

Chapter 4 Environmental Consequences

Introduction

This chapter describes past, present, and reasonably foreseeable actions as well as the affected environments of area resources.

Past, Present, and Reasonably Foreseeable Actions

Past actions in the Kahler Creek area have been primarily timber harvest operations. District timber harvest records indicate past harvest in the Kahler planning area between 1940 and 2009 totaling approximately 26,000 acres. Most of the acres harvested (approximately 22,000 acres) involved single tree selection cuts or partial removals, where individual trees or clumps of trees, generally large-diameter ponderosa pines and Douglas-firs, were removed.

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 (CE) (Decision Memo) in 2009, and (2) the Long Prairie Fuels Reduction project, which was also authorized by a Decision Memo in 2009. 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 are fully responsive to the Kahler project's purpose and need.

Future 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 SOPA, no reasonably foreseeable actions potentially affecting vegetation conditions in the Kahler planning area are anticipated over the next 5 years.

Soils

Alternative 1 – No Action

Direct and Indirect Effects

Resource Indicator and Measure 1

Soil mass movement was not identified in the area or as a risk that should play a role in any of the proposed activity units, therefore, it is assumed that mass movement will not influence the proposed alternative in the recent past, nor will it play a role in this alternative or the foreseeable future.

Resource Indicator and Measure 2

If the project area were to continue unchanged by further disturbance from humans or natural events; it would remain on its current soil developmental trajectory with no direct change to the resource indicator of erosion. This assessment is made despite the presence of DSC in the form

of legacy trails assumed to be detrimentally impacted from previous harvest. While the presence of some DSC is known to increase sediment, it is currently covered with adequate EGC to limit erosion above background levels.

Due to the presence of DSC (legacy trails) erosion could have an indirect effect on this alternative. Indirect effects would occur with the loss of EGC from disturbance (wildfire). Given the effects of past wildfire occurrence in the project area (1996 Wheeler Point Fire), it is in the reasonably foreseeable future that similar effects can happen. This alternative does not reduce fuel loads, thus the wildland fire assumptions in the alternative are for High Severity Burn.

Assumptions for the WEPP runs included 30 year climate model duration, loam and silt loam soil textures, slope gradients from 10 to 60 percent, upper slope lengths of (1200ft – harvest), and (300ft to 700ft skid trails), and with cover elements of Mature Forest (100% cover), and High Severity Fire (45% cover). Additionally the cover element of skid trails was added due to the presence of existing skid trails in the proposed units; skid trails in WEPP was a cover of 10%, with a constant surface rock content of 10%. Lower slopes (buffers) were modeled with gradients of 10 to 60 percent, lengths of 5 to 95 feet, with no treatments (Mature Forest 100%). To model the effects of wildfire buffer covers were reduced to 45% (WEPP default for High Severity Fire), soil cover of 100 percent, rock content 10 percent. Background (no action) runs were also made; with upper elements having the same variable as the lower elements to model current erosion and sediment. The inputs for each of the model runs, is listed in the appendix of this soils report.

The most productive part of the soil is often the closest to the mineral surface (Brady & Weil 1999). Erosion would either change the location of productive soil; or be a loss of soil productivity to stream sediment inputs. Additionally, it is assumed that the network of legacy trails can offer means to route surface flow and sediment to streams. In an effort to understand this effect WEPP modeling added the variable of EGC loss to the harvest scenarios modeled. As with the no action alternative showed previously; just the removal of tree canopy did not have an effect.

Table 4-1: Resource Indicators and Measures for Alternative 1

Resource Element	Resource Indicator	Measure	Existing DSC Effects (mi/ac) (Alt. 1)	Wildfire Influenced Effects on Existing DSC (mi/ac) (Alt. 1)
Soil Stability	Soil Mass Wasting	No active areas identified	0.0	0.0
Soil Productivity	Erosion	Activity unit acres modeled >0.03t/ac	0.0	18/26
Water quality	Sediment	Activity units that may produce >0.03t/ac	0.0	27/39
Detrimental Soil Conditions (DSC)	Change or absence in vegetation growth	Legacy trails in project area ³	152/45	152/45
		Legacy trails in proposed Harvest Units ⁴	13/20	45/65

³ While the presence of some DSC is known to increase sediment, it is currently covered with adequate EGC to limit sediment above background levels.

		Legacy trails in current RHCA (class 2, 3, or 4 streams) ⁴	6/9	20/30
		Legacy trails in area influenced by wildfire (400ft from streams) ⁴	0/0	18/26

Further modeling in the proposed activities added the potential of wildfire and DSC. The WEPP model inputs used first reflected the flattest sloped buffer; 10% slope between the trail end and stream. In the non-wildfire scenarios this condition was the least impactful model run. Depending upon results of the model runs increasing slopes would be used in other model runs. Loss of cover was used in the model was an assumed 10% trail cover and 45% High Severity Fire default in WEPP, was used for the buffer. In the modeling we see that a 400ft buffer is needed to limit sediment loss to streams. It is assumed that all of the other DSC (>400ft from streams); 18 miles or 26 acres of trails would produce erosion which could hinder soil productivity.

Resource Indicator and Measure 3

If the project area were to continue unchanged by further disturbance from humans or natural events; it would remain on its current soil developmental trajectory with no direct change to the resource indicator of sediment. This assessment is made despite the presence of DSC in the form of legacy trials assumed to be detrimentally impacted from previous harvest. While the presence of some DSC is known to increase sediment, it is currently covered with adequate EGC to limit sediment above background levels.

Further modeling in the proposed activities added the potential of wildfire and DSC. The WEPP model inputs used first reflected the flattest sloped buffer; 10% slope between the trail end and stream. In the non-wildfire scenarios this condition was the least impactful model run. Total loss of cover in the model run assumed, 10% trail cover and 45% High Severity Fire default in WEPP was used for the buffer. In the modeling we see that a 400ft buffer is needed to limit sediment loss to streams. Within the 400ft distance from streams there were 27 miles or 39 acres of trails would produce sediment that could influence the hydrology of the project areas.

Resource Indicator and Measure 4

Without human intervention there are not many cases when the soil resource can be influenced. Thus the inhibition of the growth of tree and brush (FSM 2551.5 exhibit 01) would be considered an expression of a detrimental change to the productivity of the soil resource. Within the proposed planning area there are human created trails that measure approximately 152 miles of assumed trail. The highest densities of visible trails in the project area are within the Wheeler Point Salvage. These trails have appeared to have inhibited vegetation growth and type of growth. To verify this change the Soil Disturbance Monitoring Protocol was adapted to evaluate the recognized changes (Page-Dumroese, 2009). While not many of these effects seem to have been reduced over time, there is one instance where the soil restored itself.

The inhibition on plant growth seems to be related to trees and brush (with Juniper and Lodge Pole Pine being less affected); grasses, herbs and forbs in general may also have been influenced, but no measureable change was identified in the soils report. Estimates of DSC (Table 4-1) are based on the 2013 Kahler field observations (see Soils Report Table 11, page 11); in those site visits; 98,200ft of trails were examined. Of the sites measured 31% was considered to be in DSC, when using the criteria from Page-Dumroese, et al (2009). Therefore within the harvest

units there is a total of 45 miles (65 acres) of trail for a total of DSC (including system roads). Since only 31% of the evaluated impacts were deemed to be DSC, we can assume 31% of the total DSC is a loss to the soil resource (13 miles or 20 acres).

Cumulative Effects

Spatial and Temporal Context for Effects Analysis

Cumulative effects are not expected from Resource Indicator and Measure (RIM) 1 – Mass movement.

Cumulative effects from RIM 2 – Erosion, are expected to be localized; unless influenced by a combination of wildfire and the erosion processes exposed to high winds. Winds can transport detached soil aloft and to a new location. This would prove to be a loss to soil productivity within a proposed unit, if this occurs it is unknown if some portion of this material would end up as sediment. The potential duration of expected erosion risk would be for at least 3 years immediately following wildfire (Elliott et al 2001 and Robichaud 2000). The volumes of erosion under this risk are also influenced by the intensity and duration of precipitation events that occur during elevated erosion risk.

Cumulative effects from RIM 3 – Sediment, are expected to be small with no elevation above assumed background levels; unless like above influenced by wildfire. If wildfire takes place elevated. The potential duration of expected sediment risk would be for at least 3 years immediately following wildfire (Elliott et al 2001 and Robichaud 2000). The volumes of sediment under this risk are also influenced by the intensity and duration of precipitation events that occur during elevated sediment risk.

Cumulative effects from RIM 4 – Detrimental Soil Conditions (DSC) that assumed to be created by equipment traffic seem to be long-lived (>40 years), with an exception in Kahler Unit 14. Soil development within Kahler has some measure of vertic soil properties; this feature was recognized in unit 14. Vertic soil properties seem to have erased the presence of equipment traffic. This was found by following the GPS location of mapped DSC. Within the mapped location of the trail once exiting the vertic properties the trail was located in the mapped location. Thus it is assumed that the vertic (heave) within the soil overtime erased the legacy trail from the landscape (within the last 40 years). While this does show a restorative benefit to soils with vertic properties, it is not advisable to locate trails on these features. These soils also store a great deal of moisture from the clays that form these soils and locating equipment traffic through this soil may prove to have inputs to sediment sources; if these clays are suspended in puddles that are then allowed to route water on trails.

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

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

Alternative 2 – Proposed Action

Project Design Features and Mitigation Measures

Per Multi-Use Sustainable Yield Act, FSM and LRMP the following design features and mitigations will be placed on Alternative 2.

1. Use of harvest equipment will not be permitted when soils reach field capacity for moisture, to limit the potential of long-term detrimental soil disturbance (Amaranthus et al. 1996, Bulmer et al. 2010, Froehlich et al. 1983, Heninger et al, 2002, Miller et al. 2004 and Page-Dumroese et al 2009.)
2. Placement of new temporary roads will be on deep soils, if it is operationally feasible. This will allow for adequate restoration of temporary roads and over time will leave less measurable detrimental soil condition across the proposed activity units (Archuleta, 2006, 2007, 2008). Lithosol (scab flats) and meadows will not be used for landings and skid trails; unless no other location is practical. If use is necessary disturbance will be kept to a minimum amount of the area, preferably at the edges of these features.
3. Within commercial harvest units, no harvest or heavy equipment will leave designated roads or trails, to limit the potential of detrimental soil disturbance. In the non-commercial thinning units, mechanical thinning equipment may be used provided that equipment that exceeds 7 PSI is not allowed to travel over the same path more than once. Some noncommercial thinning will be by sawyers (hand only).

A full list of BMPs, some with criteria driven by soil resource concerns have been incorporated within the EIS.

Direct and Indirect Effects

Resource Indicator and Measure 1

Soil mass movement was not identified in the area or as a risk that should play a role in any of the proposed activity units, therefore, it is assumed that mass movement will not influence the proposed alternative in the recent past, nor will it play a role in this alternative or the foreseeable future.

Resource Indicator and Measure 2

In Alternative 2 that will have some effect on Soil Productivity (Erosion): harvest (Ground Based, Skyline, Helicopter and Prescribed Burning). Each of these methods has an expected impact to the DSC (Reeves, 2011, Archuleta, 1997 & 1999, Siskiyou NF, 1997 and Bennett, 1982), which can influence erosion.

As mentioned in the existing condition discussion, there are existing DSC within activity areas from past activity. Some of the proposed activity impacts (Alt 2) will overlap with proposed temporary roads. During the implementation of activities, there will be some elevation of risk to erosion. However BMPs (erosion control) will mitigate or diminish; if not all most of the short term effects from erosion. To estimate this risk the WEPP model was used.

While the WEPP modeling did not take slope profiles to input into the model, a range of slope characteristics were identified in GIS that cover the range of slope conditions found within the proposed units. WEPP uses two elements in the model. The upper element represents the disturbance activity (i.e. harvest), and a low element which represents the sediment buffer to a waterway. In the model the steepest slopes found in the units were used to represent the worst case scenario for erosion modeling (upper element 60%, lower element 40% to 60%). To display differences in effect to the RHCA treatments, a variety of buffer widths were used in the model (see Soils Report Table 10).

Results of the model runs for harvest and burning treatments showed that average annual erosion was very low (0.0044t/ac). The harvest example was using no disturbance other than removal of EGC. This is not to say under the extreme conditions (high precipitation, poor EGC left in place, or unplanned equipment traffic), erosion could not occur above background levels.

Based on the model runs and assumed background levels, it was decided that the harvest and prescribed burning would produce less sediment delivery than a high severity wildfire of similar size, so the Kahler harvest and burning in RHCA would be justified and no Design Criteria is recommended based on canopy removal.

When the WEPP model used the criteria to examine skid trails there was elevated erosion, so design criteria was developed. This information was used to limit the length of trails (225ft and 600ft); acceptable skidding lengths are based on slope breaks and are defined in the Design Criteria of this EIS.

The previously mentioned trails that will be used in the proposed activity as temporary roads will be subject to restoration (obliteration) of the DSC. As long as the proposed activity is allowed to use legacy trails, they can be eliminated by contract provision of a timber sales.

Resource Indicator and Measure 3

In Alternative 2 there will be some effect to the Resource element of Water Quality (Sediment). Mentioned in the existing condition discussion there is existing DSC from past activities. Each of these methods has an expected impact to the DSC (Reeves, 2011, Archuleta, 1997 & 1999, Siskiyou NF, 1997 and Bennett, 1982), which can influence sediment. Some of the proposed activity impacts will overlap with proposed temporary roads. During the implementation of activities, there will be some elevation of risk to erosion. However BMPs (sediment) will mitigate or diminish; most if not all, short term effects from erosion. To estimate this sediment risk the WEPP model was used the two soil textures of loam and silt loam are the only soil textures that were mapped within the proposed units.

