancement and proposed burning would have short-term impacts on the quality of intermountain sulphur butterfly habitat. Habitat suitability would not be reduced due to the fact that untreated and unburned portions of the landscape will be available, and affected acres would recover in the year following burning. The action alternatives would also benefit the shrub/steppe habitat type by reducing encroachment of pine and Douglas fir. This would restore the historic landscape in treated areas and, together with prescribed burning, help maintain this habitat type.

The action alternatives have the potential to impact surface water quality and groundwater. However, the project contains site-specific Best Management Practices which are designed to prevent further impairment to water quality and to protect groundwater. These Best Management Practices would also prevent impacts on fish. In addition, the potential for high

intensity wildfire in the riparian areas would be reduced.

OTHER UNDEVELOPED LANDS

Background

An outcome of the lands with wilderness characteristics analysis process was the identification of polygons of other undeveloped lands (Table I-2). These polygons did not meet criteria as lands with wilderness characteristics and they are not inventoried roadless areas or a designated wilderness area. Each individual polygon of land has no substantially noticeable harvest activity and does not contain maintenance level 2, 3, 4, or 5 forest roads. They are stand-alone polygons of varying acreages all less than 4,999 acres within the analysis area. All polygons less than one (1) acre were dropped from detailed study because individual polygons this small could easily result from mapping error and they are too small to be meaningful. Detailed information regarding the methodology used for the Kahler project analysis, along with maps and tables is located in Appendix I 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 other 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 those areas described as other undeveloped lands in Table 6 and totals 15,575 acres. Other undeveloped lands have intrinsic ecological and social values because they do not contain history of management or the past harvest is no longer substantially noticeable and the lands do not contain forest roads maintained to levels 2, 3, 4, and 5.

Indicators for Comparison

The following values are used as indicators of comparison to display effects among alternatives on other undeveloped lands:

- Intrinsic biophysical values (soil, water, fisheries, plants, wildlife)
- Intrinsic social values (recreation, apparent naturalness, remoteness, scenic quality)
- Other locally identified unique characteristics
- Change in acres of other undeveloped lands

Affected Environment

Table 9 displays the acres of other undeveloped lands within the Kahler analysis area along with references to maps in Appendix I for a visual representation. In the 39,059 acre analysis area, approximately 15,575 acres (about 40 percent of the analysis area) have been identified as isolated polygons of other undeveloped lands that are at least one acre in size. Approximately 7,989 acres (about 20 percent) have been identified as meeting criteria for lands with wilderness characteristics, and the remaining 15,495 acres (about 40 percent) are developed and managed (contain evidence of substantially noticeable past management and/or forest maintenance level 2, 3, 4, and 5 roads). Individual polygons of other undeveloped lands less than an acre (373

polygons totaling 15.2 acres) were eliminated from further study because they are too small to be meaningful.

Table 9 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 substantially noticeable past management activities and maintenance level 2, 3, 4, or 5 roads.

Table 9: Size Class and Acres of Other Undeveloped Lands in the Kahler Analysis Area

Number of Polygons	Size Class	Approximate Acres
37	1 to 10 acres	184
25	11 to 100 acres	959
14	101 to 1,000 acres	4,090
4	1,000 to 4,999 acres	10.342
80	**Total**	**15,575**

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.

Soils on other undeveloped lands may still experience the effects of compaction and displacement from management activities that are no longer substantially noticeable on the surface. Compaction and displacement within the prism of the management impacts (equipment trails) may still have the capacity to diminish vegetative growth and ground cover (Froehlich & McNabb1983, Amaranthus et al, 1996, Bulmer et al, 2010 and Miller 2004). Vegetation outside of the impact area often offers a source of ground cover from falling dead organic matter. While these management impacts may not be visible within feet of the impact; they can be viewed in aerial photography where not obscured by canopy closure. The existence of canopy closure does not mean the impacts are no longer present. Maintenance level 1 roads may also still be experiencing residual soil effects (such as potential instability) because on the whole, these roads were not returned to their original contour. These roads have had drainage structures removed and their surfaces may be largely re-vegetated, but there may be areas of localized erosion and much of their length would still be compacted. Where no roads or past management have occurred, soils would be unimpaired by humans.

Water resources on other undeveloped lands would be largely unimpaired by humans. Exceptions would include maintenance level 1 roads and spring developments, both of which intercept ground water and potentially alter over-surface flows. There are approximately 33 perennial springs within the other undeveloped lands, most of which have been developed for livestock and wildlife and have water right certificates. These water systems and fences are maintained annually as needed. The water developments are necessary for operation of the grazing permits. A few have been inventoried, and a sub-set support groundwater dependent ecosystems (Fritz and Hernandez, 2014). Where no water developments, roads or past management have occurred, water flows and quality would be unimpaired by humans.

Plant communities, particularly habitat for threatened, endangered, and sensitive species, would be mostly unimpaired by human activities. The shrub-steppe plant communities provide unique habitat for numerous sensitive plant species. Areas impacted by past management activities and maintenance level 1 roads have altered plant communities progressing through various stages of succession. Noxious weeds have fewer transport venues in undeveloped areas and less opportunity to become established. However noxious weeds have many vectors, such as wind and wildlife, and infestations in remote areas not often visited likely go undetected and untreated.

Wildlife habitat on other undeveloped lands varies widely in structure, composition, and density. These stands provide habitat for a wide range of wildlife species dependent on open canopy forest, closed canopy forest, grasslands, shrublands, early successional stages, dead wood, and other features. This variation in structure, composition, density, and other habitat features (including snags and downed wood) are the result of multiple factors including historic disturbance regimes, topographical features (aspect, slope position, moisture gradients, etc.), past management (harvest, fire suppression, etc), and other factors. In some areas, past management is no longer substantially noticeable in terms of evidence of harvest or maintenance level 1 roads, but changes in species composition and density (due to fire suppression or removal of certain species and size classes) and dead wood availability are noticeable. Areas where there have been no timber management activities often provide snag densities that exceed those expected based on data from reference stands. Where no road building, past timber management, or natural disturbance events have occurred, snag and downed wood dynamics and stand structure, composition, and density (which contribute to habitat quality for a wide suite of wildlife species) are similar to what would have been expected historically and show no impairment by humans. Larger blocks of other undeveloped lands (areas 1,000 acres or more) would serve as movement corridors for many wildlife species. Conifer encroachment into shrublands and grasslands would likely appear to be undeveloped lands, however, the composition and structure of these areas is largely not consistent with what would have been expected historically. Where road construction has occurred in these areas, loss of growing space and fragmentation are still evident today. Where moisture and other factors allow, undeveloped lands and those areas where management activities are no longer noticeable (in terms of stand structure) provide higher quality and better distributed cover habitat for elk and dense dry upland forest stands for species like the pileated woodpecker.

Recreation in other undeveloped lands would consist of cross-country hiking, horseback riding, hunting, bird and wildlife viewing, and gathering of natural foods and medicines. The existence of maintenance level 1 roads would not substantially change the recreation experience, although they could provide easier travel where not blocked by down wood or rocks. Other undeveloped lands in the northwest half of the Kahler analysis area are very dissected and dispersed. Opportunities for a feeling of remoteness are limited by the size and shape of polygons. Distance and topographic screening are also factors in creating such opportunities. Nearby, non-conforming sights and sounds of roads and timber harvest can be heard and often seen from within the other undeveloped lands. In larger polygons of other undeveloped lands (>1,000 acres), the topography of the area would make access challenging and involve much physical effort. A sense of remoteness may be experienced in the interior of such polygons. Visual integrity within many other undeveloped lands would be pristine in the foreground, but views of managed landscapes could intrude within the smaller polygons, depending on the amount of screening provided by topography and tree cover. Cultural resources within other undeveloped

lands would be undisturbed by management and the historic integrity and character of these sites be intact.

No additional special or unique values in other undeveloped lands associated with the Kahler analysis area have been identified by project resource specialists.

The existing condition of all remaining 15,495 acres of land within and affected by the Kahler analysis area that are not lands with wilderness characteristics or other undeveloped lands present 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

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 (see description of affected environment in Chapter 3 for a full list of resources considered). Biological and ecosystem functions would continue. The landscape would likely continue developing complex fuel loads. A wildfire would have potential to result in extensive mortality within denser forest stands which would result in larger acreages of blackened landscapes compared to prescribed fires. Some forest visitors would avoid blackened landscapes, at least until green vegetation predominantly returns (3 to 5 years). However, fire is a natural occurrence and expected disturbance process in this landscape. All polygons of other undeveloped lands would continue to not meet criteria as lands with wilderness characteristics 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 (2-4)

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 only briefly summarized here. Where management would occur within other undeveloped lands, soils would be exposed to compaction and displacement from heavy equipment and erosion due to soil surface exposure during skidding or road construction/reconstruction. However, given the design criteria, a minimum of 80 percent of an activity area would remain in a condition of acceptable productivity potential consistent with Forest Plan standards.

The action alternatives have the potential to impact surface water quality and groundwater. However, the project contains site-specific Best Management Practices which are designed to prevent further impairment to water quality and to protect groundwater. These Best

Management Practices would also prevent impacts on fish. In addition, the potential for high intensity wildfire in the riparian areas would be reduced.

Design criteria identified on page 23 of the EIS would protect threatened, endangered, or sensitive plants. Areas of disturbed soil would be open to colonization by noxious weeds.