Results of the model runs for harvest and burning treatments showed that average annual sediment was below background, <0.03t/ac (Harris, et.al. 2007). This means that harvest of trees (in or out of the RHCA), to the prescribed canopy density (>40% cover); would not show a measureable effect from sediment. This is not to say all proposed activities (in or out of the RHCA) would not have an effect to sediment (see Soils Report Table 10). Since skid trails are often extremely deficient of EGC, additional modeling was done to examine skid trails. Skid trails (a yarding method) are the one example when sediment could rise above background levels. A cover of 10% (skid trails) was used in WEPP model runs (see Soils Report Table 10). When skidding of trees was examined in relationship to the RHCA thinning, unlike the felling of trees; it was determined that a buffer was indeed needed to minimize the risk of sediment to streams.

Based on the model runs and assumed background levels, it was assumed that the harvest and prescribed burning would produce less sediment delivery than a high severity wildfire of similar size. The analysis thereby shows that the Kahler harvest and burning in RHCA would be justified and no Design Criteria is recommended based on canopy removal. Skid trails however may not be allowed to get closer than 75ft to 100ft, depending on slope from a stream in RHCA treatments; (Hydro Report, Table 14). With all other streams the normal buffer distances will still apply, for both harvest and equipment traffic.

Some benefits to the sediment are expected from this alternative. As previously mentioned there are existing legacy trails. Some of these trails will be used as temporary roads in the project and subject to removal per the forest plan. Additionally since the temporary roads are used in the timber sale itself, it is allowable that under contract provisions of the timber sale they can be obliterated. These obliterated roads are considered restoration of the soil resource; in the event of a wildfire or similar defoliating event, the obliterated road will not offer a means of sediment inputs.

Resource Indicator and Measure 4

In Alternative 2 there will be some effect to Detrimental Soil Conditions (DSC). Mentioned in the existing condition discussion there is existing DSC from past activities. Each of these methods has an expected impact to the DSC (Reeves, 2011, Archuleta, 1997 & 1999, Siskiyou NF, 1997 and Bennett, 1982), which can influence sediment.

While Reeves offers a comprehensive list of expected detrimental effects, it appears these estimates may underestimate effects if certain conditions are present or absent. To offer an expected DSC that may be relevant to proposed activities and conditions present the following were used in DSC calculations; Ground Based 10% (Archuleta, 1997 & 1999), Skyline 5%, Helicopter 1% (Siskiyou NF, 1997), Prescribed Burning 1% (Bennett, 1982). Additionally, there may be some use of ground based equipment to pre-bunch helicopter loads to improve efficiency of helicopter logging. This activity will be done with a single pass to limit DSC described by Han (2006); the soil moisture for this activity will also be limited to dry conditions as a further mitigation.

Understanding the benefiting opportunities from fuel loading (slash) with yarding method may be an important factor to consider in the analysis. If harvest in a unit occurs before or as it transitions from moist to dry soil conditions; equipment may need to ride on slash to minimize DSC.

To illustrate how important this may be to the Kahler project, Figure 4-1 is offered as an example. In this harvest on the Umpqua NF (Flat IRTC)⁴; shows how some ground based yarding equipment is designed to float on slash, benefiting the soil resource; minimizing the detrimental effects of compaction and displacement. Slash was available for both sections, but the yarding systems required the harvester to use slash to minimize soil disturbance and the skidder to push it out of the way. The actual trails marked within the harvester section do not represent all trails used. The map only represents those trails needing to be obliterated by the harvest contractor in that IRTC (stewardship) project. There were “ghost trails” which registered no DSC disturbance (between mapped trails) used in the harvester section. These unmapped trails used a slash mats (>1 foot) to float equipment; leaving no measureable detrimental effects in their wake. Another reason that trails were around 80 to 100ft apart; the trees being harvested from “ghost trails” were directional felled to the mapped trails from unmapped trails. This allowed for the “ghost trail” to be used once in a single direction, effectively making a single pass and limiting DSC effects (Han, 2006)

The comparison in Figure 4-1 is important for the Kahler analysis; it is assumed that the opportunity to mitigate equipment disturbance with slash may not be an option in many Kahler project units. Therefore if harvester logging is used during implementation; it must occur after

⁴ Impacts were GPS located and later subsoiled to restore acceptable soil productivity to the entire unit

the soil has transitioned from moist to dry soil conditions. If this design criterion is not followed, the resulting effect will likely be similar to the skidder disturbance seen in Figure 4-1.

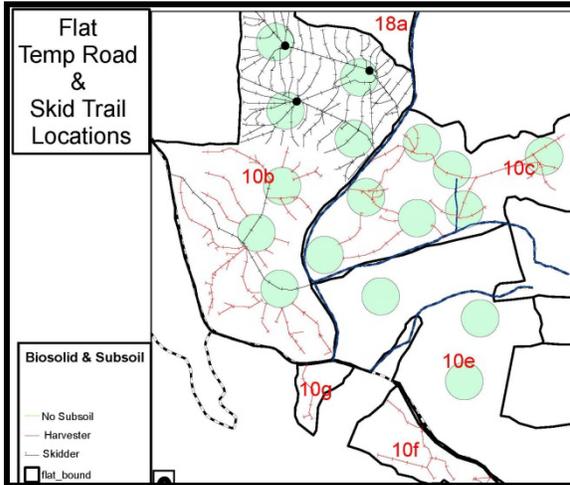


Figure 4-1 Cropped map of Flat IRTC monitoring. Umpqua NF, 2009.

The elements of DSC are currently present in proposed units and will change in some areas by proposed activities. This change will take place mostly in association with the overlap of legacy trails and new temporary roads. Where this overlap occurs it is expected that there will an overall decrease in DSC for that segment of legacy trail.

Table 4-2: Resource Indicators and Measures for Alternative 2

Resource Element	Resource Indicator	Measure	Existing DSC Effects (mi/ac) (Alt. 2)	Wildfire Influenced Effects on Existing DSC (mi/ac) (Alt. 2)
Soil Stability	Soil Mass Wasting	No active areas identified	0.0	0.0
Soil Productivity	Erosion	Activity unit acres modeled >0.03t/ac	0.0	0/0
Water Quality	Sediment	Activity units that may produce >0.03t/ac	0.0	0/0
Detrimental Soil Conditions (DSC)	Change or absence in vegetation growth	Legacy trails in project area ⁵	142/38	142/38
		Legacy trails in proposed Harvest Units ⁴	3/13	3/13
		Legacy trails in current RHCA (class 2, 3, or 4 streams) ⁴	6/9	6/9
		Legacy trails in area influenced by wildfire (400ft from streams) ⁴	0/0	0/0

⁵ While the presence of some DSC is known to increase sediment, it is currently covered with adequate EGC to limit sediment above background levels.

Within the proposed planning area there are human created trails that measure approximately 152 miles of assumed trail. The highest densities of visible trails in the project area are within the Wheeler Point Salvage units. These trails have appeared to have inhibited vegetation growth and type of plants. To verify this change the Soil Disturbance Monitoring Protocol was adapted to evaluate the recognized changes (Page-Dumroese, 2009). While not many of these effects seem to have been reduced over time, there is one instance in Unit 14, where the soil restored itself; this example is explained in the cumulative analysis section of this alternative.

The inhibition on plant growth seems to be related to trees and brush (with Juniper and Lodge Pole Pine being less affected); grasses, herbs and forbs in general may also have been influenced, but no measureable change was identified in the soils report. Estimates of DSC (Table 4-2) are based on the 2013 Kahler field observations (Soils Report, Table 4)); in those site visits; 98,200ft of trails were examined. Of the sites measured, 31% was considered to be in DSC, when using the criteria from Page-Dumroese, et al (2009).

Therefore within the harvest units there is a total of 45 miles (65 acres) of trail for a total of DSC (including system roads). Since only 31% of the evaluated impacts were deemed to be DSC; like alternative 1, we can assume 31% of the total DSC is a loss to the soil resource (13 miles or 20 acres). Of the legacy trails mapped in the project area, some measure of the road obliterated (units 2, 3b, 4b, 18, 19, 22, 27, 31 and 60a), dependent upon activity use. Actual mileage of obliteration is dependent upon the amount of temporary road and legacy DSC overlap.

Further modeling of the proposed activities added the potential of lost EGC from wildfire and DSC for alternative 1. The same model inputs were used in WEPP the Wildfire Scenario used in Alternative 3, with the assumption that the proposed action would reduce the fire risk, so a Low Severity Fire was modeled (85% cover). In the modeling we see sediment prone acres that may offer input to streams; similar to those created by the proposed activities (Table 4-2). This modeling indicates; after the project is implemented, the assumed effects of wildfire would not be as intense and thus produce unmeasurable effects from the proposal and its required mitigations.

Provided all mitigating factors are present when proposed activity occurs, the anticipated DSC for a given unit or the proposal (as a whole) does not exceed 20% DSC criteria (LRMP).

Cumulative Effects

Spatial and Temporal Context for Effects Analysis

Cumulative effects are not expected from Resource Indicator and Measure (RIM) 1 – Mass movement, (Table 4-2).

Cumulative effects from RIM 2 – Erosion, are expected to be localized; unless influenced by a combination of wildfire and the erosion processes exposed to high winds. Winds can transport detached soil aloft and to a new location. This would prove to be a loss to soil productivity within a proposed unit, if this occurs it is unknown if some portion of this material would end up as sediment. The potential duration of expected erosion risk would be for at least 3 years immediately following wildfire (Elliott et al 2001 and Robichaud 2000). The volumes of erosion under this risk are also influenced by the intensity and duration of precipitation events that occur during elevated erosion risk.

Cumulative effects from RIM 3 – Sediment, are expected to be small with no elevation above assumed background levels (Harris, et.al. 2007) with the described mitigations and BMPs; unless like above influenced by wildfire. If wildfire takes place elevated. The potential duration of expected sediment risk would be for at least 3 years immediately following wildfire (Elliott et al 2001 and Robichaud 2000), assuming for a low severity wildfire and the reduced fuel loads.

Cumulative effects from RIM 4 – Detrimental Soil Conditions (DSC) that assumed to be created by equipment traffic seem to be long-lived (>40 years), with an exception in Kahler Unit 14. Soil development within Kahler has been mapped as having some measure of vertic soil properties; this feature was recognized in unit 14. Vertic soil properties seem to have erased the presence of equipment traffic. This was found by following the GPS location of mapped DSC, out of the area of vertic soils; where the rest of the DSC remained on the landscape. Thus it is assumed that the vertic properties (soil heave) overtime erased the legacy trail from the landscape (within the last 40 years). While this does show a restorative benefit to soils with vertic properties, it is not advisable to locate trails on these features. These soils also store a great deal of moisture from the clays that form these soils and locating equipment traffic through this soil may prove to have inputs to sediment sources; if these clays are suspended in puddles that sediment may have the opportunity to be routed to streams under high precipitation. Therefore units with soils described with vertic properties (units 7, 11b, 22, 23, 23a, and 28) should be evaluated during placement of any equipment traffic ways (Kahler design criteria).

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

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

Alternative 3

Project Design Features and Mitigation Measures

Per Multi-Use Sustainable Yield Act, FSM and LRMP the following design features and mitigations will be placed on Alternative 3.

1. Use of harvest equipment will not be permitted when soils reach field capacity for moisture, to limit the potential of long-term detrimental soil disturbance (Amaranthus et al. 1996, Bulmer et al. 2010, Froehlich et al. 1983, Heninger et al, 2002, Miller et al. 2004 and Page-Dumroese et al 2009.)
2. Placement of new temporary roads will be on deep soils, if it is operationally feasible. This will allow for adequate restoration of temporary roads and over time will leave less measurable detrimental soil condition across the proposed activity units (Archuleta, 2006, 2007, 2008). Lithosol (scab flats) and meadows will not be used for landings and skid trails; unless no other location is practical. If use is necessary disturbance will be kept to a minimum amount of the area, preferably at the edges of these features.
3. Within commercial harvest units, no harvest or heavy equipment will leave designated roads or trails, to limit the potential of detrimental soil disturbance. In the non-commercial thinning units, mechanical thinning equipment may be used provided that equipment that exceeds 7 PSI is not allowed to travel over the same path more than once. Some noncommercial thinning will be by sawyers (hand only).

A full list of BMPs, some with criteria driven by soil resource concerns have been incorporated within the EIS.

Direct and Indirect Effects

Resource Indicator and Measure 1

Soil mass movement was not identified in the area or as a risk that should play a role in any of the proposed activity units, therefore, it is assumed that mass movement will not influence the alternative 3 in the recent past, nor will it play a role in this alternative or the foreseeable future.

Resource Indicator and Measure 2

Similar to the previous alternative; this alternative 3 will have some effect on Soil Productivity (Erosion): harvest (Ground Based, Skyline, Helicopter and Prescribed Burning). Each of these methods has an expected impact to the DSC (Reeves, 2011, Archuleta, 1997 & 1999, Siskiyou NF, 1997 and Bennett, 1982), which can influence erosion.

As mentioned in the existing condition discussion, there are existing DSC within activity areas from past activity. Some of the proposed activity impacts (Alt 3) will overlap with proposed temporary roads. During the implementation of activities, there will be some elevation of risk to erosion. However BMPs (erosion control) will mitigate or diminish; if not all most of the short term effects from erosion. To estimate this risk the WEPP model was used.