Vegetation treatments would move treated forests to early seral species and tend to promote more open stands composed of larger, older ponderosa pine. These changes would benefit some wildlife species associated with open conditions, while reducing habitat for species associated with closed canopies and greater proportions of fir. Where cover is reduced, elk could disperse to other areas with cover and low levels of motorized disturbance. It is likely that vegetation treatment and road use in undeveloped lands would reduce existing snag densities to a small degree and impact the context of habitat (conversion of more dense stands to more open stands). Vegetative treatments would also impact future snag recruitment over a large portion of the forested acres in the analysis area. While snag densities in treatment units would likely be reduced in the short and mid-term (and in some cases the long-term) it is not expected that the snag density distribution at the analysis area scale would be affected appreciably. Management activities in historic grassland and shrubland habitats would promote the re-establishment of these habitats by reducing encroachment of conifers. There would also be short, mid, and long term impacts to grassland and shrubland communities and wildlife that utilize these habitats (particularly ground and near-ground nesting migratory birds) as a result of mechanical equipment use and prescribed burning.

Recreation would change slightly, adding dispersed camping, motorized sports, and firewood collection to the potential uses within other undeveloped lands. The quality of the hunting experience would be reduced if elk are displaced. Where treatment occurs within undeveloped lands, there would be a loss of apparent naturalness. Recreationists seeking a primitive experience or a sense of remoteness would have less area available due to harvest in the large polygons of other undeveloped lands (3,118 acres in Alternative 2, 3,080 acres in Alternative 3, 2,619 acres in Alternative 4), whereas the small polygons have already been infringed upon by adjacent sights and sounds of management and human presence prior to implementation. On acres treated by commercial thinning, noncommercial thinning, or juniper removal, management activities would be substantially noticeable for up to 50 years, depending on the rate of stump decay and recovery of disturbed soils. Visual quality within other undeveloped lands where management occurs would still meet Forest Plan standards, although views would no longer be pristine. There are several cultural resource sites within these other undeveloped lands, however no impacts are expected on known cultural resources since all would be avoided by project activities. All of the proposed activities will not affect the historic integrity or historic character of these sites.

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).

All action alternatives propose some level of activity within other undeveloped lands, varying only by the number of acres or miles treated (see Table 10). Refer to 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 10: Activities proposed in Other Undeveloped Lands in Kahler

Activity	Alternative 2	Alternative 3	Alternative 4
Commercial Thinning	5,017 acres	4,727 acres	4,162 acres
Temporary Road Constructed	3.7 miles	3.7 miles	0 miles
Prescribed Fire	11,505 acres	11,505 acres	11,505 acres

Other undeveloped lands with no proposed treatments (see Table 11) would remain the same as described in the affected environment. All 15,575 acres of other undeveloped lands within the project planning area would still not be considered lands with wilderness characteristics, roadless areas, inventoried roadless areas, or a designated wilderness area.

Table 11: Other Undeveloped Lands in Kahler Analysis Area by Alternative

Alternative	Acres Prior to Activity	Acres Remaining After Implementation	Percent of Analysis Area After Implementation	Percent Loss of Undeveloped Lands
1	15,575	15,575	0%	No loss
2	15,575	10,558	27%	32%
3	15,575	10,848	28%	30%
4	15,575	11,413	29%	28%

Cumulative Effects Common to All Action Alternatives (2-4)

The cumulative effects geographic boundary is the 39,059 acre Kahler analysis area. This boundary is appropriate because a larger scale would dilute the effects on other undeveloped lands and their intrinsic biophysical and social values. The temporal boundary for this cumulative effects analysis is 50 years. This timeframe is appropriate because that is how long it would take harvest and temporary road construction to no longer be substantially noticeable (based on field observations of other past management in the Kahler analysis area).

In the planning area the increased numbers of stumps, the open nature of the forest stand, and soils disturbed by skid trails, temporary roads, and landings would likely be the most apparent change resulting from implementation. In the long term (about 50+ years), the proposed activities would result in the development of historic open, park-like conditions, characterized by larger diameter trees. Prescribed burning and future wildfires would cumulatively change composition and structure of vegetation (EIS, Chapter 4 Vegetation section). Burned areas would display a prominent blackened color for about one year, becoming subordinate on the landscape as grass and other vegetation grows. Outside the treated areas, the conditions described in the affected environment would remain unchanged except by natural processes and ongoing activities such as grazing and hunting.

Kahler Project Wilderness, Inventoried Roadless Areas, Lands with Wilderness Characteristics, and Other Undeveloped Lands Report

The intrinsic biophysical values of other undeveloped lands would be cumulatively impacted by implementation of the Kahler project, grazing, past harvest and road construction. For other undeveloped lands in which project activities would occur, the cumulative effects to soil; water quality; plant and animal communities; habitat for threatened, endangered, and sensitive species; recreation; and cultural resources are disclosed in the applicable resource sections of the EIS and are not reiterated here. Apparent naturalness and a sense of 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.

FINDING OF CONSISTENCY

All 15,575 acres of other undeveloped lands identified within the analysis 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.

/s/ *Janel Lacey* 9/10/15

JANEL LACEY DATE
South Zone Recreation Manager

ATTACHMENTS:

Appendix: Inventory of Potential Wilderness Areas and Identification of Other Undeveloped Lands.

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Appendix J
Roads and Travel Report

Travel Action Plan

Kahler
Umatilla National Forest
2015
Risk vs. Value

Prepared By:
Lori Seitz, South Zone Road Manager

March 2015

The Interdisciplinary team (IDT)

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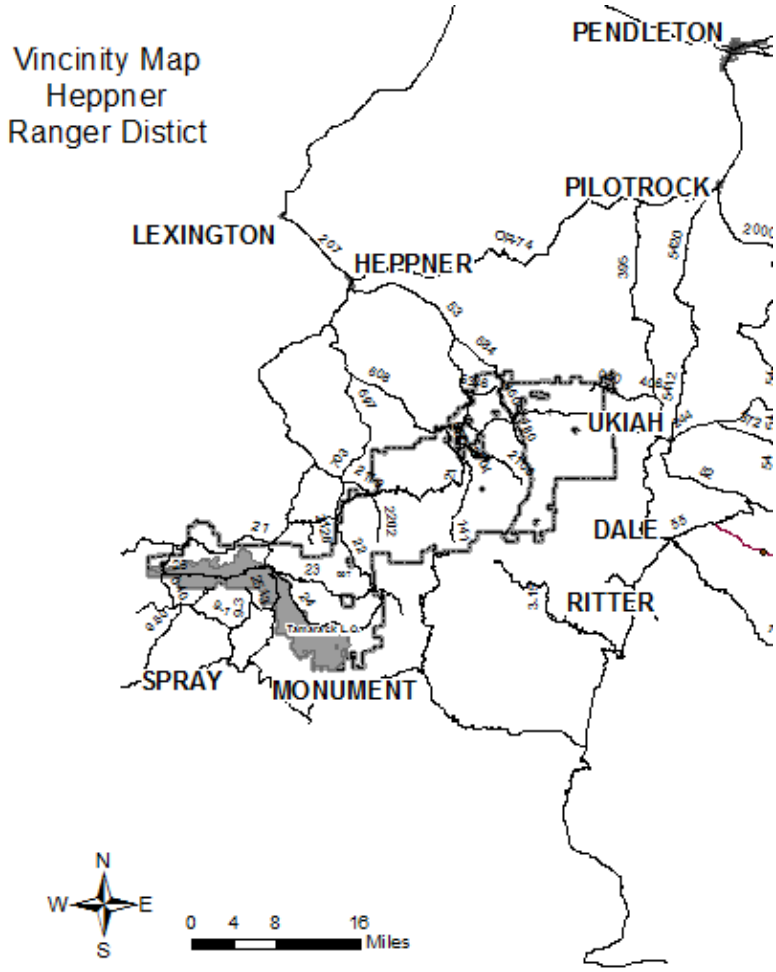
INTRODUCTION TO THE ANALYSIS

The Kahler project area is located on the Heppner Ranger District, Umatilla National Forest in the southwest end of the district on 32,849 acres.



Map 1. Vicinity Map of Kahler Project area.

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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) displays 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 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

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Map 2 Existing Transportation System

Legend

MAINTENANCE LEVEL

- 1 - BASIC CUSTODIAL CARE (CLOSED)
- 2 - HIGH CLEARANCE VEHICLES
- 3 - SUITABLE FOR PASSENGER CARS

FUNCTIONAL

- COUNTY OR STATE
- A - ARTERIAL
- C - COLLECTOR
- L - LOCAL

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 District goal of 1.5 miles/sq. miles of open road

Table 3. Roads Kahler Project Area.

	Current			**Alternative 2**			**Alternative 3**			**Alternative 4**		
	Mi.	**%**	**Density (Mi. /Sq. Mi.)**	**Mi.**	**%**	**Density (Mi. /Sq. Mi.)**	**Mi.**	**%**	**Density (Mi. /Sq. Mi.)**	**Mi.**	**%**	**Density (Mi. /Sq. Mi.)**
Total Roads	202		3.9	202			202			202		
Roads Open	92	45	1.8	75	37	1.5	76	38	1.5	76	38	1.5
Roads Closed	111	55%		127	63%		126	62%		126	62%	

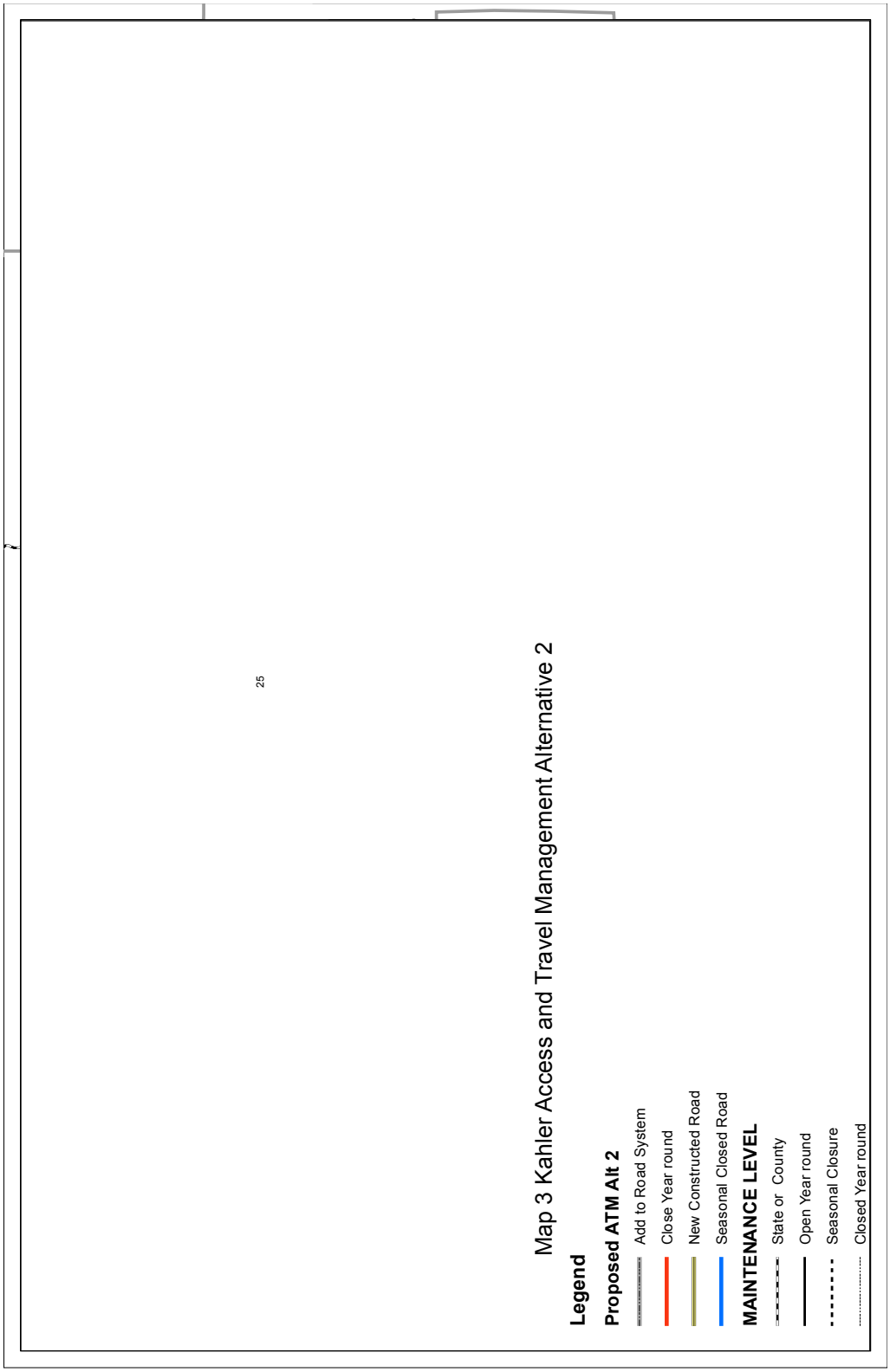
Roads Open include State, County and Motorized trails and not seasonally closed roads or trails as they are open outside of the critical time periods.

Proposed Seasonal Closures (Mi.)	**Alt 2**	**Alt 3**	**Alt 4**
2407020	1.8	0.0	0.0
2408020	2.0	2.0	2.0
2408000	3.7	3.7	3.7
Total	7.5	5.7	5.7
Proposed Year-round Closures (Mi.)			
2141000	1.2	1.2	1.2
2406040	3.4	3.4	3.4
2407020	0.0	0.5	0.5
2408023	0.6	0.6	0.6
2500050	0.0	0.0	0.5
2500060	0.7	0.7	0.7
2500063	0.9	0.9	0.9
2500068	0.3	0.3	0.3
2500200	1.3	1.3	1.3
2500701	0.4	0.4	0.0
2500035	0.2	0.6	0.6
Total	9.0	9.9	10.0
O-2400140 OHV Trail to be closed	0.4	0.4	0.4
Total Proposed Road Closures including Seasonal/OHV Trail	16.9	16.0	16.1

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

Proposed Decommission	**Miles**
2100396	0.37
2141000	0.41
2141060	0.19
2400140	0.32
2406025	1.43
2406026	0.92
2407041	0.15
2500150	0.29
2500150	0.40
2500161	0.35
2500165	0.39
2500166	0.07
2500172	0.16
2500172	0.15
Proposed Total	5.60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Map 3 Kahler Access and Travel Management Alternative 2
Legend
Proposed ATM Alt 2
Add to Road System
Close Year round
New Constructed Road
Seasonal Closed Road
MAINTENANCE LEVEL
State or County
Open Year round
Seasonal Closure
Closed Year round

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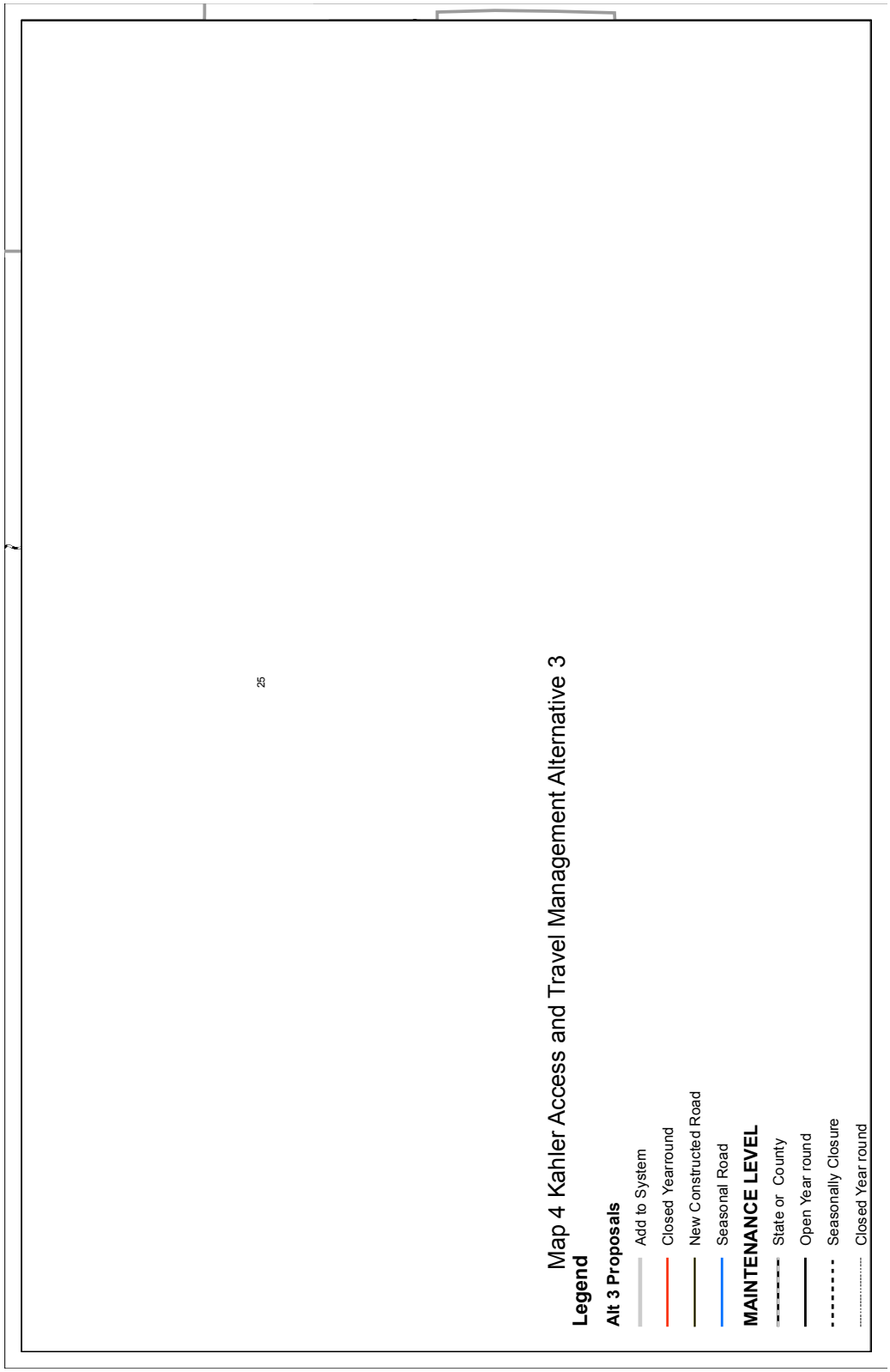
KAHLER TRANSPORTATION PLAN ***Kahler***