While the WEPP modeling did not take on the ground slope profiles to input into the model, a range of slope characteristics were identified in GIS that cover the range of slope conditions found within the proposed units. WEPP uses two elements in the model. The upper element represents the disturbance activity (i.e. harvest), and a low element which represents the sediment buffer to a waterway. In the model the steepest slopes found in the units were used to represent the worst case scenario for erosion modeling (upper element 60%, lower element 40% to 60%). To display differences in effect to the RHCA treatments, a variety of buffer widths were used in the model (Soils Report, Table 10).

Results of the model runs for harvest and burning treatments showed that average annual erosion was the same as Alternative 2. The harvest example was using no disturbance other than removal of EGC. This is not to say under the extreme conditions (high precipitation, poor EGC left in place, or unplanned equipment traffic), erosion could not occur above background levels.

Based on the model runs and assumed background levels, it was determined that the harvest and prescribed burning would produce less sediment delivery than a high severity wildfire of similar size, so the Kahler harvest and burning in RHCA would be justified and no Design Criteria is recommended based on canopy removal.

When the WEPP model used the criteria to examine skid trails there was elevated erosion, so design criteria was developed. This information was used to limit the length of trails (225ft and 600ft); acceptable skidding lengths are based on slope breaks and are defined in the Design Criteria of this EIS.

The previously mentioned trails that will be used in the proposed activity as temporary roads will be subject to restoration (obliteration) of the DSC. As long as the proposed activity is allowed to use legacy trails, they can be eliminated by contract provision of a timber sales.

Resource Indicator and Measure 3

In Alternative 2 there will be some effect to the Resource element of Water Quality (Sediment). Mentioned in the existing condition discussion there is existing DSC from past activities. Each of these methods has an expected impact to the DSC (Reeves, 2011, Archuleta, 1997 & 1999, Siskiyou NF, 1997 and Bennett, 1982), which can influence sediment. Some of the proposed activity impacts will overlap with proposed temporary roads. During the implementation of activities, there will be some elevation of risk to erosion. However BMPs (sediment) will mitigate or diminish; most if not all, short term effects from erosion. To estimate this sediment risk the WEPP model was used the two soil textures of loam and silt loam are the only soil textures that were mapped within the proposed units.

Results of the model runs for harvest and burning treatments showed that average annual sediment was below background, <0.03t/ac (Harris, et.al. 2007). This means that harvest of trees (in or out of the RHCA), to the prescribed canopy density (>40% cover); would not show a measureable effect from sediment. This is not to say all proposed activities (in or out of the RHCA) would not have an effect to sediment (Soils Report, Table 10). Since skid trails are often extremely deficient of EGC, additional modeling was done to examine skid trails. Skid trails (a yarding method) are the one example when sediment could rise above background levels. A cover of 10% (skid trails) was used in WEPP model runs (Soils Report, Table 10). When skidding of trees was examined in relationship to the RHCA thinning, unlike the felling of trees; it was determined that a buffer was indeed needed to minimize the risk of sediment to streams.

Based on the model runs and assumed background levels, it was assumed that the harvest and prescribed burning would produce less sediment delivery than a high severity wildfire of similar size. The analysis thereby shows that the Kahler harvest and burning in RHCA would be justified and no Design Criteria is recommended based on canopy removal. Skid trails however may not be allowed to get closer than 75ft from a stream in RHCA treatments; in cases of increased slopes that buffer can be 100ft (Soils Report, Table 9). With all other streams the normal buffer distances will still apply, for both harvest and equipment traffic.

Some benefits to the sediment are expected from this alternative. As previously mentioned there are existing legacy trails. Some of these trails will be used as temporary roads in the project and subject to removal per the forest plan. Additionally since the temporary roads are used in the timber sale itself, it is allowable that under contract provisions of the timber sale they can be obliterated. These obliterated roads are considered restoration of the soil resource; in the event of a wildfire or similar defoliating event, the obliterated road will not offer a means of sediment inputs.

Resource Indicator and Measure 4

In Alternative 2 there will be some effect to Detrimental Soil Conditions (DSC). Mentioned in the existing condition discussion there is existing DSC from past activities. Each of these methods has an expected impact to the DSC (Reeves, 2011, Archuleta, 1997 & 1999, Siskiyou NF, 1997 and Bennett, 1982), which can influence sediment.

While Reeves offers a comprehensive list of expected detrimental effects, it appears these estimates may underestimate effects if certain conditions are present or absent. To offer an expected DSC that may be relevant to proposed activities and conditions present the following were used in DSC calculations; Ground Based 10% (Archuleta, 1997 & 1999), Skyline 5%, Helicopter (Siskiyou NF, 1997), Prescribed Burning (Bennett, 1982). Additionally, there may be some use of ground based equipment to pre-bunch helicopter loads to improve efficiency of

helicopter logging. This activity will be done with a single pass to limit DSC described by Han (2006); the soil moisture for this activity will also be limited to dry conditions as a further mitigation.

Understanding the benefiting opportunities from fuel loading (slash) with yarding method may be an important factor to consider in the analysis. If harvest in a unit occurs before or as it transitions from moist to dry soil conditions; equipment may need to ride on slash to minimize DSC.

To illustrate how important this may be to the Kahler project, Figure 4-1 is offered as an example. In this harvest on the Umpqua NF (Flat IRTC)⁶; shows how some ground based yarding equipment is designed to float on slash, benefiting the soil resource; minimizing the detrimental effects of compaction and displacement. Slash was available for both sections, but the yarding systems required the harvester to use slash to minimize soil disturbance and the skidder to push it out of the way. The actual trails marked within the harvester section do not represent all trails used. The map only represents those trails needing to be obliterated by the harvest contractor in that IRTC (stewardship) project. There were “ghost trails” which registered no DSC disturbance (between mapped trails) used in the harvester section. These unmapped trails used a slash mats (>1 foot) to float equipment; leaving no measureable detrimental effects in their wake. Another reason that trails were around 80 to 100ft apart; the trees being harvested from “ghost trails” were directional felled to the mapped trails from unmapped trails. This allowed for the “ghost trail” to be used once in a single direction, effectively making a single pass and limiting DSC effects (Han, 2006)

The comparison in Figure 4-1 is important for the Kahler analysis; it is assumed that the opportunity to mitigate equipment disturbance with slash may not be an option in many Kahler project units. Therefore if harvester logging is used during implementation; it must occur after the soil has transitioned from moist to dry soil conditions. If this design criterion is not followed, the resulting effect will likely be similar to the skidder disturbance seen in Figure 4-1.

The elements of DSC are currently present in proposed units and will change in some areas by proposed activities. This change will take place mostly in association with the overlap of legacy trails and new temporary roads. Where this overlap occurs it is expected that there will an overall decrease in DSC for that segment of legacy trail.

Within the proposed planning area there are human created trails that measure approximately 152 miles of assumed trail. The highest densities of visible trails in the project area are within the Wheeler Point Salvage units. These trails have appeared to have inhibited vegetation growth and type of plants. To verify this change the Soil Disturbance Monitoring Protocol was adapted to evaluate the recognized changes (Page-Dumroese, 2009). While not many of these effects seem to have been reduced over time, there is one instance in Unit 14, where the soil restored itself; this example is explained in the cumulative analysis section of this alternative.

The inhibition on plant growth seems to be related to trees and brush (with Juniper and Lodge Pole Pine being less affected); grasses, herbs and forbs in general may also have been influenced, but no measureable change was identified in the soils report. Estimates of DSC (Table 4-2) are based on the 2013 Kahler field observations (Soils Report, Table 5); in those site visits; 98,200ft of trails were examined. Of the sites measured, 31% was considered to be in DSC, when using the criteria from Page-Dumroese, et al (2009).

⁶ Impacts were GPS located and later subsoiled to restore acceptable soil productivity to the entire unit

Therefore within the harvest units there is a total of 45 miles (65acres) of trail for a total of DSC (including system roads). Since only 31% of the evaluated impacts were deemed to be DSC; like alternative 1, we can assume 31% of the total DSC is a loss to the soil resource (13 miles or 20 acres). Of the legacy trails mapped in the project area, some measure of the road obliterated (units 3b, 4b, 18, 19, 22, 27, 31 and 60a), dependent upon activity use. Actual mileage of obliteration is dependent upon the amount of temporary road and legacy DSC overlap. In this alternative unit 2 will not have any legacy trail rehabilitation.

Further modeling of the proposed activities added the potential of lost EGC from wildfire and DSC for alternative 1. The same model inputs were used in WEPP the Wildfire Scenario used in Alternative 2, with the assumption that the proposed action would reduce the fire risk, so a Low Severity Fire was modeled (85% cover). In the modeling we see sediment input to streams similar to those created by the proposed activities (Table 4-2). This modeling indicates; after the project is implemented, the assumed effects of wildfire would not be as intense and thus produce unmeasurable effects from the proposal and its required mitigations.

Provided all mitigating factors are present when proposed activity occurs, the anticipated DSC for a given unit or the proposal (as a whole) does not exceed 20% DSC criteria (LRMP).

Table 4-3: Resource Indicators and Measures for Alternative 3

Resource Element	Resource Indicator	Measure	Existing DSC Effects (mi/ac) (Alt. 3)	Wildfire Influenced Effects on Existing DSC (mi/ac) (Alt. 3)
Soil Stability	Soil Mass Wasting	No active areas identified	0.0	0.0
Soil Productivity	Erosion	Activity unit acres modeled >0.03t/ac	0.0	0/0
Water Quality	Sediment	Activity units that may produce >0.03t/ac	0.0	0/0
Detrimental Soil Conditions (DSC)	Change or absence in vegetation growth	Legacy trails in project area ⁷	146/39	146/39
		Legacy trails in proposed Harvest Units ⁴	6/14-	6/14
		Legacy trails in current RHCA (class 2, 3, or 4 streams) ⁴	6/9	6/9
		Legacy trails in area influenced by wildfire (400ft from streams) ⁴	0/0	0/0

Cumulative Effects

Spatial and Temporal Context for Effects Analysis

Cumulative effects are not expected from Resource Indicator and Measure (RIM) 1 – Mass movement, (Table 4-2).

⁷ While the presence of some DSC is known to increase sediment, it is currently covered with adequate EGC to limit sediment above background levels.

Cumulative effects from RIM 2 – Erosion, are expected to be localized; unless influenced by a combination of wildfire and the erosion processes exposed to high winds. Winds can transport detached soil aloft and to a new location. This would prove to be a loss to soil productivity within a proposed unit, if this occurs it is unknown if some portion of this material would end up as sediment. The potential duration of expected erosion risk would be for at least 3 years immediately following wildfire (Elliott et al 2001 and Robichaud 2000). The volumes of erosion under this risk are also influenced by the intensity and duration of precipitation events that occur during elevated erosion risk.

Cumulative effects from RIM 3 – Sediment, are expected to be small with no elevation above assumed background levels (Harris, et.al. 2007) with the described mitigations and BMPs; unless like above influenced by wildfire. If wildfire takes place elevated. The potential duration of expected sediment risk would be for at least 3 years immediately following wildfire (Elliott et al 2001 and Robichaud 2000), assuming for a low severity wildfire and the reduced fuel loads.

Cumulative effects from RIM 4 – Detrimental Soil Conditions (DSC) that assumed to be created by equipment traffic seem to be long-lived (>40 years), with an exception in Kahler Unit 14. Soil development within Kahler has been mapped as having some measure of vertic soil properties; this feature was recognized in unit 14. Vertic soil properties seem to have erased the presence of equipment traffic. This was found by following the GPS location of mapped DSC, out of the area of vertic soils; where the rest of the DSC remained on the landscape. Thus it is assumed that the vertic properties (soil heave) overtime erased the legacy trail from the landscape (within the last 40 years). While this does show a restorative benefit to soils with vertic properties, it is not advisable to locate trails on these features. These soils also store a great deal of moisture from the clays that form these soils and locating equipment traffic through this soil may prove to have inputs to sediment sources; if these clays are suspended in puddles that sediment may have the opportunity to be routed to streams under high precipitation. Therefore units with soils described with vertic properties (units 7, 11b, 22, 23, 23a, and 28) should be evaluated during placement of any equipment traffic ways (Kahler design criteria).

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

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

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

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

Regulatory Framework

Land and Resource Management Plan

The Umatilla National Forest Land and Resource Management Plan (LRMP) provides standards and guidelines for all activities.

The Desired Future Condition in the 1990 Forest Plan (LRMP) for water/soil is to maintain soil productivity (Forest Plan p. 4-9). The plan further states that Standards and Guidelines are to

maintain a minimum of 80 percent of an activity area in a condition of acceptable productivity potential. Acceptable productivity is defined as:

- Less than 20% increase in bulk density of volcanic soil or a less than 15 percent increase in soil bulk density for other forest soils.
- Soil disturbance of less than 50 percent of the topsoil humus enriched A1 and or AC horizons from an area 100 sq. ft. (i.e. 5ft by 20ft)
 - Molding of the soil in vehicle tracks that area rutted to a depth less than 6 inches.
- Severely burned soil with the top layer of mineral soil altered in color (usually to red) and the next ½ inch blackened from organic matter charring.
- Plan and conduct land management activities so that soil loss from surface erosion and mass wasting, caused by activities will not result in an unacceptable reduction in soil productivity or water quality.
- Management activities shall be designed and implemented to retain sufficient ground vegetation and organic matter to maintain long-term soil and site productivity.
- Active slump and landslide area are considered unavailable for road construction. Areas with known landslide potential and lake sediments require special transportation planning and design, layout preconstruction, construction and maintenance techniques.