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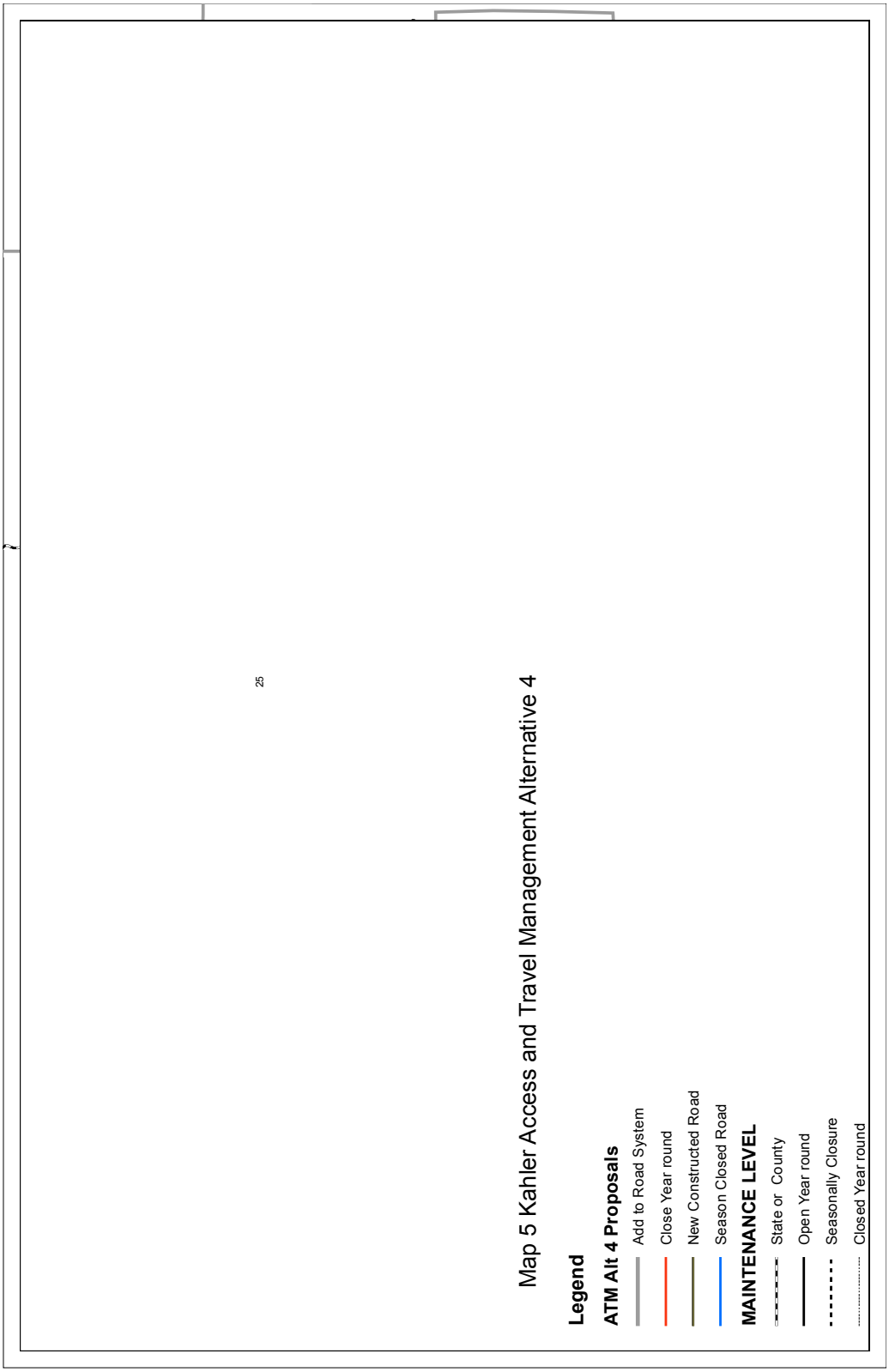
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Map 5 Kahler Access and Travel Management Alternative 4
Legend
ATM Alt 4 Proposals
Add to Road System
Close Year round
New Constructed Road
Season Closed Road
MAINTENANCE LEVEL
State or County
Open Year round
Seasonally Closure
Closed Year round

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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 an 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 pit run. 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
Risk	**Category 1** **HIGH VALUE / LOW RISK** 22% Good Condition No Work Necessary	**Category 4** **LOW VALUE / LOW RISK%** 41% Stable Condition No Work Necessary
	Value	

*Road miles include entire road segments, not confined 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	Decommission a road by reestablishing vegetation and, if necessary, initiating restoration ecological processes interrupted or adversely impacted by the unneeded road
	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	C	Access Private Land, Proposed Close Alt 4
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 Alt 2
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		

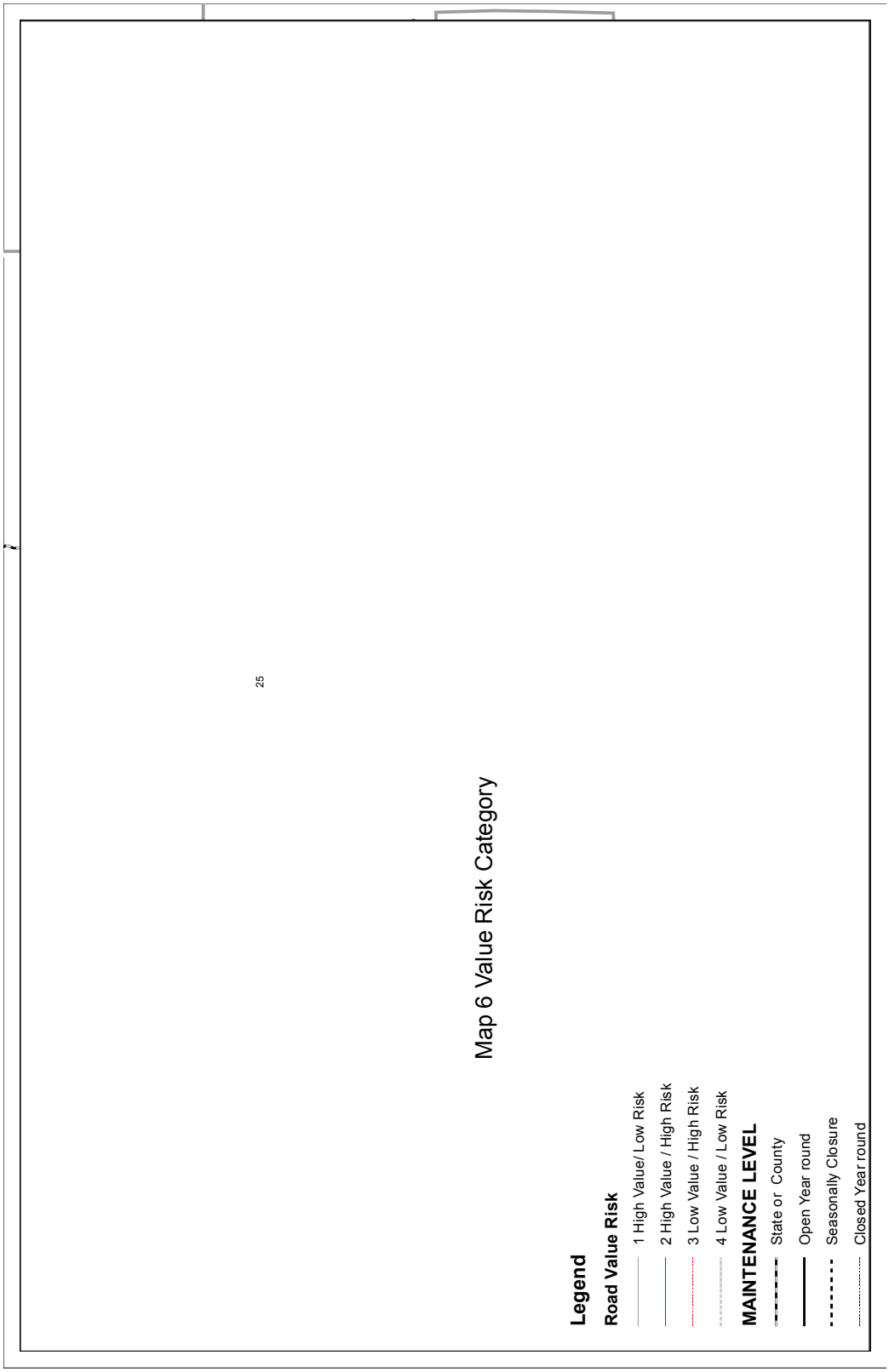
Road Number	BMP	ATM	ATM Changes	Comment
2141090	0.00	C		Fix washout
2141090	1.21	C		Correct length
2142031	0.47	C		
2142032	0.00	C		
2142033	0.00	C		
2142060	0.00	C		
2142095	0.00	C		
2400014	0.00	C		
2400019	0.00	C		
2400021	0.00	C		
2400024	0.00	C		Lengthen culvert
2400025	0.00	C		Pit Road, water source
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

Road Number	BMP	ATM	ATM Changes	Comment
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		

Road Number	BMP	ATM	ATM Changes	Comment
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
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		

Road Number	BMP	ATM	ATM Changes	Comment
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		

KAHLER TRANSPORTATION PLAN ***Kahler***



ROADS ANALYSIS SPREADSHEETS

Road Number	BMP	EMP	Segment Length	Functional Class	Objective Mntc Level	Operational Mntc Level	Surface	ATM	Recreation Use Value	Resource Mgmt. Value	Fire Value	Watershed Risk	Wildlife Risk	NOXIOUS WEEDS RISK	Engineering Value	Value Rating	Risk Rating	District Rating	Road Mgmt. Category	Adjusted Category	ATM Changes	Comments
2000013	0.00	0.34	0.34	L	1	1	NAT	C	L	H	L	L	L	L	L	HV	HR	HVHR	4			
2000400	0.00	0.53	0.53	L	3	3	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	1			
2100390	0.00	1.40	1.40	L	2	2	AGG	O	H	H	H	I	H	L	H	LV	LR	LVLR	1			
2100390	1.40	2.26	0.86	L	1	1	AGG	C	L	H	L	I	L	H	H	LV	LR	LVLR	4			
2100394	0.00	1.21	1.21	L	1	1	NAT	C	L	H	L	I	L	H	L	HV	LR	HVLR	4			
2100395	0.00	0.72	0.72	L	1	1	NAT	C	L	H	L	M	L	H	L	HV	LR	HVLR	4			
2100396	0.00	0.37	0.37	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4		D	Decommission End
2141000	0.00	1.62	1.62	C	2	2	IMP	O	H	H	H	L	H	H	M	LV	LR	LVLR	1			
2141000	1.62	2.39	0.77	C	1	1	NAT	C	L	H	L	L	L	H	L	HV	HR	HVHR	4			
2141000	2.39	2.84	0.45	C	1	1	NAT	C	L	H	H	H	L	H	L	HV	HR	HVHR	4		D	Decommission wet area
2141000	2.84	4.88	2.04	C	1	1	NAT	C	L	H	H	H	L	H	L	LV	LR	LVLR	4			Harden and Install culvert
2141000	4.88	6.10	1.22	C	2	2	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	1		C	Proposed closure, more effective
2141020	0.00	1.49	1.49	L	2	2	NAT	O	H	H	H	L	H	H	L	HV	LR	HVLR	1			
2141035	0.00	1.42	1.42	L	1	1	NAT	C	L	L	L	L	L	L	L	HV	LR	HVLR	4			

2141040	0.00	0.44	0.44	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2141040	0.44	1.40	0.96	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2141041	0.00	0.92	0.92	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2141050	0.00	0.37	0.37	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2141060	0.00	0.67	0.67	L	1	1	NAT	C	L	H	L	H	L	H	L	HV	LR	HVLR	4	3	D	Decommission Watershed risk
2141070	0.00	0.36	0.36	L	1	1	NAT	C	L	H	L	M	L	H	L	LV	LR	LVLR	4			
2141090	0.00	1.21	1.21	L	1	1	IMP	C	L	H	L	L	L	H	M	LV	LR	LVLR	4			fix washout
2141090	1.21	1.38	0.17	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			correct length
2142000	0.00	1.90	1.90	C	2	2	AGG	O	H	H	H	L	H	H	H	HV	LR	HVLR	2			Needed Road Monitor Noxious Weeds
2142000	1.90	4.47	2.57	C	2	2	NAT	O	H	H	H	L	H	H	L	HV	LR	HVLR	1			
2142000	4.47	6.47	2.00	C	2	2	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	1			
2142031	0.47	1.17	0.70	L	1	1	NAT	C	L	L	L	L	L	H	L	HV	LR	HVLR	4			
2142032	0.00	0.34	0.34	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2142033	0.00	1.21	1.21	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2142060	0.00	0.43	0.43	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2142095	0.00	0.38	0.38	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2142100	0.00	1.40	1.40	L	2	2	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	1			
2142105	0.00	0.49	0.49	L	1	1	NAT	C	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2400000	0.00	18.25	18.25	A	3	3	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	2			Major Road Monitor Noxious Weeds
2400014	0.00	0.11	0.11	L	1	1	IMP	C	L	L	L	L	L	H	M	HV	HR	HVHR	4			
2400019	0.00	0.67	0.67	L	1	1	NAT	C	L	H	L	L	L	H	L	HV	LR	HVLR	4			
2400021	0.00	0.59	0.59	L	1	1	NAT	C	L	H	L	L	L	H	L	HV	LR	HVLR	4			
2400024	0.00	1.00	1.00	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			Lengthen culvert

2400025	0.00	0.81	0.81	L	1	1	AGG	C	L	H	H	L	L	H	H	LV	LR	LVLR	4			Pit Road, water source
2400026	0.00	0.49	0.49	L	1	1	NAT	C	L	H	L	H	H	H	L	LV	LR	LVLR	4			OHV trail, wet area
2400027	0.00	0.44	0.44	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2400080	0.00	1.86	1.86	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2400140	0.00	1.57	1.57	L	1	1	NAT	C	L	H	L	H	H	H	L	HV	LR	HVLR	4			
2400140	1.57	2.99	1.42	L	1	1	NAT	C	L	H	L	H	H	H	L	HV	LR	HVLR	4			OHV Trail
2400140	2.99	3.35	0.36	L	1	1	NAT	C	L	H	L	H	H	H	L	HV	HR	HVHR	4		C	Decommission OHV after new road
2400140	3.35	4.62	1.27	L	2	2	NAT	C	H	H	H	L	H	H	L	LV	LR	LVLR	1			OHV Trail
2400140	4.62	5.61	0.99	L	2	2	NAT	S	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2400141	0.00	0.32	0.32	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2400142	0.00	0.15	0.15	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			Close need to verify not on private
2400142	0.35	0.49	0.14	L	1	1	NAT	C	L	H	L	L	L	H	L	HV	LR	HVLR	4			
2400143	0.00	0.89	0.89	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2400144	0.00	0.49	0.49	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2400145	0.00	0.72	0.72	L	1	1	NAT	C	L	H	L	L	L	H	L	HV	LR	HVLR	4			
2400152	0.00	0.70	0.70	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	HR	LVHR	4			Correct Length
2400154	0.00	0.46	0.46	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2400155	0.00	1.00	1.00	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	HR	LVHR	4			
2400180	0.00	4.49	4.49	L	2	2	AGG	S	H	H	H	M	H	H	H	HV	LR	HVLR	1			
2400181	0.00	1.53	1.53	L	2	2	NAT	S	H	H	H	L	H	H	L	HV	LR	HVLR	2			Needed Road Monitor Noxious Weeds

2400181	1.85	3.40	1.55	L	2	2	NAT	S	H	H	H	L	H	H	L	LV	LR	LVLR	2			Needed Road Monitor Noxious Weeds
2400181	3.72	9.57	2.77	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			Goes in and out of private
2400183	0.00	0.16	0.16	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2400802	0.00	0.30	0.30	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2406000	0.00	5.70	5.70	C	2	2	AGG	O	H	H	H	M	H	H	H	LV	LR	LVLR	2			Needed Road Monitor Noxious Weeds
2406010	0.00	0.56	0.56	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2406011	0.00	0.37	0.37	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2406012	0.00	0.15	0.15	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2406020	0.00	0.37	0.37	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2406020	0.37	0.40	0.03	L	1	1	NAT	O	H	L	H	L	H	H	L	HV	LR	HVLR	4			
2406025	0.00	2.44	2.44	L	1	1	NAT	C	L	H	L	M	L	H	L	HV	HR	HVHR	3		D	Decommission pull Culverts
2406026	0.00	0.92	0.92	L	1	1	NAT	C	L	L	L	M	L	H	L	HV	HR	HVHR	4		D	Already Decommission Can't Find
2406027	0.00	0.62	0.62	L	1	1	NAT	C	L	H	H	L	L	L	H	LV	LR	LVLR	4			Road added to system
2406040	0.00	3.36	3.36	L	2	2	IMP	O	H	H	H	L	L	H	M	LV	LR	LVLR	2		C	Propose closure
2406040	3.36	3.89	0.53	L	1	1	IMP	C	L	H	L	H	L	H	M	LV	LR	LVLR	3	LVLR		
2406041	0.00	2.23	2.23	L	1	1	IMP	C	L	H	L	M	L	H	M	HV	HR	HVHR	3			Clean Culvert keep closed
2406042	0.00	0.43	0.43	L	1	1	IMP	C	L	H	L	L	L	H	M	LV	LR	LVLR	4			
2406045	0.00	1.04	1.04	L	1	1	NAT	C	L	H	L	M	L	H	L	LV	LR	LVLR	4			

2406050	0.00	1.10	1.10	L	1	1	AGG	C	L	H	L	L	L	H	H	LV	LR	LVLR	4			
2406050	1.10	1.99	0.89	L	1	1	NAT	C	L	H	L	H	L	H	L	LV	LR	LVLR	4			Correct Length
2406055	0.00	0.22	0.22	L	1	1	NAT	C	L	L	L	M	L	H	L	LV	LR	LVLR	4			
2407000	0.00	1.94	1.94	C	2	2	AGG	O	H	H	H	L	H	H	H	LV	HR	LVHR	1			
2407020	0.00	1.78	1.78	L	2	2	AGG	O	H	H	H	M	H	H	H	LV	LR	LVLR	1		S	Proposed Seasonal closure wildlife mitigation
2407030	0.00	0.94	0.94	L	1	1	AGG	C	L	H	L	M	L	H	H	HV	LR	HVLR	4			
2407031	0.00	0.50	0.50	L	1	1	NAT	C	L	L	L	L	L	H	L	HV	LR	HVLR	4			
2407032	0.00	0.21	0.21	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	HR	LVHR	4			
2407040	0.00	1.04	1.04	L	2	2	IMP	O	H	H	H	L	H	H	M	LV	HR	LVHR	1			
2407040	1.04	1.75	0.00	L	2	2	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			Corrected Length
2407041	0.00	1.22	1.22	L	1	1	AGG	C	L	H	L	H	L	H	H	LV	LR	LVLR	4		D	Decommission at end in Stream Not used
2407042	0.00	0.41	0.41	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2407043	0.00	0.37	0.37	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2407044	0.00	1.17	1.17	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2407045	0.00	0.45	0.45	L	1	1	IMP	C	L	H	L	L	L	H	M	HV	LR	HVLR	4			
2407046	0.00	0.54	0.54	L	1	1	NAT	C	L	H	L	L	L	H	L	HV	LR	HVLR	4			
2407047	0.00	0.25	0.25	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2408000	0.00	3.84	3.84	C	2	2	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	1		S	Proposed Seasonal closure wildlife mitigation
2408000	3.84	4.29	0.45	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			