Federal Law

Multi-Use Sustainable Yield Act (1960)

The project with described mitigation and BMPs in place should be able to meet the intent and direction of the Sustained Yield Act. Sustained yield means achieving and maintaining into perpetuity a high-level annual or regular periodic output of renewable resources without impairment of the productivity of the land.

Clean Water Act

Minimizing the risk of sediment within the project and its design criteria was considered to help the Kahler Project meet the Clean Water Act.

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

For the proposed actions within this proposed project there are no activities expected to exceed DSC defined by the forest plan. The highest expected DSC will be in unit the ground based unit 21 (17% or 8.7 acres DSC). The lowest DSC will be 11% in a variety of units.

The project with described mitigation and BMPs in place should be able to meet the intent and direction of the LRMP as it pertains to the soil resource.

It is assumed that the project being able to meet LRMP and FSM will lead to a project that will be considered sustainable in the terms of the Sustained Yield Act.

Short-term Uses and Long-term Productivity

Related to temporary roads in general, provided they are placed on a soil depth where restoration is possible, temporary roads can truly be temporary on the landscape. Often it is assumed that these activities will never return to a previous impact condition. When the literature is examined in this respect we see that numerous authors find this not to be the case (Archuleta, 2007 and 2008, Heninger et al 2002, Luce 1997). Taking this information into account we can assume that the installation (or reconstruction), use then obliteration of temporary roads will be short lived and that the effects will not harm the long-term productivity of the soil resource.

Unavoidable Adverse Effects

Irreversible and Irretrievable Commitments of Resources

As it may apply to temporary roads placed on shallow soils, these effects may be irreversible depending upon the depth of impact, organic matter present in the soil and the depth of the soil itself. While these areas are of minimal importance to timber production, but have a multitude of other resource values. These impacts over time may be colonized by noxious weeds and other pioneer species suited to such undeveloped conditions; which may lead to other resource damage. Therefore these types of impacts are expected to minimize to reduce the occurrence of irreversible damage to the soil resource.

Summary

When we consider the presence of Mollisols (grass developed soils) within the proposed units, this suggests that the development of these stands were started under a grassed condition. This information should be important to all alternatives when considering the past conditions and the potentially droughty nature of the soils within these stands. Taking these factors into account it is not expected that the proposed activities will harm or alter the further development of these soils.

Soil stability will not be changed by this project in any alternative.

The no action alternative will leave more DSC on the landscape than any of the action alternatives. This assumption is based on the expectation of obliteration of temporary roads and landings. These impacts if uncovered by a wildfire like the Wheeler Point Fire, may serve as a conduit for erosion and sediment over a short period (≤ 3 years) to longer durations (14 years), depending upon the intensity of the wildfire (Robichaud, 2000).

Summary of Environmental Effects

The anticipated change in the soil resource will be minimal given the amount of restoration opportunities being left on the landscape in the form of legacy DSC (trails). Table 4-4 shows the change in DSC will range from the current estimate of 1582 acres to 1499 acres under alternative 3.

Table 4-4 Summary of Environmental Effects for the Kahler Project

Resource Element	Indicator/ Measure	Alt 1	Alt 2	Alt 3
Soil Stability	Soil Mass Wasting	No effect.	No effect	No effect
Soil Productivity	Erosion	Given the current EGC the expectation of erosion	Given the proposed EGC in this	Given the proposed EGC in this

Resource Element	Indicator/ Measure	Alt 1	Alt 2	Alt 3
		elevated above background. However if the loss of EGC were to occur existing DSC 400ft from streams may produce some erosion. It is conceivable that these DSC features could route to streams.	alternative there is no expectation of erosion elevated above background. This is also true with the occurrence of a wildfire after treatment	alternative there is no expectation of erosion elevated above background. This is also true with the occurrence of a wildfire after treatment
Water Quality	Sediment	Given the current EGC there is no expectation of sediment above background. However if the loss of EGC were to occur; existing DSC within 400ft of streams could offer a conduit sediment to streams above background levels	Given the proposed EGC in this alternative there is no expectation of sediment above background. This is true provided the buffer distances within RHCA are followed.	Given the proposed EGC in this alternative there is no expectation of sediment above background. This is true provided the buffer distances within RHCA are followed.
Existing DSC	Change in vegetation growth	With this alternative there is no opportunity to obliterate existing DSC. These areas will continue to have diminished soil both in and out RHCA. This will leave DSC over 1582 ac	With this alternative there is opportunity to obliterate existing DSC. This alternative will increase soil productivity both in and out RHCA. This will leave DSC over 1575 ac	With this alternative there is no opportunity to obliterate existing DSC. These areas will continue to be diminished both in and out RHCA. This will leave DSC over 1499 ac

Hydrology

Methodology

The Kahler Project area is the 32,840 acres which are under National Forest management and surround the proposed projects. Project area, unit sizes, road and stream lengths, past activities, etc. are derived from Geographic Information System (GIS) databases which are maintained by the Forest Service.

Analysis tool used to summarize past, present, and future conditions 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.

Short term refers to the 0 to 10 year time frame; long term refers to the 11 to 100 year time frame.

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. Reduced 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 reduce future forest density issues.

In addition, low severity fire may reduce conifer encroachment on streams and springs, thereby increasing the availability of 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 re-sprouting and growth, and quickly stabilizes the soil. Locally eroded soil may be deposited in channels and floodplains and provide hardwood habitat.

Detrimental effects of high severity fire include reductions in stream shade on a large enough scale to affect stream temperature, and exposure of sufficient soil so that eroded material

interferes with fish habitat. High severity fire interferes with the productivity of the soil, so vegetative regrowth is not optimal.

All of these processes would continue under this Alternative.

Sedimentation from road use would remain at the on-going levels under this alternative.

Cumulative Effects

Background Assumptions

- It is assumed that reductions of beavers at the end of the 19th century and their local scarcity has greatly reduced the habitat for riparian hardwoods in the Kahler Area. It is also assumed that as long as trapping is permitted, beavers are unlikely to achieve their potential population in the area.
- It is assumed that the composition of riparian shrub communities have been severely altered since the reports between the years 1826 and 1910 (McAllister, 2008).
- It is assumed that the sheep and cattle stocking rates, riparian grazing practices, and soil erosion described by Langille, 1903, reduced both the numbers of individual hardwoods and their diversity throughout the Project Area.
- It is assumed that livestock grazing before the 1980s, increased elk population, and extirpation of wolves contributed to the reduced numbers of individual hardwoods, their reduced diversity, and their altered community composition.
- It is assumed that these past impacts also contributed to recent 303 (d) listings for biological criteria, and dissolved oxygen. In addition biological criteria and dissolved oxygen levels may be affected by the groundwater contribution to base stream flows.

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

By far the largest recorded fire was the 1996 Wheeler Point Fire. Burn severity records are available for the 1996 Wheeler Point Fire (Table 4-5). It burned a total of 22,727 acres, including 6950 acres on the UNF. Of the 826 acres of riparian areas that burned, approximately 660 burned with high severity. All of the canopy was killed in these areas, and shade was reduced to near zero. The reduction in shade is very likely to have increased stream temperatures, and possibly affected biological criteria and dissolved oxygen. Temperature increases in flowing streams are likely to have contributed to higher temperatures downstream. The likely sedimentation increase was modeled at 3.9 tons per square mile (Table 4-5), a 71.5 percent increase over background sedimentation.

Table 4-5 1996 Wheeler Point Fire

Source	tons/mi ²	area mi ²	area tons
Wheeler Pt Fire ³	3.90	51.30	200.20
sum	3.90		200
WP Fire percent above background			71.5%

³WEPP Disturbed Model.

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

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

Table 4-6 Existing Condition Background Sedimentation rate in tons per square mile per year.

Alternative 1 Background Sedimentation			
Source	tons/mi ²	area mi ²	area tons
slope, banks ¹	5.35	51.30	274.46
ex. grav rds ²	0.0134	51.30	0.69
ex nat rds ²	0.0650	51.30	3.34
ex paved ²	0.0103	51.30	0.53
sum	5.44		280

Notes: ¹Harris and others, 2007. ²WEPP Road Model.

Action Alternatives

Design Features

See Hydrology Report for proposed measures for Kahler Project design and implementation. This table displays the design criteria used to form the analysis for the Hydrology section.

Direct and Indirect Effects

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

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

PACFISH

The rationale for treating in Class 4 RHCAs is that the vegetation in them most closely resembles the adjacent upland vegetation, i.e. “Dry Forest,” rather than the presumed potential “riparian” (i.e., water-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 1, 2, 5, 6, 7, and 8, and with Standard and Guideline TM-1b, “Apply silvicultural practices ... to acquire desired vegetation characteristics where needed to attain Riparian Management Objectives (RMOs). Apply silvicultural practices in a manner that does not retard attainment of RMOs and that avoids adverse effects on listed anadromous fish.”

Specific treatments were developed to move toward attainment of RMOs. The relevant RMOs are pool frequency, water temperature, large woody debris, and width/depth ratio. Pool frequency and width/depth ratio would directly benefit over the long term from Kahler's plan to fall NCT size wood directly into streams. Pool frequency and large woody material would indirectly benefit over the long term from Kahler's plan to prescribe burn in RHCAs, because a few large trees would be killed and fall into streams. Water temperature would directly benefit from NCT and commercial thinning in the short term by removing ladder fuels, thereby reducing the risk of crown fires. Water temperature may indirectly benefit in the long term from wood fallen into streams, because it would retain sediment, rebuild the floodplain, increase hardwood habitat, and improve aquifer capacity. Water temperature may indirectly benefit over the long term from CT and NCT reducing stand density in riparian areas, because more light would reach the forest floor, and possibly stimulate suppressed hardwood vegetation.

Specific design elements were developed in order to avoid retarding the attainment of RMOs. These are included in the Harvest System Soil and Water Prescriptions for Water Bodies, (8/6/2014, ECF), and described below. Design Criteria include the use of PACFISH RHCAs. All of the RHCAs are in place, but silvicultural treatments are proposed for some of them.

Sediment effects

Heavy equipment trails have the potential to impact ephemeral streams by introducing fine sediment. The fine sediment may be carried downstream during rainfall and runoff flows. The trails may also capture the ephemeral flows, and begin to function as Class 4 streams. Ephemeral streams are protected from these impacts by Design Criteria. WQ 5: Sites would be chosen to avoid, minimize or mitigate potential for erosion and sediment delivery to nearby waterbodies. WQ20: Do not use drainage bottoms as turn-around areas for equipment during mechanical vegetation treatments. WQ27: Design and locate skid trails and skidding operations to minimize soil disturbance to the extent practicable. WQ28: Equipment crossing ephemeral draws that do not classify as Class IV will be confined to designated crossings. There will be a minimum 100 foot spacing between designated stream crossings. Skidding up and down ephemeral streams would be prohibited. Debris would be placed into the crossings to reduce soil disturbance, compaction, and erosion. However, the debris must be removed before the unit is closed out. Trees within these swales may be cut unless there are defined channel banks. If there are defined banks, the trees that support the banks would not be cut. Cut trees may be removed by dragging or lifting out, as long as equipment does not skid up and down the stream. If crossing swales during runoff is anticipated, culverts, bridges, and/or rock/earth work would be used to stabilize and armor channel banks and bottoms and prevent erosion (See Hydrology Appendix A Prescriptions).

There would be log haul on approximately 26 miles of existing roads within RHCAs. Belt et al. (1992) infers that "sediment produced within the buffer strip would enter the stream more readily than sediment from source areas more distant from the stream channel." Erosion on these roads would be more likely to increase suspended sediment in streams than haul outside of RHCAs. The effects of these activities in riparian areas would be limited by the designs described above. They include Design Criteria WQ 8 and WQ 9, which stipulate installation of sediment control prior to ground disturbance and no activity during wet conditions. Because of these Design Criteria, it is not expected that the activities in RHCAs would cause measurable increases in sedimentation above the background levels.

Also, these Alternatives propose to use roads as shown in Chapter 2. 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 these recommendations are generally followed. She reports that placing aggregate at road approaches to streams would be considered on a case by case basis. However, stopping haul in wet weather would approximate the same effect.

During the life of this project, approximately 10 years, the preparation, use, closure, and decommissioning of the haul roads may expose soil and cause small scale, localized, increases in stream sediment, especially if there is precipitation before re-growth of ground cover. Sedimentation would be limited by the use of BMPs and Design Criteria, those stated above and the others in Chapter 2. 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 10 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. Culverts may be removed and drivable dips or water bars established. The sites would be expected to be fully stabilized within 12 to 24 months.

Mechanical and combustion fuel treatment projects proposed in the Alternatives are expected to reduce the risk that wildfire would cause measurable sedimentation in the area's streams. In addition to project design, the re-establishment of vegetation and the shedding of forest litter are expected to quickly reduce the risk of erosion of exposed soil from project activities (Elliott et al. 2000). Because of project design, re-establishment of vegetation, and forest litter, it is expected that if eroded soil from these activities reached any stream, the resulting sedimentation would cause no more than small, localized, short duration effects at the reach scale.

Generally, measurable effects to temperature, biological criteria, dissolved oxygen, and sedimentation at the subwatershed scale are unlikely.

Cumulative Effects

Past Management

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

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

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

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

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

Since 1981, approximately 10,926 acres in the Project Area have had some type of commercial harvest which affected the timber canopy. There has also been an insect outbreak which affected 632 acres, a fire that affected 6950 acres, and existing roads which affect 419 acres of canopy. The harvest included overstory removal, regeneration, salvage, and commercial thinning. The harvests before 1995 included trees in riparian areas. The ECA for Alternative 2 is approximately

20 percent. The combination of the decimation of beavers, livestock over-grazing in late 19th and early 20th centuries, declining livestock numbers coupled with increasing wildlife, fire suppression, and riparian timber harvest has resulted in the current riparian canopy which is predominantly conifers, and appears to be deficient in hardwoods. Also, several of the recently surveyed stream reaches are deficient in woody material.