2408000	4.26	4.92	0.66	L	1	1	NAT	C	L	H	L	L	L	H	L	HV	LR	HVLR	4			Corrected Length
2408010	0.00	0.14	0.14	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2408020	0.00	1.97	1.97	L	2	2	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	1		S	Proposed Seasonal closure wildlife mitigation
2408020	1.97	4.09	2.12	L	2	2	AGG	S	L	H	L	L	L	H	H	LV	LR	LVLR	4			
2408020	4.09	6.05	1.96	L	2	2	NAT	S	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2408021	0.00	0.79	0.79	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2408022	0.00	0.27	0.27	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2408023	0.00	0.57	0.57	L	2	2	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	1		C	Correction Already closed
2408024	0.00	0.55	0.55	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2408025	0.00	0.21	0.21	L	1	1	NAT	C	L	H	L	L	L	H	L	HV	LR	HVLR	4			
2408026	0.00	0.64	0.64	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2408027	0.00	0.21	0.21	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2408028	0.00	0.12	0.12	L	2	2	NAT	S	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2408029	0.00	0.35	0.35	L	1	1	NAT	C	L	H	L	L	L	H	L	HV	LR	HVLR	4			Proposed New Construction
2408030	0.00	1.89	1.89	L	1	1	AGG	C	L	H	L	L	L	H	H	LV	LR	LVLR	4			
2408031	0.00	1.56	1.56	L	1	1	AGG	C	L	H	L	L	L	H	H	LV	LR	LVLR	4			
2408034	0.00	1.00	1.00	L	1	1	AGG	C	L	H	L	L	L	H	H	LV	LR	LVLR	4			
2408034	1.00	1.35	0.35	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2408034	1.35	1.73	0.38	L	1	1	NAT	C	L	H	L	L	L	H	L	HV	LR	HVLR	4			
2408050	0.00	0.84	0.84	L	1	1	AGG	C	L	H	L	L	L	H	H	LV	LR	LVLR	4			
2408051	0.00	0.34	0.34	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2408060	0.00	0.82	0.82	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			

2500000	0.00	15.64	15.64	A	3	3	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	2			Major Road Monitor Noxious Weeds
2500030	0.00	1.58	1.58	L	2	2	AGG	O	H	H	H	L	H	H	H	HV	LR	HVLR	1			
2500033	0.00	2.22	2.22	L	2	2	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	1			
2500035	0.00	0.63	0.63	L	2	2	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	1		C	proposed closed wildlife mitigation
2500041	0.00	0.90	0.90	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2500042	0.00	0.60	0.60	L	1	1	IMP	C	L	H	L	H	L	H	H	LV	LR	LVLR	3	4		Road added to system Install CMP keep closed
2500050	0.00	0.55	0.55	L	2	2	IMP	O	H	L	H	L	H	H	M	LV	LR	LVLR	2			Access Private Land Proposed Closed in Alt 4
2500056	0.19	0.21	0.02	L	1	1	IMP	C	L	L	L	L	L	H	M	LV	LR	LVLR	4			
2500056	0.21	0.52	0.31	L	1	1	IMP	C	L	L	L	L	L	H	M	LV	LR	LVLR	4			
2500057	0.50	0.52	0.03	L	1	1	NAT	Other	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2500058	0.09	0.28	0.19	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			Starts on private no access
2500059	0.00	1.22	1.22	L	2	2	IMP	O	H	L	H	H	H	L	M	HV	HR	HVHR	1			
2500060	0.00	0.87	0.87	L	2	2	IMP	O	H	L	H	L	H	H	M	HV	LR	HVLR	2			Need Road Monitor Noxious Weeds

2500060	0.87	1.95	1.08	L	2	2	IMP	O	H	L	H	L	H	H	M	HV	LR	HVLR	2		C	Proposed closed wildlife mitigation
2500062	0.00	1.50	1.50	L	2	2	IMP	O	H	H	H	M	H	H	M	HV	LR	HVLR	2			Need Road Monitor Noxious Weeds
2500063	0.00	0.87	0.87	L	2	2	IMP	O	H	L	H	M	H	L	M	LV	LR	LVLR	2		C	Proposed closed wildlife mitigation
2500064	0.00	0.84	0.84	L	1	1	IMP	C	L	L	L	M	L	H	M	LV	HR	LVHR	4			
2500067	0.00	0.29	0.29	L	1	1	IMP	C	L	L	L	M	L	H	M	HV	HR	HVHR	4			
2500068	0.00	0.41	0.41	L	2	2	NAT	O	H	L	H	H	H	H	L	LV	LR	LVLR	3		C	Proposed closed wildlife mitigation
2500068	0.82	1.20	0.38	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			No access from Private
2500070	0.00	1.10	1.10	L	2	2	IMP	O	H	H	H	L	H	H	M	LV	LR	LVLR	2			Need Road Monitor Noxious Weeds
2500071	0.00	1.20	1.20	L	1	1	NAT	C	L	L	L	H	L	H	L	LV	LR	LVLR	4			
2500075	0.00	1.12	1.12	L	1	1	NAT	C	L	H	L	H	L	L	L	HV	HR	HVHR	4			
2500076	0.00	0.45	0.45	L	1	1	IMP	C	L	L	L	H	L	H	M	HV	HR	HVHR	4			
2500077	0.00	1.03	1.03	L	1	1	IMP	C	L	H	L	M	L	L	M	HV	HR	HVHR	4			
2500078	0.00	0.33	0.33	L	1	1	IMP	C	L	H	L	L	L	H	M	HV	HR	HVHR	4			
2500079	0.00	0.65	0.65	L	1	1	IMP	C	L	L	L	H	L	H	M	HV	HR	HVHR	4			
2500080	0.00	1.28	1.28	L	1	1	IMP	C	L	L	L	L	L	H	M	LV	LR	LVLR	4			Needed Road Monitor Noxious Weeds

2500090	0.00	2.40	2.40	L	2	2	IMP	O	H	L	H	L	H	H	M	LV	LR	LVLR	2			Need Road Monitor Noxious Weeds
2500092	0.00	0.65	0.65	L	1	1	NAT	C	L	L	L	H	L	H	L	LV	HR	LVHR	4			
2500100	0.00	1.37	1.37	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2500110	0.00	0.85	0.85	L	1	1	NAT	C	L	L	L	L	L	L	L	HV	HR	HVHR	4			
2500110	0.85	1.21	0.36	L	2	2	NAT	O	H	L	H	L	H	H	L	LV	LR	LVLR	4			
2500120	0.00	0.46	0.46	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2500122	0.00	0.40	0.40	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2500130	0.00	1.95	1.95	L	2	2	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	2			Private Land Access
2500131	0.00	0.40	0.40	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2500131	0.40	0.60	0.20	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2500131	0.68	0.89	0.21	L	1	1	NAT	O	H	L	L	L	L	H	L	LV	LR	LVLR	4			
2500131	0.97	1.10	0.13	L	1	1	NAT	O	H	L	L	L	L	H	L	HV	HR	HVHR	4			
2500133	0.00	0.09	0.09	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2500135	0.00	0.19	0.19	L	2	2	NAT	O	H	H	H	L	H	L	L	HV	LR	HVLR	1			
2500136	0.00	0.18	0.18	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2500137	0.00	0.08	0.08	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2500138	0.00	0.14	0.14	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2500139	0.00	0.21	0.21	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	LR	LVLR	1			
2500150	0.00	1.00	1.00	L	1	1	NAT	C	L	H	L	H	L	H	L	HV	HR	HVHR	4		D	DECOMMISSION in RHCA
2500151	0.00	0.68	0.68	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2500158	0.00	0.58	0.58	L	1	1	NAT	C	L	H	L	L	L	H	L	HV	LR	HVLR	4			
2500160	0.00	1.75	1.75	L	2	2	NAT	O	H	H	H	M	H	H	L	LV	LR	LVLR	2			Need Road Monitor Noxious Weeds

2500161	0.00	0.35	0.35	L	1	1	NAT	C	L	L	L	H	L	H	L	LV	LR	LVLR	4		D	Decommission in RHCA
2500165	0.00	0.37	0.37	L	1	1	NAT	C	L	L	L	M	L	H	L	HV	LR	HVLR	3	LVLR	D	Already Decommission Low Risk
2500166	0.00	0.68	0.68	L	1	1	IMP	C	L	H	L	M	L	H	M	HV	LR	HVLR	4		D	Already Decommission
2500167	0.00	0.10	0.10	L	1	1	IMP	C	L	H	L	L	L	H	M	HV	LR	HVLR	4			
2500170	0.00	0.40	0.10	L	1	1	IMP	O	H	H	H	H	L	H	M	HV	LR	HVLR	3	LVLR		Install culvert, monitor noxious weeds
2500170	0.40	1.24	0.84	L	1	1	IMP	C	L	H	L	H	H	H	M	HV	LR	HVLR	4			
2500171	0.00	0.40	0.40	L	1	1	IMP	C	L	H	L	H	L	H	M	HV	LR	HVLR	3			
2500171	0.40	1.30	0.90	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2500171	1.30	1.75	0.45	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			Correct length
2500172	0.00	0.70	0.70	L	1	1	NAT	C	L	H	L	H	L	H	L	LV	LR	LVLR	3		D	install temporary Crossing Decommission after use
2500180	0.00	0.90	0.90	L	1	1	IMP	C	L	H	L	M	L	L	M	HV	HR	HVHR	4			
2500190	0.00	1.85	1.85	L	1	1	NAT	C	L	H	L	M	L	L	L	LV	LR	LVLR	4			
2500200	0.00	1.27	1.27	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	HR	LVHR	2			Need Road Monitor Noxious Weeds
2500200	1.27	1.80	0.53	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	LR	LVLR	2		C	Proposed closed wildlife mitigation
2500200	1.80	2.79	0.99	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			