Without beaver ponds and without optimal amounts of wood, sediment mobilized in the Kahler Project Area and the Kahler Watershed tends to leave the area, rather than being stored in ponds and behind log jams. In addition, channels are less stable, because of the lack of woody material functioning as roughness and flow resistance (Photo 3).

In the 1980s, concern about livestock grazing's impacts on fish habitat, including sedimentation, initiated changes in allotment management and the construction of range improvements in the Kahler Project Area. The 1990 Forest Plan relied on Best Management Practices to attain consistency with the Clean Water Act. In 1992, the Heppner Ranger District completed an Access and Travel Management Plan which closed approximately half of the roads on the District to the public. They may still be used by permit for management and administrative activities. The 1995 amendment to the Forest Plan called PACFISH (USDA, 1995) established stream buffers to protect fish habitat. Activities are only allowed in the buffers if they improve habitat. It was believed that without activities, passive restoration would occur, which would improve the habitat. In 2008, the Heppner Ranger District ended Off-road OHV use on the west end of the district, including in the Kahler Area. All of these actions have contributed to reducing long term stream sedimentation on the lands managed by the Forest Service in the Watershed.

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

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

Summary of Environmental Effects

The Forest Service portion of the Kahler Watershed contains approximately 168 miles of roads. The Kahler Project would use those existing roads and build 3.0 miles of temporary roads in upland locations on NFS land. Alternative 2 would use 1.2 miles of private road and Alternative 3 would use 1.6 miles of private road. The total road density is approximately 3.9 miles of roads per square mile of Watershed. This road density is greater than the 3.4 miles per square mile for the entire Umatilla NF (USDA, Final EIS, 1990). Approximately 109 miles would be used to haul logs.

Skid trails and a subset of new temporary roads would be assessed after project activities as candidates for subsoiling and advanced rehabilitation activities. None of the new temporary roads would be located in RHCAs, and there would be no new stream crossings. Alternative 2 would use 1.5 miles of existing temporary roads in RHCAs. Alternative 3 would use 0.5 miles of existing temporary roads in RHCAs. The addition of the new temporary roads would temporarily

increase the total road density slightly, but because of rounding, it would remain at 3.9 miles per square mile (see Roads Report). The road density would remain at 3.9 when rehabilitation is completed after the project.

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

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

Closing open roads does not necessarily affect the hydrologic impacts of roads. However, when closed roads are not used, they often develop a ground cover which may slow overland flow and reduce sediment which enters streams at road crossings. Rehabilitation activities accelerate this process. Advanced rehabilitation can also improve infiltration of water into the soil, and reduce constriction of streams. Establishing conifers and hardwoods maintains and increases soil porosity, which may eventually restore the pre-road capacity of the soil to hold water. When this occurs, the risk of erosion is greatly reduced.

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

Table 12 shows the assumed hill slope and stream bank sedimentation of 5.35 tons per square mile per year for the Kahler Project. The existing road system is currently used by the Forest Service for management needs, by the public for recreation, and by permitted users for their specified purposes. This low level of use is modeled to contribute an additional 0.09 tons per year per square mile to streams. Table 4-5 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 4-7 Action Alternatives Harvest Sedimentation in tons per square mile and tons per year

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

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

The harvest part of the Kahler Project, including log haul on gravel, native surface, and paved roads and commercial thinning, non-commercial thinning, and mechanical fuel treatments is modeled to increase sedimentation by approximately 0.24 tons per square mile per year (4.3 percent) over the first 5 years of the project (Table 4-7). This rate of sedimentation would end when harvesting activities ended.

Table 4-8 Action Alternatives Burning Sedimentation in tons per square mile and total tons per year

Alternatives 2 and 3 Prescribed Burning			
Source	tons/mi²	area mi²	area tons
landscape ³	0.2200	51.30	11.40
act fuel ³	0.0670	51.30	3.40
Sum	0.29		12
Alts 2 and 3 percent above background			4.3%

Notes: ³WEPP Disturbed Model.

Table 4-8 shows the Action Alternatives burning sedimentation in tons per square mile and total tons of sedimentation in the Kahler Area. This increase would be approximately 0.29 tons per square mile, or approximately 4.3 percent above background. It would begin after the harvest was complete, and occur during the second approximately 5 years of the project.

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

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

Ongoing Activities

Most of the Kahler Watershed has on-going grazing by domestic livestock during the summer months. Time sequenced riparian photo point monitoring has shown that bank stability has increased and sedimentation has decreased in the Little Wall Allotment (photos 1 and 2), approximately 6 miles east of Kahler.

Ponds and watering troughs have been constructed to benefit cattle, wildlife, and fire protection in the Kahler Project Area. Cattle use these ponds during the June through September season. Wildlife use them all year around. They are used for fire suppression as needed during fire season. Because of this use, there are rims of exposed soil around each pond and trough (Photo 6). Cattle and wildlife also make trails along fences, at salt sites, and to access water. These

trails are typically 1 foot wide. It is estimated that the cattle and wildlife related soil exposure equals approximately 14 acres in the analysis area. The amount of exposed soil caused by cattle and wildlife is not expected to change with the Kahler Project Action Alternatives. Also, it is not likely that the exposed soil measurably affects stream sedimentation, because many sites are located away from streams and a relatively small area is affected.

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

Small scale non-commercial thinning and fuels reduction projects are also on-going in the Kahler Project Area, with similar treatments and goals as this project.

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

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

Kahler, Tamarack, Alder, and Wheeler Creeks in the Project Area are used beneficially by anadromous fish.

Foreseeable Future Activities

There are no foreseeable future activities.

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. The wetlands are associated with streams and/or springs. There are a number of spring/wetland complexes in the Project Area, notably on the west forks and mainstem of Alder Creek, Wheeler Creek, Davis Creek, tributaries and main stem of Henry Creek, tributaries and main stem of Kahler Creek, tributaries and main stem of Tamarack Creek, Ives Creek, and tributaries and main stems of East and West Bologna Canyon. These complexes range from a few square feet to approximately 5 acres. The outer portions of the wetlands tend to dry up as summer progresses. The inner portions of the larger wetlands, and some of the smaller wetlands stay green all year. In a number of cases, the wetlands straddle stream channels, and water flows perennially for a few hundred feet below them. The wetlands are vegetated with sedges and grasses and are very productive of forage. In the late summer/early fall, the wetlands 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

See Hydrologist Report for water rights pertaining to the Kahler project.

Fisheries

Spatial Context for Effects Analysis

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

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

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

Temporal Context for Effects Analysis

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

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

Past Management

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

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

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

The decimation of beaver also reduced habitat for riparian hardwoods. Livestock grazing practices before 1916 resulted in the reduction of the numbers of individual riparian hardwoods

and their diversity. They also altered the composition of the riparian hardwood community. As head months of livestock have declined in the last 100 years, head months of wildlife have increased. The grazing by livestock and wildlife has been an important factor in the maintenance of low levels of riparian hardwoods.

Since 1981, approximately 10,926 acres in the Project Area have had some type of commercial harvest which affected the timber canopy. There has also been an insect outbreak which affected 632 acres, a fire that affected 6950 acres, and existing roads which affect 419 acres of canopy. The harvest included overstory removal, regeneration, salvage, and commercial thinning. The harvests before 1995 included trees in riparian areas. The ECA for Alternative 2 is approximately 20 percent. The combination of the decimation of beavers, livestock over-grazing in late 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.

Alternative 1 – No Action

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

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

Considering this and cumulative effects, there is the possibility that the riparian vegetation and stream habitat response to no timber management or prescribed fire would be measurable 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.

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 1,100 acres (20 percent) have burned out of approximately 5,700 acres of riparian areas since 1944.

By far the largest recorded fire was the 1996 Wheeler Point Fire. 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 4-9), a 71.5 percent increase over background sedimentation.

Table 4-9. 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 4-10). No other existing sediment sources are believed to be relevant. The background sediment yield figures would remain the same under this alternative.

Table 4-10. Existing Condition Background Sedimentation Rate in Tons/Mi² 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: ¹Harris and others, 2007. ²WEPP 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

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

Alternative 3 – modified Proposed Action

Impacts for Alternative 3 will be the same as Alternative 2.

Summary of Effects

Below, in Table 4-11, 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 4-11 Summary of Effects by Alternative

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

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

Forest Vegetation

This section discloses the environmental consequences of implementing the silvicultural activities proposed for each of the alternatives. Subsections discriminate between: (1) direct effects, which are caused by an activity (action) and occur at the same time and place; (2) indirect effects, which are caused by an activity (action) and are later in time or farther removed in distance than direct effects, but are still reasonably foreseeable; and (3) cumulative effects, which result from the incremental impact of an activity (action) when added to other past, present, and reasonably foreseeable future actions.

Alternative 1 – No Action

By definition, direct and indirect effects (40 CFR 1508.8), and cumulative effects (40 CFR 1508.7) result from the proposed action, and thus are not germane to the No Action alternative. However, the No Action alternative allows previously approved (on-going) activities to proceed, but none of the silvicultural activities included in the Kahler proposed action would be implemented under alternative 1.

Because alternative 1 does not include any silvicultural activities, it is not expected to result in direct or indirect effects on species composition, forest structure, and stand density. Since there are no direct or indirect effects of implementing this alternative on the forest vegetation indicators, there are also no cumulative effects associated with alternative 1.

The concept of this alternative is that ongoing disturbance and succession processes influencing vegetation conditions in the Kahler planning area would continue without human interference. If the needs described earlier in this report (see the Introduction section, page 1) could be addressed by alternative 1 – a questionable assumption – it would occur as a result of vegetation changes induced by natural ecosystem processes, not as a result of implementing silvicultural activities specifically directed at modifying composition, structure, and density in the Kahler planning area.

Therefore, this section estimates the forest vegetation conditions that will develop on the affected environment from not implementing the proposed action. Just like for the action alternatives, analysis of the No Action alternative is based on an examination of species composition, forest structure, and stand density. The analysis presented in this section is possible because, as described in the Effects Analysis section, FVS modeling was used to examine vegetation development relationships in the absence of future vegetation treatments.

Species Composition (Forest Cover Types)

Table 4-11 shows the estimated impact of No Action on species composition (forest cover type) in 2065. The scale context for table 4-11 is the same ‘footprint’ area as the Kahler proposed action (app. 12,220 acres). Table 4-11 addresses this question: what would happen to species composition in 50 years if the Kahler proposed action is not implemented in 2015?

Table 4-11 shows that without implementing the silvicultural activities included in the Kahler PA, we can expect the following species composition outcomes in the next 50 years:

- (1) Douglas-fir almost doubles in area.
- (2) Grand fir more than doubles in area.
- (3) Some shrub-steppe nonforest environments with high value to native ungulates transition to a lower-value (for wildlife) western juniper woodland type.
- (4) Ponderosa pine, a keystone plant species on dry-forest biophysical environments, is reduced by more than two-thirds in area.
- (5) The small amounts of quaking aspen and western larch currently found in the proposed-action footprint area will disappear entirely, causing a reduction in vegetation biodiversity.

Table 4-12: Estimated impact of not implementing the proposed action on species composition

Forest Cover Type	No Action (2012)		No Action (2065)	
	Acres	Percent	Acres	Percent
Douglas-fir	3,960	32	7,780	64
Engelmann spruce	40	< 1	40	< 1
Grand fir	720	6	1,930	16
Nonforest	130	1	0	0
Ponderosa pine	7,120	58	2,100	17
Quaking aspen	10	< 1	0	0
Western juniper	230	2	360	3
Western larch	10	< 1	0	0
Total	12,220	30	12,210	100

Notes: Summarized from the Kahler vegetation database, but only for the portion of the affected environment applicable to the proposed action (alternative 2). This analysis reflects the estimated results of not implementing vegetation activities on the footprint area of the Kahler proposed action (app. 12,220 acres of the Kahler affected environment). Acreages totals shown are not the same due to rounding.

Table 4-12 shows the estimated impact, in 2065, of No Action on species composition (forest cover type) for the Kahler forest vegetation affected environment (AE). Table 4-12 addresses this question: if the Kahler proposed action is not implemented in 2015, and considering natural succession for areas outside of the Kahler proposed action footprint, what would happen to species composition for the forest vegetation affected environment by 2065?

Table 4-12 shows that without implementing the silvicultural activities included in the Kahler PA, we can expect the following species composition outcomes for the Kahler forest vegetation affected environment by 2065:

- (1) Douglas-fir more than doubles in area.
- (2) Grand fir more than doubles in area.
- (3) Some shrub-steppe nonforest environments with high value to native ungulates transition to a lower-value (for wildlife) western juniper woodland type.
- (4) Ponderosa pine, a keystone plant species on dry-forest biophysical environments, is reduced in area by about 60 percent.
- (5) The small amounts of quaking aspen and western larch currently found in the affected environment will disappear entirely, causing a reduction in vegetation biodiversity.

Table 4-13: Estimated impact of not implementing the proposed action on the affected environment's species composition

Forest Cover Type	No Action (2012)		No Action (2065)	
	Acres	Percent	Acres	Percent
Douglas-fir	7,760	25	15,730	51
Engelmann spruce	60	< 1	60	< 1
Grand fir	1,440	5	3,520	11
Lodgepole pine	10	< 1	0	0
Nonforest	3,840	12	3,710	12
Ponderosa pine	17,220	55	7,230	23
Quaking aspen	20	< 1	0	0
Western juniper	740	2	870	3
Western larch	30	< 1	0	0
Total	31,120	100	31,120	100

Notes: Summarized from the Kahler vegetation database for the entire affected environment (approximately 31,120 acres; see table 6), and reflecting the estimated results of not implementing vegetation activities associated with the proposed action on approximately 12,220 acres of the Kahler affected environment.

This forest vegetation analysis is informed by an analytical technique referred to as the Historical Range of Variation (HRV) (see Historical Range of Variation Analytical Technique section on pages 19-20 in the Forest Vegetation Report). HRV is used to examine the consequences of not implementing the proposed action on species composition.

Table 4-14, which shows the results of an HRV analysis for species composition as it is estimated to exist in 2065, suggests that without implementing silvicultural activities included in the Kahler PA, 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.

Table 4-14 discloses vegetation trends to be expected from No Action – early-seral species composition (the ponderosa pine and western larch cover types on dry-forest sites) are replaced with late-seral cover types (Douglas-fir and grand fir) because thinning and prescribed fire are not being used to periodically adjust composition. Since it is assumed that wildfire continues to be suppressed for the No Action alternative, then this keystone ecosystem process is also not available to function as a natural adjustment agent.

Table 4-14: HRV analysis for forest cover types of the Kahler forest vegetation affected environment

Forest Cover Type	DRY UPLAND FOREST PVG			
	Historical Range		No Action (2065)	
	Percent	Acres	Percent	Acres
Douglas-fir	5-20	1,350-5,400	58	15,720
Grand fir	1-10	270-2,700	12	3,280
Lodgepole pine	0	0	0	0

Forest Cover Type	DRY UPLAND FOREST PVG			
	Historical Range		No Action (2065)	
	Percent	Acres	Percent	Acres
Ponderosa pine	50-80	13,500-21,600	27	7,230
Subalpine fir and spruce	0	0	0	0
Western juniper	0-5	0-1,350	3	740
Western larch	1-10	270-2,700	0	0
Western white pine	0-5	0-1,350	0	0
Whitebark pine	0	0	0	0
Total			100	26,970

Notes: Existing amounts are taken from the Kahler vegetation database. Gray shading indicates cover types that are either above or below the historical range of variation. Historical ranges were taken from Martin (2010). Lodgepole pine, subalpine fir and spruce, and whitebark pine have zeroes for historical ranges because they would not be expected to occur on the dry upland forest biophysical environment. This analysis includes unsuitable NFS lands included in the Kahler proposed action (see table 6, footnote 2); it does not include Dry UF acreage located outside of the affected environment but within the Kahler planning area, or Moist UF PVG or nonforest acreage.

Forest Structure (Forest Structural Stages)

Table 4-14 shows the estimated impact of No Action on forest structure (forest structural stage) in 2065. The scale context for table 4-14 is the same ‘footprint’ area as the Kahler proposed action (app. 12,220 acres). Table 4-14 addresses this question: what would happen to forest structure in 50 years if the Kahler proposed action is not implemented in 2015?

Table 4-14 shows that without implementing the silvicultural activities included in the Kahler PA, we can expect the following forest structure outcomes by 2065:

- (1) Old forest multi-strata almost triples in area.
- (2) Old forest single stratum disappears from the proposed action footprint area.
- (3) Stem exclusion declines to less than 20% of its current abundance.
- (4) Stand initiation disappears from the proposed action footprint area.
- (5) Understory reinitiation increases by almost 50% in area.

Table 4-15: Estimated impact of not implementing the proposed action on forest structure

Forest Structural Stage	No Action (2012)		No Action (2065)	
	Acres	Percent	Acres	Percent
SI: Stand Initiation	160	1	0	0
SE: Stem Exclusion	4,510	37	830	7
UR: Understory Reinitiation	4,900	40	7,080	58
OFSS: Old Forest Single Stratum	1,090	9	0	0
OFMS: Old Forest Multi-Strata	1,430	12	4,180	34
Nonforest	130	1	130	1
Total	12,220	100	12,220	100

Notes: Summarized from the Kahler vegetation database, but only for the portion of the affected environment applicable to the proposed action (alternative 2). This analysis reflects the estimated results of not implementing vegetation activities associated with the proposed action on approximately 12,220 acres of the Kahler affected environment.

Table 4-15 shows the estimated impact, in 2065, of No Action on forest structure (forest structural stages) for the Kahler forest vegetation AE. Table 4-15 addresses this question: if the Kahler proposed action is not implemented in 2015, and considering natural succession for areas outside of the Kahler proposed action footprint, what would happen to forest structure for the forest vegetation affected environment by 2065?

Table 4-15 shows that without implementing the silvicultural activities included in the Kahler PA, we can expect the following forest structure outcomes for the Kahler forest vegetation affected environment by 2065:

- (1) Old forest multi-strata almost triples in area.
- (2) Old forest single stratum disappears from the affected environment area.
- (3) Stem exclusion declines by more than 50%.
- (4) Stand initiation declines by about 35%.
- (5) Understory reinitiation increases by about 40%.

Table 4-16: Estimated impact of not implementing the proposed action on the affected environment’s forest structure

Forest Structural Stage	No Action (2012)		No Action (2065)	
	Acres	Percent	Acres	Percent
SI: Stand Initiation	5,140	17	3,360	11
SE: Stem Exclusion	9,330	30	4,360	14
UR: Understory Reinitiation	8,690	28	12,210	39
OFSS: Old Forest Single Stratum	1,550	5	0	0
OFMS: Old Forest Multi-Strata	2,580	8	7,360	24
Nonforest	3,840	12	3,840	12
Total	31,130	100	31,130	100

Notes: Summarized from the Kahler vegetation database for the entire affected environment (approximately 31,120 acres; see table 6), and reflecting the estimated results of not implementing vegetation activities associated with the proposed action on approximately 12,220 acres of the Kahler affected environment.

This forest vegetation analysis is informed by an analytical technique referred to as the Historical Range of Variation (HRV) (see Historical Range of Variation Analytical Technique section on pages 19-20 in the Forest Vegetation report). HRV is used to examine the consequences of not implementing the proposed action on forest structure.

Table 4-16, which shows the results of an HRV analysis for forest structure as it is estimated to exist in 2065, suggests that without implementing silvicultural 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.

Table 4-16 discloses vegetation trends that are not unexpected from a No Action scenario – late-seral, multi-cohort (multi-layer) stand conditions (as represented by the OFMS and UR forest structural stages) are replacing the historically dominant early-seral, single-cohort (single-layer) forest structures (the OFSS, SE, and SI stages). Transitions from early-seral structures to late-seral structures are associated with the No Action alternative because thinning and prescribed fire is 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.

Table 4-17: HRV analysis for forest structural stages of the Kahler forest vegetation affected environment

Forest Structural Stage	DRY UPLAND FOREST PVG			
	Historical Range		No Action (2065)	
	Percent	Acres	Percent	Acres
SI: Stand Initiation	15-25	4,050-6,750	12	3,360
SE: Stem Exclusion	10-20	2,700-5,400	16	4,360
UR: Understory Reinitiation	5-10	1,350-2,700	45	12,040
OFSS: Old Forest Single Stratum	40-60	10,800-16,200	0	0
OFMS: Old Forest Multi-Strata	5-15	1,350-4,050	27	7,230
Total			100	26,990

Stand Density (Stand Density Classes)

Table 4-18 shows the estimated impact of No Action on stand density (stand density classes) in 2065. The scale context for table 4-18 is the same ‘footprint’ area as the Kahler proposed action (app. 12,220 acres). Table 4-18 addresses this question: what would happen to stand density in 50 years if the Kahler proposed action is not implemented in 2015?

Table 4-18 shows that without implementing the silvicultural activities included in the Kahler PA, we can expect the following stand density outcomes by 2065:

- (1) Low stand density declines to less than 1% of the proposed action footprint area.
- (2) Moderate stand density declines to about 25% of its original area.
- (3) High stand density increases by slightly more than 40%.

Table 4-18: Estimated impact of not implementing the proposed action on stand density

Stand Density Class	No Action (2012)		No Action (2065)	
	Acres	Percent	Acres	Percent
Low	1,800	15	30	< 1
Moderate	2,150	18	520	4
High	8,140	67	11,540	94
Nonforest	130	1	130	1
Total	12,220	101	12,220	99

Notes: Summarized from the Kahler vegetation database, but only for the portion of the affected environment applicable to the proposed action (alternative 2). This analysis reflects the estimated results of not implementing vegetation activities associated with the proposed action on approximately 12,220 acres of the Kahler affected environment.

Table 4-19 shows the estimated impact, in 2065, of No Action on stand density (stand density classes) for the Kahler forest vegetation AE. Table 4-19 addresses this question: if the Kahler proposed action is not implemented in 2015, and considering natural succession for areas outside of the Kahler proposed action footprint, what would happen to stand density for the forest vegetation affected environment by 2065?

Table 4-19 shows that without implementing the silvicultural activities included in the Kahler PA, we can expect the following stand density outcomes for the Kahler forest vegetation affected environment by 2065:

- (1) Both the low and moderate stand density classes decline to less than 40% of their original area.
- (2) High stand density increases by more than 70% during the 50-year period.

Table 4-19: Estimated impact of not implementing the proposed action on the affected environment’s stand density

Stand Density Class	No Action (2012)		No Action (2065)	
	Acres	Percent	Acres	Percent
Low	10,190	33	3,950	13
Moderate	4,540	15	1,700	5
High	12,550	40	21,630	70
Nonforest	3,840	12	3,840	12
Total	31,120	100	31,120	100

Notes: Summarized from the Kahler vegetation database for the entire affected environment (approximately 31,120 acres; see table 6), and reflecting the estimated results of not implementing vegetation activities associated with the proposed action on approximately 12,220 acres of the Kahler affected environment.

This forest vegetation analysis is informed by an analytical technique referred to as the Historical Range of Variation (HRV) (see Historical Range of Variation Analytical Technique section on pages 19-20 of the Forest Vegetation report). HRV is used to examine the consequences of not implementing the proposed action on stand density.

Table 4-20 presents the results of an HRV analysis for stand density as it exists in 2065; it suggests that without implementing silvicultural 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.

Table 4-20 discloses vegetation trends to be expected from No Action – 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.

Table 4-20: HRV analysis for stand density classes of the Kahler forest vegetation affected environment

Stand Density Class	DRY UPLAND FOREST PVG			
	Historical Range		No Action (2065)	
	Percent	Acres	Percent	Acres
Low	40-85	10,800-22,950	15	3,950
Moderate	15-30	4,050-8,100	6	1,700
High	5-15	1,350-4,050	79	21,330
Total			100	26,980

Cumulative Effects

Past actions, including timber harvest (fig. 8), tree planting, and noncommercial thinning, helped create existing conditions in the planning area. Present (ongoing) actions, which includes noncommercial thinning and prescribed fire activities authorized by categorical exclusions in 2009 and 2010 (Figure 15 of the Forest Vegetation Report), will reduce stand density, modify forest structure, and shift species composition in the areas being treated, but recent funding levels suggest that very little actual noncommercial thinning will occur (perhaps no more than 100-200 acres per year in the Kahler planning area), which reflects our budget allocation experience between 2010 and 2012 (fig. 15 in the Forest Vegetation report).

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 SOPA.

Because alternative 1 does not include any silvicultural activities, it is not expected to result in direct or indirect effects species composition, forest structure, and stand density. Since there are no direct or indirect effects of implementing this alternative on the forest vegetation indicators, 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, not from implementing any of the proposed activities (actions). Since vegetation change will relate primarily to the timing, magnitude, duration, and intensity of future disturbance events, along with limited change caused by present (ongoing) actions, and because consideration of unpredictable natural change is speculative and beyond the scope of this analysis, no attempt was made to estimate the future effects of disturbance.

If none of the proposed silvicultural activities included in the proposed action will be implemented to move existing conditions closer to desired conditions, then forest vegetation within the planning area will remain overly dense (Table 4-20) and continue to be dominated by mid- and late-seral stages of species composition (particularly the Douglas-fir forest cover type) (Table 4-14). Old forest (late-old) structure on dry-forest sites will continue to be marginal or deficient because proposed activities will not be used to reduce the stem exclusion and understory reinitiation structural stages, and thereby increase the future representation of old forest single stratum structural stage, which is substantially deficient at this time (Table 25 of the Forest Vegetation Report, page 51).

The estimated cumulative effects of alternative 1 are considered to be negative when compared with the estimated cumulative effects for either alternative 2 or 3.

Alternative 2 – Proposed Action

Direct and Indirect Effects for Alternative 2

Direct effects are assumed to occur only on the portion of the forest vegetation affected environment included in alternative 2 (comprising app. 12,220 acres; see table 6).

Three indicators are used to present pretreatment and post-treatment trends for vegetation conditions: forest cover types, forest structural stages, and stand density classes. Direct effects on cover types, structural stages, and density classes are a consequence of implementing the forest vegetation management activities described in table 1 of this report.

Indirect effects consider the impact of direct effects on the larger forest vegetation affected environment in which they occur – direct effects resulting from implementing alternative 2 (app. 12,220 acres) are applied to the entire affected environment (app. 31,120 acres) to estimate indirect effects. Three indicators are used to analyze pre-treatment and post-treatment trends for indirect effects: species composition (forest cover types), forest structural stages, and stand density classes.

Species Composition (Forest Cover Types)

Species composition, as represented by forest cover types, is expected to change in response to implementation of silvicultural activities proposed for alternative 2 (see the post-implementation column in table 29). Most of the forest cover types affected by implementation of alternative 2 are late-seral (grand fir and Douglas-fir on upland-forest sites; western juniper on shrub-steppe environments), and they are reduced as a direct effect of implementation; the primary early-seral cover type (ponderosa pine) is increased as a consequence of implementing this alternative.