2500201	0.00	0.40	0.40	L	1	1	NAT	C	L	H	L	M	L	H	L	HV	HR	HVHR	4			
2500202	0.00	0.62	0.62	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2500203	0.00	0.30	0.30	L	1	1	NAT	C	L	H	L	L	L	L	L	LV	HR	LVHR	4			
2500315	0.00	0.23	0.23	L	2	2	NAT	O	H	L	H	L	H	H	L	LV	LR	LVLR	4			
2500400	0.00	0.08	0.08	L	2	2	AGG	O	H	H	H	L	H	H	H	LV	LR	LVLR	2			Need Road Monitor Noxious Weeds
2500400	0.08	1.84	1.76	L	1	1	AGG	C	L	H	L	L	L	H	H	LV	HR	LVHR	4			
2500410	0.00	2.76	2.76	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2500600	0.00	1.00	1.00	L	1	1	IMP	C	L	H	L	L	L	H	M	LV	LR	LVLR	4			
2500700	0.00	1.63	1.63	L	1	1	NAT	C	L	H	L	M	L	H	L	HV	HR	HVHR	4			
2500701	0.00	0.38	0.38	L	2	2	NAT	O	H	H	H	H	H	H	L	HV	HR	HVHR	2		C	Proposed closed wildlife mitigation
2500702	0.00	0.64	0.64	L	1	1	NAT	C	L	H	L	H	L	H	L	LV	LR	LVLR	4			
2500703	0.00	0.28	0.28	L	1	1	IMP	C	L	H	L	H	L	H	M	LV	LR	LVLR	4			
2500706	0.00	0.39	0.39	L	1	1	NAT	C	L	H	L	M	L	H	L	LV	LR	LVLR	4			
2500706	0.44	0.98	0.54	L	1	1	NAT	C	L	H	L	M	L	H	L	LV	LR	LVLR	4			
2500710	0.00	0.28	0.28	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2513000	0.00	1.36	1.36	C	2	2	AGG	O	H	H	H	M	H	H	H	HV	HR	HVHR	2			
2513030	0.00	0.57	0.57	L	1	1	IMP	C	L	H	L	M	L	L	L	LV	LR	LVLR	4			Log bridge failed at MP0.32
2513040	0.00	0.69	0.69	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			
2513040	0.69	1.20	0.51	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			Correct length
2516000	0.00	3.76	3.76	C	2	2	AGG	O	H	H	H	L	H	L	H	LV	LR	LVLR	1			
2516055	0.00	0.55	0.55	L	1	1	NAT	C	L	L	L	L	L	H	L	HV	HR	HVHR	4			
2516099	0.00	1.15	1.15	L	1	1	NAT	C	L	H	L	L	L	H	L	LV	LR	LVLR	4			

2516099	1.15	1.79	0.64	L	2	2	NAT	O	H	H	H	L	H	H	L	LV	LR	LVLR	2			Outside project boundary should close wet area last 0.34. Haul Route
2516100	0.00	0.35	0.35	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2516101	0.00	0.36	0.36	L	1	1	NAT	C	L	L	L	L	L	H	L	LV	LR	LVLR	4			
2519000	0.00	2.79	2.79	C	2	2	AGG	O	H	L	H	L	H	H	H	LV	LR	LVLR	1			
2519081	0.40	1.10	0.70	L	1	1	NAT	C	L	H	L	L	L	H	L	HV	HR	HVHR	4			
O2400018	0.00	1.50	1.50					OHV	H	H	H	L	H	H	L	LV	LR	LVLR	1			OHV Trail

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 private 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	Alternative 4
New Temporary	3.0	3.0	0
Existing Temporary	6.9	5.4	5.4
Private Road	1.2	1.6	1.5
Closed Roads	58.2	53.5	51.4
Seasonal Roads	5.7	5.7	5.7
Open Roads	80.4	76.9	76.9
Total Road Miles Used	145.5	137.7	135.5

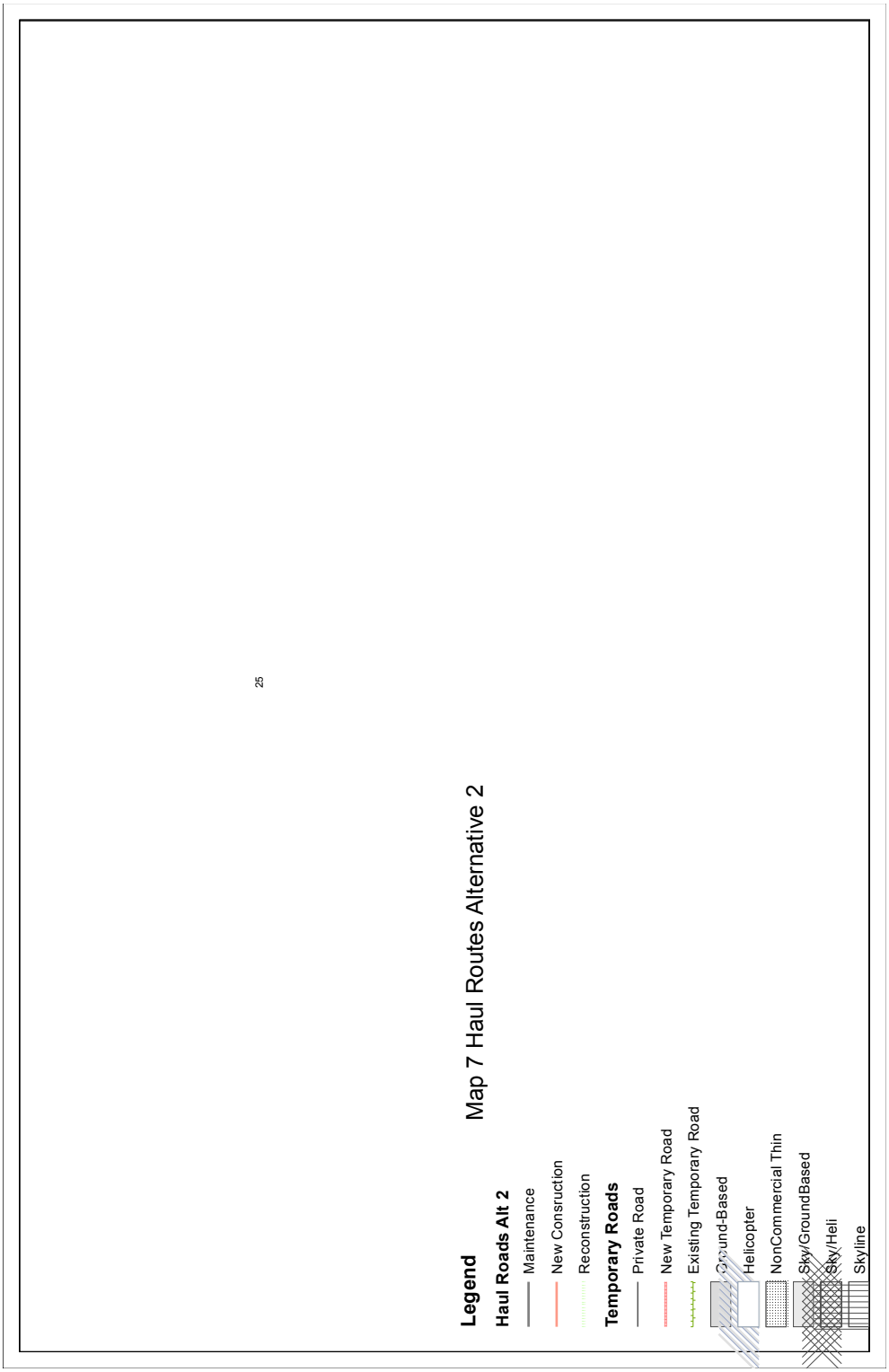
Transportation System Haul Routes Alternative 2

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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Map 7 Haul Routes Alternative 2
Legend
Haul Roads Alt 2
Maintenance
New Consruction
Reconstruction
Temporary Roads
Private Road
New Temporary Road
Existing Temporary Road
Ground-Based
Helicopter
NonCommercial Thin
Sky/GroundBased
Sky/Heli
Skyline