The post-implementation changes in forest cover types (2015) are viewed as beneficial because they directly support the Kahler project’s purpose and need (e.g., “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”).

By 2065, the near-term implementation effects of alternative 2 are not maintained – Douglas-fir and grand fir both increase when compared with their 2015 levels, while ponderosa pine is decreased from its 2015 (post-implementation) level.

Table 4-21: Direct effects for species composition for alternative 2 (proposed action)

Forest Cover Type	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Douglas-fir	3,960	32	580	5	2,120	17
Engelmann spruce	40	< 1	40	< 1	40	< 1
Grand fir	720	6	150	1	330	3
Nonforest	130	1	130	1	130	1
Ponderosa pine	7,120	58	11,290	92	9,570	78
Quaking aspen	10	< 1	10	< 1	10	< 1
Western juniper	230	2	0	0	0	0
Western larch	10	< 1	10	< 1	10	< 1

Forest Cover Type	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Total	12,220	30	12,210	100	12,210	100

Notes: Summarized from the Kahler vegetation database, but only for the portion of the affected environment to be modified by alternative 2 – approximately 12,220 acres. Acreages totals shown are not the same due to rounding.

Table 4-22 shows that the direct effects of implementing alternative 2 has an obvious, near-term influence on species composition when the effects are expressed for the entire forest vegetation affected environment (AE). As a result of implementing alternative 2, the representation of three cover types is reduced from pre-treatment levels (Douglas-fir, grand fir, and western juniper). The representation of ponderosa pine increases for the affected environment – it transitions from 55% of the affected environment (pre-treatment) to 69% of the affected environment (post-treatment).

By 2065, the near-term beneficial implementation effects of alternative 2 on the forest vegetation affected environment are not maintained. Douglas-fir and grand fir both rebound to an extent where their 2065 acreage exceeds what it was in 2012. Ponderosa pine is also reduced to levels below its 2012 baseline level.

The 2065 outcome is based on two factors:

- (1) natural succession continues to cause substantial vegetation change on the portion of the affected environment not affected by implementation of alternative 2, and
- (2) the acres treated by alternative 2 cannot be sustained in their post-treatment (2015) condition without follow-up thinning treatments during the 50-year period.

Note that future thinning treatments are not assumed for this analysis as they might be considered speculative; prescribed fire may occur during this 50-year timeframe (Marshall 2014), however, and it would be partially effective at preventing a return to pre-implementation conditions.

Table 4-22: Indirect effects for species composition for alternative 2 (proposed action)

Forest Cover Type	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Douglas-fir	7,760	25	4,380	14	10,070	32
Engelmann spruce	60	< 1	60	< 1	60	< 1
Grand fir	1,440	5	880	3	1,910	6
Lodgepole pine	10	< 1	10	< 1	0	0
Nonforest	3,840	12	3,840	12	3,840	12
Ponderosa pine	17,220	55	21,390	69	14,700	47
Quaking aspen	20	< 1	20	< 1	10	< 1

Forest Cover Type	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Western juniper	740	2	510	2	510	2
Western larch	30	< 1	30	< 1	10	< 1
Total	31,120	100	31,120	100	31,110	100

Notes: Summarized from the Kahler vegetation database for the entire affected environment (approximately 31,120 acres; see table 6), and reflecting the direct effects of implementing alternative 2 on approximately 12,220 acres of the Kahler affected environment. Acreages totals shown are not the same due to rounding.

This forest vegetation analysis is informed by an analytical technique referred to as the Historical Range of Variation (HRV) (see Historical Range of Variation Analytical Technique section on pages 19-20 in the Forest Vegetation report). HRV is used to examine the consequences of implementing the proposed action on species composition.

Table 4-23 presents results of an HRV analysis for species composition as it exists in 2015 (post-implementation) and 2065 (reflecting 50 years of vegetation development without any future retreatment of the 2012 acreage); it suggests that alternative 2 was extremely effective at addressing the Kahler purpose and need with respect to species composition – immediately after treatment (2015), all of the forest cover types were within their ranges of variation except for western larch, which was slightly below the lower limit of its range.

By 2065, Table 4-23 shows that 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.

Table 4-23: HRV analysis for forest cover types of the Kahler forest vegetation affected environment

Forest Cover Type	DRY UPLAND FOREST POTENTIAL VEGETATION GROUP					
	Historical Range		Post-Treatment (2015)		Post-Treatment (2065)	
	Percent	Acres	Percent	Acres	Percent	Acres
Douglas-fir	5-20	1,350-5,400	16	4,310	37	9,990
Grand fir	1-10	270-2,700	3	790	7	1,790
Lodgepole pine	0	0	0	0	0	0
Ponderosa pine	50-80	13,500-21,600	79	21,370	54	14,690
Subalpine fir and spruce	0	0	0	0	0	0
Western juniper	0-5	0-1,350	2	510	2	510
Western larch	1-10	270-2,700	0	0	0	0
Western white pine	0-5	0-1,350	0	0	0	0
Whitebark pine	0	0	0	0	0	0
Total			100	26,980	100	26,980

Notes: Existing amounts are taken from the Kahler vegetation database. Gray shading indicates cover types that are either above or below the historical range of variation. Historical ranges were taken from Martin (2010). Lodgepole pine, subalpine fir and spruce, and whitebark pine have zeroes for historical ranges because they would not be expected to occur on the dry upland forest

biophysical environment. This analysis includes unsuitable NFS lands proposed for vegetation treatment (see table 6, footnote 2). This analysis does not include quaking aspen because no historical range was provided for it in Martin (2010); it also does not include Dry UF acreage located outside of the affected environment but within the Kahler planning area, or Moist UF PVG or nonforest acreage.

Forest Structure (Forest Structural Stages)

Forest structure, as represented by using forest structural stages, is expected to change in response to implementation of silvicultural activities proposed for alternative 2 (see the post-implementation column in Table 4-24).

The 2015 (post-implementation) information in Table 4-24 shows two primary changes resulting from implementation of alternative 2: (1) old forest multi-strata (OFMS) stands receive understory thinning treatments to transform them immediately to the old forest single stratum (OFSS) stage (400 acres of treatment); and (2) understory reinitiation (UR) stands are thinned to remove ladder fuels and increase residual tree growth and vigor – this treatment transitions UR stands to the stem exclusion (SE) stage.

The post-implementation changes in forest structure (2015) are viewed as beneficial because they directly support the Kahler project’s purpose and need (e.g., “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”).

Why was a transition from UR to SE an objective of the silvicultural activities proposed for alternative 2? The answer relates to application of prescribed fire, and its role in establishing and maintaining the OFSS structural stage.

Prescribed fire (underburning) emulates a keystone disturbance process for dry-forest sites – low-severity, high-frequency surface fire occurring on a cycle of 5-20 years. By thinning UR stands, the lower cohort (layer) of trees is removed, and this lower cohort functions as ladder fuel. Without removing ladder fuel first, it is difficult or impossible to safely implement prescribed fire on these sites. After the ladder fuel has been removed, the proper structural stage assignment for these stands is SE.

The SE structure in this scenario functions as an intermediate stage on a successional trajectory culminating in stable and persistent OFSS (but only if it is maintained with frequent underburning). Overstory trees in an SE stand are too small to be considered for old forest, but they are large enough to be fire resistant. After thinning transforms UR to open SE, then prescribed fire can safely be applied (every 10-20 years) to reduce surface fuels, cycle nutrients, and manage future ingrowth of late-seral species, particularly Douglas-fir and grand fir. In other words, thinning creates a post-implementation structural configuration (SE and OFSS) compatible with the project’s purpose and need, but prescribed fire is crucial for maintaining these structures through time.

The ultimate result of this treatment regimen, and its resulting structural progression, is illustrated well in Table 4-24 – by 2065, 86% of the Kahler proposed action acreage supports the OFSS structural stage, and the SE stage has all but disappeared by then (because most of it transitioned to OFSS).

Table 4-24: Direct effects for forest structure for alternative 2 (proposed action)

Forest Structural Stage	Pre-Implementation	Post-Implementation	Post-Implementation
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	(2012)		(2015)		(2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
SI: Stand Initiation	160	1	160	1	0	0
SE: Stem Exclusion	4,510	37	7,470	61	160	1
UR: Understory Reinitiation	4,900	40	1,940	16	0	0
OFSS: Old Forest Single Stratum	1,090	9	1,490	12	10,550	86
OFMS: Old Forest Multi-Strata	1,430	12	1,030	8	1,380	11
Nonforest	130	1	130	1	130	1
Total	12,220	100	12,220	99	12,220	99

Notes: Summarized from the Kahler vegetation database, but only for the portion of the affected environment to be modified by alternative 2 – approximately 12,220 acres.

Table 4-25 shows that direct effects of implementing alternative 2 influenced the Kahler affected environment (AE) in 2015 in a similar way as for the Kahler proposed action acreage – the old forest structural stages (OFMS and OFSS) changed by equivalent amounts, the UR stage declines, and the SE stage increases.

By 2065, the near-term beneficial implementation effects of alternative 2 (reflecting the 2015 information in Table 4-25) on the forest vegetation affected environment are maintained or actually improved:

- (1) both of the old forest stages increase;
- (2) stem exclusion declines to a moderate proportion of the affected environment acreage;
- (3) stand initiation (SI) decreases somewhat, reflecting slow but ongoing recovery of the Wheeler Point fire area;
- (4) and understory reinitiation is maintained at moderate levels. These findings reflect the overall structural stage situation for the Kahler affected environment– HRV results (Table 4-26) demonstrate whether the 2015 and 2065 structural stage results are ecologically appropriate.

Table 4-25: Indirect effects for forest structure for alternative 2 (proposed action)

Forest Structural Stage	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
SI: Stand Initiation	5,140	17	5,130	16	3,360	11
SE: Stem Exclusion	9,330	30	12,840	41	3,690	12
UR: Understory Reinitiation	8,690	28	5,180	17	5,120	16
OFSS: Old Forest Single Stratum	1,550	5	1,950	6	10,550	34
OFMS: Old Forest Multi-Strata	2,580	8	2,180	7	4,570	15
Nonforest	3,840	12	3,840	12	3,840	12
Total	31,130	100	31,120	99	31,130	100

Notes: Summarized from the Kahler vegetation database for the entire affected environment (approximately 31,120 acres; see table 6), and reflecting the direct effects of implementing alternative 2 on approximately 12,220 acres of the Kahler affected environment. Acreages totals shown are not the same due to rounding.

This forest vegetation analysis is informed by an analytical technique referred to as the Historical Range of Variation (HRV) (see Historical Range of Variation Analytical Technique section on pages 19-20 in the Forest Vegetation report). HRV is used to examine the consequences of implementing the proposed action on forest structure.

Table 4-26 presents 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 acreage, other than periodic underburning); it 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. But as described above, 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 – see table 12) and OFSS (which is dramatically under-represented for Kahler – see table 12).

By 2065, Table 4-26 suggests that the structural stage distribution is worse than it was in 2015 (because more of the 2065 boxes have gray shading than is true for the 2015 boxes). 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%).

Table 4-26: HRV analysis for forest structural stages of the Kahler forest vegetation affected environment

Forest Structural Stage	DRY UPLAND FOREST POTENTIAL VEGETATION GROUP					
	Historical Range		Post-Treatment (2015)		Post-Treatment (2065)	
	Percent	Acres	Percent	Acres	Percent	Acres
SI: Stand Initiation	15-25	4,050-6,750	19	5,130	12	3,360
SE: Stem Exclusion	10-20	2,700-5,400	48	12,850	14	3,690
UR: Understory Reinitiation	5-10	1,350-2,700	19	5,090	18	4,990
OFSS: Old Forest Single Stratum	40-60	10,800-16,200	7	1,950	39	10,510
OFMS: Old Forest Multi-Strata	5-15	1,350-4,050	7	1,960	16	4,440
Total			100	26,980	99	26,990

Notes: Existing amounts are taken from the Kahler vegetation database. Gray shading indicates cover types that are either above or below the historical range of variation. Historical ranges were taken from Martin (2010). This analysis includes unsuitable NFS lands included in the Kahler proposed action (see table 6, footnote 2). This analysis does not include Dry UF acreage located outside of the affected environment but within the Kahler planning area, or Moist UF PVG or nonforest acreage. Acreages totals shown are not the same due to rounding.

Stand Density (Density Classes)

Stand density, as represented by using stand density classes, is expected to change in response to implementation of silvicultural activities proposed for alternative 2 (see the post-implementation column in Table 4-27). Inspection of Table 4-27 quickly shows that the alternative 2 silvicultural

activities are expected to transform all of the moderate and high density class to the low density class.

The post-implementation changes in stand density classes (2015) are viewed as beneficial because they directly support the Kahler project’s purpose and need (e.g., “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”).

By 2065, the near-term (2015) implementation effects of alternative 2 are not maintained – without follow-up thinning treatments during the intervening 50 years, most of the low density class is expected to transition to the moderate density class.

Note that follow-up thinning treatments were not assumed for this analysis as they might be considered speculative; prescribed fire may occur during this 50-year timeframe (Marshall 2014), however, and it would be partially effective at preventing a wholesale transition from low density to moderate density.

Table 4-27: Direct effects for stand density for alternative 2 (proposed action)

Stand Density Class	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Low	1,800	15	12,090	99	300	2
Moderate	2,150	18	0	0	11,790	96
High	8,140	67	0	0	0	0
Nonforest	130	1	130	1	130	1
Total	12,220	101	12,220	100	12,220	99

Notes: Summarized from the Kahler vegetation database, but only for the portion of the affected environment to be modified by alternative 2 – approximately 12,220 acres.