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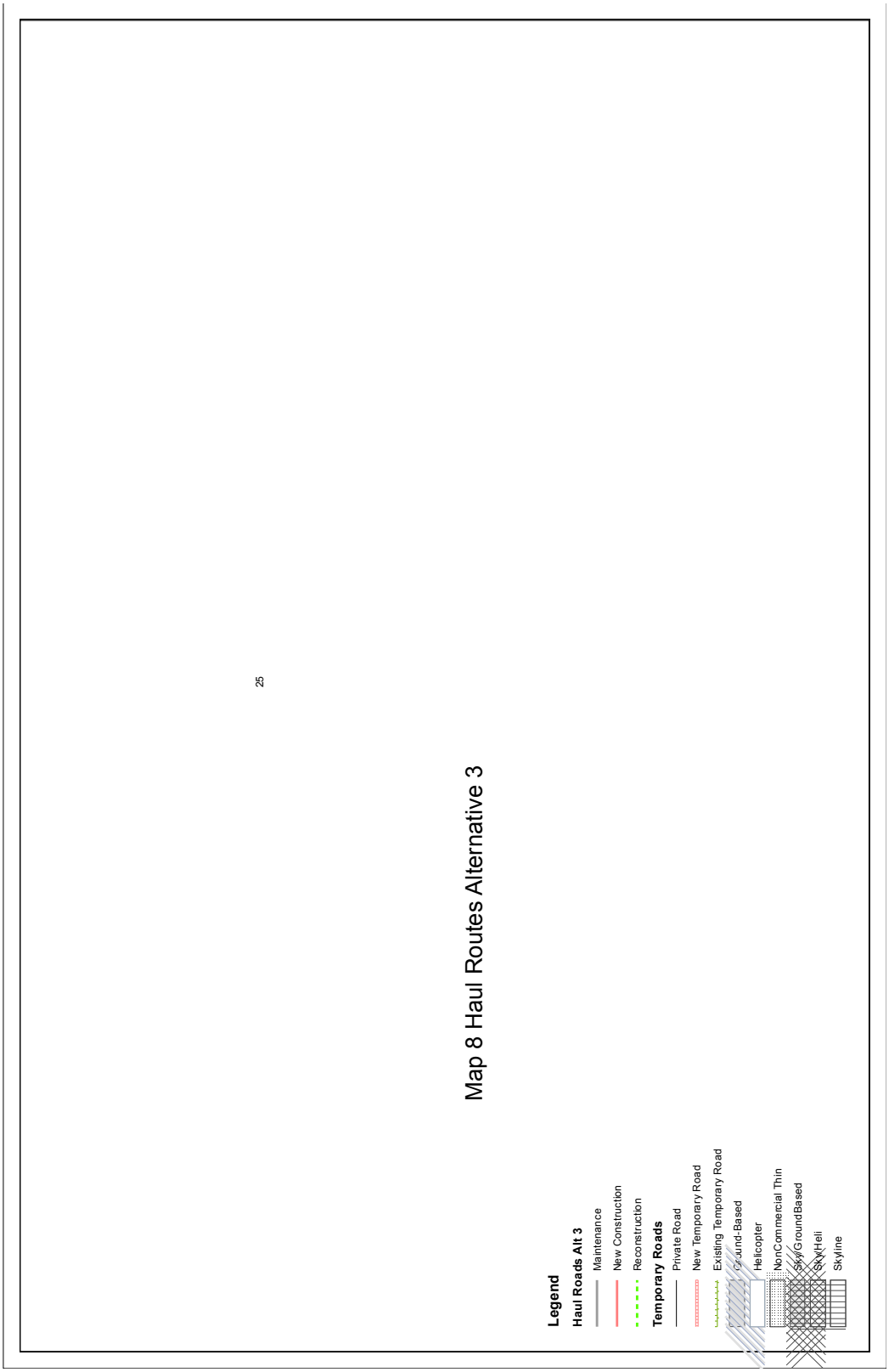
Transportation System Haul Route Alternative 3

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 8 Haul Routes Alternative 3
Legend
Haul Roads Alt 3
Maintenance
New Construction
Reconstruction
Temporary Roads
Private Road
New Temporary Road
Existing Temporary Road
Ground-Based
Helicopter
NonCommercial Thin
Sky/GroundBased
Sky/Heli
Skyline
25

Transportation System Haul Route Alternative 4

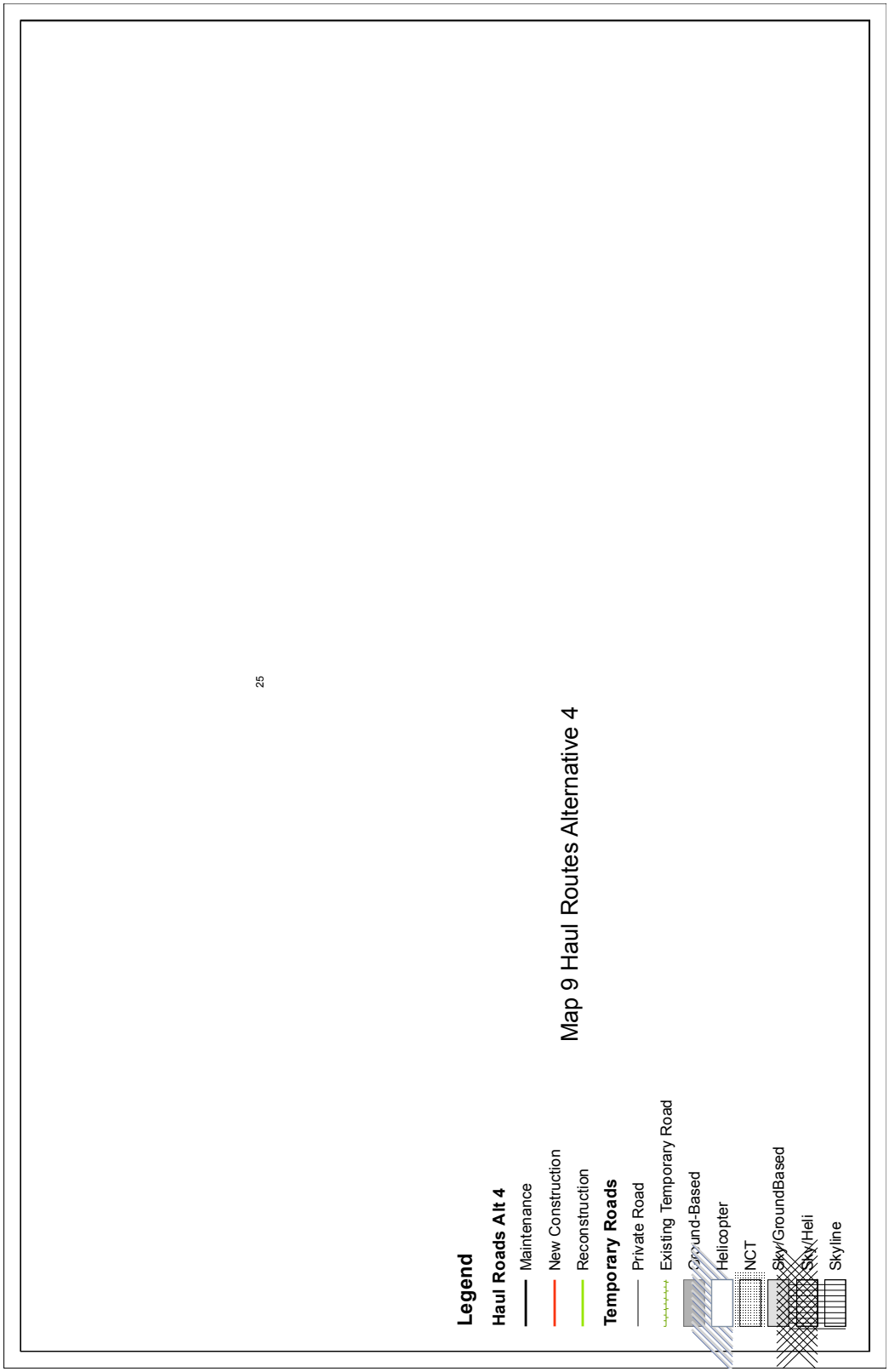
Road No	Reconst (Miles)	Cost	Maint Level	Open Seasonal	Closed	Comments
2000013			1	0.0	0.3	
2000400			3	0.5	0.0	
2100000			2	14.1	0.0	
2100390			2	1.4	0.9	
2100394			1	0.0	0.8	
2100395			1	0.0	0.7	
2100396			1	0.0	0.4	
2141000			2	1.6	0.8	
2141000	2.1	$ 32,640	1	0.0	2.1	Harden and Replace Culvert
2141000			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	

Road No	Reconst (Miles)	Cost	Maint Level	Open Seasonal	Closed	Comments
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	.00	
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	0.4	
2408020			2	6.0	0.0	
2408021			1	0.0	0.0	
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	

Road No	Reconst (Miles)	Cost	Maint Level	Open Seasonal	Closed	Comments
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	51.4	

Label	Existing	Private	Length
T2100394U20	0.8		0.8
T2141U21B	0.1		0.1
T2400000U69	0.6		0.6
T2406026U99	0.9		0.9
T2406027R	0.2		0.2
T2406040U208	1.0		1.0
T2500024L	0.7		0.7
T2500040U3a	0.3		0.3
T2500152U91	0.2		0.2
T2500200_1	0.2		0.2
T2500200U29	0.4		0.4
WHE_3_1	0.0	1.1	1.1
WHE_3_3	0.0	0.4	0.4
	5.4	1.5	9.9

KAHLER TRANSPORTATION PLAN ***Kahler***



Kahler KV Plan

Road No	Road Mile	Treatmen	Unit	Quantitie	Price Per Uni	Total	
2141000	1.3	Closure	Gate	1	$ 1,550.0	$1,550	
2406040	3.4	Closure	Gate	1	$ 1,550.0	$1,550	
2407020	1.7	Closure	Gate	1	$ 1,550.0	$1,550	
2408000	3.7	Closure	Gate	1	$ 1,550.0	$1,550	
2408020	2						
2408023	0.6	Closure	Gate	1	$ 1,550.0	$1,550	
2500035	0.9	Closure	Gate	1	$ 1,550.0	$1,550	
2500060	0.7	Closure	Gate	1	$ 1,550.0	$1,550	
2500063	0.8						
2500068	0.3						
2500180	0	Closure	Gate	1	$ 1,500.0	$1,500	
2500200	1.3	Closure	Gate	1	$ 1,550.0	$1,550	
2500701	0.4	Closure	Gate	1	$ 1,550.0	$1,550	
OHV Trail	0.3	Decommission		0.3	$ 4,000.0	$1,200	
Deco	5.6	Decommi	Rip and Se	5.6	$ 4,000.0	$22,400	
						$39,050	
					Overhead 34	$13,277	
						$52,327	
Decommi	Miles						
2100396	0.4						
2141000	0.4						
2141060	0.2						
2400140	0.3						
2406025	1.4						
2406026	0.9						
2407041	0.2						
2500150	0.3						
2500150	0.4						
2500161	0.4						
2500165	0.4						
2500166	0.1						
2500172	0.2						
2500172	0.1						
osed Total	5.6						

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for the greatest good

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