Table 4-29 shows that the direct effects of implementing alternative 2 have a similar influence on the affected environment (AE) in 2015 as they did on the proposed action acreage – the low density class doubled, while the moderate and high density classes declined dramatically.

By 2065, the near-term beneficial implementation effects of alternative 2 (reflecting the 2015 information in Table 4-29) on the Kahler affected environment are not maintained, as evidenced by the fact that low density declines to a point where it is substantially less than either the moderate or high density classes.

Table 4-28: Indirect effects for stand density for alternative 2 (proposed action)

Stand Density Class	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Low	10,190	33	20,480	66	4,220	14
Moderate	4,540	15	2,400	8	12,970	42
High	12,550	40	4,410	14	10,090	32
Nonforest	3,840	12	3,840	12	3,840	12

Stand Density Class	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Total	31,120	100	31,130	100	31,120	100

Notes: Summarized from the Kahler vegetation database for the entire affected environment (approximately 31,120 acres; see table 6), and reflecting the direct effects of implementing alternative 2 on approximately 12,220 acres of the Kahler affected environment. Acreages totals shown are not the same due to rounding.

This forest vegetation analysis is informed by an analytical technique referred to as the Historical Range of Variation (HRV) (see Historical Range of Variation Analytical Technique section on pages 19-20 in the Forest Vegetation report). HRV is used to examine the consequences of implementing the proposed action on stand density.

Table 4-30 presents 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); it suggests 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 the historical ranges shown in Table 4-30, is well within its range of variation (and this is certainly a positive outcome of implementing alternative 2), whereas the moderate and high density classes are both outside of their historical ranges (but high is above its range by just 1%).

By 2065, Table 4-30 suggests that 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.

Note that follow-up thinning treatments were not assumed for this analysis as they might be considered speculative; prescribed fire may occur during this 50-year timeframe (Marshall 2014), however, and it would be partially effective at preventing a progression from low density back to moderate or high density conditions.

Table 4-29: HRV analysis for stand density classes of the Kahler forest vegetation affected environment

Stand Density Class	DRY UPLAND FOREST POTENTIAL VEGETATION GROUP					
	Historical Range		Post-Treatment (2015)		Post-Treatment (2065)	
	Percent	Acres	Percent	Acres	Percent	Acres
Low	40-85	10,800-22,950	75	20,320	16	4,220
Moderate	15-30	4,050-8,100	9	2,380	48	12,820
High	5-15	1,350-4,050	16	4,280	37	9,940
Total			100	26,980	101	26,980

Notes: Existing amounts are taken from the Kahler vegetation database. Gray shading indicates cover types that are either above or below the historical range of variation. Historical ranges were taken from Martin (2010). This analysis includes unsuitable NFS lands included in the Kahler proposed action (see table 6, footnote 2). This analysis does not include Dry UF acreage located outside of the affected environment but within the Kahler planning area, or Moist UF PVG or nonforest acreage.

Project Design Features and Mitigation Measures

Project design features pertaining to silvicultural activities and upland-forest treatments are provided in a separate Kahler environmental assessment document containing design elements for all resource areas. The silviculture design features are contained in a section called 'Vegetation'.

Cumulative Effects

Past actions, including timber harvest (fig. 8 in the Forest Vegetation report), tree planting, and noncommercial thinning, helped create existing conditions in the planning area. Silvicultural 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 include noncommercial thinning and prescribed fire activities authorized by categorical exclusions (CE) in 2009; some of the CE-authorized noncommercial thinning occurred in the Kahler planning area between 2010 and 2012 (Figure 15 of the Forest Vegetation Report). 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 SOPA.

When considering direct and indirect effects of the project's proposed silvicultural activities on species composition ((Table 4-26)), forest structure (Table 4-29), and stand density (Table 37 of the Forest Vegetation Report, page 61), 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 silvicultural activities).

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

Alternative 3

Direct effects are assumed to occur only on the portion of the forest vegetation affected environment included in alternative 3 (comprising app. 11,540 acres; see table 6).

Three indicators are used to present pretreatment and post-treatment trends for vegetation conditions: forest cover types, forest structural stages, and stand density classes. Direct effects on cover types, structural stages, and density classes are a consequence of implementing the five activities described earlier in this section: upland-forest commercial thinning, upland-forest noncommercial thinning, reforestation, juniper thinning and shrub-steppe enhancement, and aspen restoration (Table 1 of the Forest Vegetation Report, page 2).

Indirect effects consider the impact of direct effects on the larger forest vegetation affected environment in which they occur – the direct effects of implementing alternative 2 (app. 11,540 acres) are applied to the entire affected environment (app. 31,120 acres) to estimate indirect effects. The same three indicators are used to examine pre-treatment and post-treatment trends for analysis of indirect effects: species composition (forest cover types), forest structural stages, and stand density classes.

Species Composition (Forest Cover Types)

Species composition, as represented by forest cover types, is expected to change in response to implementation of silvicultural activities proposed for alternative 3 (see the post-implementation column in Table 4-31). Most of the forest cover types affected by implementation of alternative 3 are late-seral (grand fir and Douglas-fir on upland-forest sites; western juniper on shrub-steppe environments), and they are reduced as a direct effect of implementation; the primary early-seral cover type (ponderosa pine) is increased as a consequence of implementing this alternative.

The post-implementation changes in forest cover types (2015) are viewed as beneficial because they directly support the Kahler project’s purpose and need (e.g., “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”). Composition changes associated with alternative 3, however, are not as effective at addressing the purpose and need as composition changes associated with alternative 2.

By 2065, the near-term implementation effects of alternative 3 are not fully maintained – Douglas-fir and grand fir are still reduced in comparison to their pre-implementation situation (2012), but they have rebounded from their post-implementation (2015) situation. The same situation occurs for ponderosa pine – its 2065 level exceeds the 2012 amount, but is less than the 2015 acreage. Most other forest cover types are stable, exhibiting neither increases nor decreases.

Table 4-30: Direct effects for species composition for alternative 3

Forest Cover Type	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Douglas-fir	3,660	32	520	5	1,940	17
Engelmann spruce	40	< 1	40	< 1	40	< 1
Grand fir	630	5	150	1	330	3
Nonforest	130	1	130	1	130	1
Ponderosa pine	6,840	59	10,670	93	9,070	79
Quaking aspen	10	< 1	10	< 1	10	< 1
Western juniper	210	2	0	0	0	0

Forest Cover Type	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Western larch	10	< 1	10	< 1	10	< 1
Total	11,530	99	11,530	100	11,530	100

Notes: Summarized from the Kahler vegetation database, but only for the portion of the affected environment to be modified by alternative 2 – approximately 11,540 acres. Differences in percentages are due to rounding.

Table 4-31 shows that the direct effects of implementing alternative 3 has an obvious, near-term influence on species composition when the effects are expressed for the entire forest vegetation affected environment (AE). As a result of implementing alternative 3, the representation of three forest cover types is reduced from pre-treatment levels (Douglas-fir, grand fir, and western juniper). The representation of ponderosa pine increases substantially for the affected environment – it transitions from 55% of the affected environment (pre-treatment) to 69% of the affected environment (post-treatment).

By 2065, the near-term beneficial implementation effects of alternative 3 on the forest vegetation affected environment are not maintained. Douglas-fir and grand fir both rebound to an extent where their 2065 acreage exceeds what it was in 2012. Ponderosa pine, lodgepole pine, quaking aspen, and western larch are also reduced to levels below their 2012 baseline acreage.

The 2065 outcome reflects two situations:

- (1) natural succession continues to cause substantial vegetation change on the portion of the affected environment not affected by implementation of alternative 3, and
- (2) the acres treated by alternative 3 cannot be sustained in their post-treatment (2015) condition without follow-up thinning treatments during the 50-year period.

Note that future thinning treatments are not assumed for this analysis as they might be considered speculative; prescribed fire may occur during this 50-year timeframe (Marshall 2014), however, and it would be partially effective at preventing a return to pre-implementation conditions.

Table 4-31: Indirect effects for species composition for alternative 3

Forest Cover Type	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Douglas-fir	7,760	25	4,620	14	10,240	33
Engelmann spruce	60	< 1	60	< 1	60	< 1
Grand fir	1,440	5	960	3	2,080	7
Lodgepole pine	10	< 1	10	< 1	0	0
Nonforest	3,840	12	3,840	12	3,840	12
Ponderosa pine	17,220	55	21,040	69	14,360	46
Quaking aspen	20	< 1	20	< 1	10	< 1
Western juniper	740	2	530	2	530	2

Forest Cover Type	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Western larch	30	< 1	30	< 1	10	< 1
Total	31,120	100	31,110	100	31,130	100

Notes: Summarized from the Kahler vegetation database for the entire affected environment (approximately 31,120 acres; see table 6), and reflecting the direct effects of implementing alternative 3 on approximately 11,540 acres of the Kahler affected environment. Acreages totals shown are not the same due to rounding.

This forest vegetation analysis is informed by an analytical technique referred to as the Historical Range of Variation (HRV) (see Historical Range of Variation Analytical Technique section on pages 19-20 in the Forest Vegetation report). HRV is used to examine the consequences of implementing the proposed action on species composition.

Table 4-33 presents results of an HRV analysis for species composition as it exists in 2015 (post-implementation) and 2065 (reflecting 50 years of vegetation development without any future retreatment of the 2012 acreage, other than periodic underburning); it suggests that alternative 3 was extremely effective at addressing the Kahler purpose and need with respect to species composition – immediately after treatment (2015), all of the forest cover types were within their ranges of variation except for western larch, which was slightly below the lower limit of its range.

By 2065, Table 4-33 shows that 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.

Table 4-32: HRV analysis for forest cover types of the Kahler forest vegetation affected environment

Forest Cover Type	DRY UPLAND FOREST POTENTIAL VEGETATION GROUP					
	Historical Range		Post-Treatment (2015)		Post-Treatment (2065)	
	Percent	Acres	Percent	Acres	Percent	Acres
Douglas-fir	5-20	1,350-5,400	17	4,570	38	10,180
Grand fir	1-10	270-2,700	3	850	7	1,930
Lodgepole pine	0	0	0	0	0	0
Ponderosa pine	50-80	13,500-21,600	78	21,030	53	14,350
Subalpine fir and spruce	0	0	0	0	0	0
Western juniper	0-5	0-1,350	2	530	2	530
Western larch	1-10	270-2,700	0	0	0	0
Western white pine	0-5	0-1,350	0	0	0	0
Whitebark pine	0	0	0	0	0	0
Total			100	26,980	100	26,990

Notes: Existing amounts are taken from the Kahler vegetation database. Gray shading indicates cover types that are either above or below the historical range of variation. Historical ranges were taken from Martin (2010). Lodgepole pine, subalpine fir and spruce, and whitebark pine have zeroes for historical ranges because they would not be expected to occur on the dry upland forest

biophysical environment. This analysis includes unsuitable NFS lands included in the Kahler proposed action (see table 6, footnote 2). This analysis does not include quaking aspen because no historical range was provided for it in Martin (2010). It also does not include Dry UF acreage located outside of the affected environment but within the Kahler planning area, or Moist UF PVG or nonforest acreage. Acreages totals shown are not the same due to rounding.

Forest Structure (Forest Structural Stages)

Forest structure, as represented by using forest structural stages, is expected to change in response to implementation of silvicultural activities proposed for alternative 3 (see the post-implementation column in Table 4-34).

The 2015 (post-implementation) information in Table 4-34 shows two primary changes resulting from implementation of alternative 3:

- (1) old forest multi-strata (OFMS) stands received understory thinning treatments to transform them immediately to the old forest single stratum (OFSS) stage (400 acres of treatment);
- (2) and understory reinitiation (UR) stands were thinned to remove ladder fuels and increase residual tree growth and vigor – this change transitioned UR stands to the stem exclusion (SE) stage.

The post-implementation changes in forest structure (2015) are viewed as beneficial because they directly support the Kahler project's purpose and need (e.g., “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”).

Why was a transition from UR to SE an objective of the silvicultural activities proposed for alternative 3? The answer relates to application of prescribed fire, and its role in establishing and maintaining the OFSS structural stage.

Prescribed fire (underburning) emulates a keystone disturbance process of dry-forest sites – occurrence of low-severity, high-frequency surface fire on a cycle of 5-20 years. By thinning UR stands, the lower cohort (layer) of trees is removed, and this lower cohort functions as ladder fuel. Without removing ladder fuel first, it is difficult or impossible to safely implement prescribed fire on these sites. After the ladder fuel has been removed, the proper structural stage assignment for these stands is SE.

The SE structure in this scenario functions as an intermediate stage on a successional trajectory culminating in stable and persistent OFSS (if it is maintained with frequent underburning). Overstory trees in an SE stand are too small to be considered for old forest, but they are large enough to be fire resistant. After thinning transforms UR to open SE, then prescribed fire can safely be applied (every 10-20 years) to reduce surface fuels, cycle nutrients, and manage future ingrowth of late-seral species, particularly Douglas-fir and grand fir for dry forests of Kahler planning area. In other words, thinning creates a post-implementation structural configuration (OFSS or SE) compatible with the purpose and need, but prescribed fire is crucial for maintaining these structures through time.

The ultimate result of this treatment regimen, and its resulting structural progression, is illustrated well in Table 4-34 – by 2065, 87% of the Kahler proposed action acreage supports the OFSS structural stage, and the SE stage has all but disappeared by then (because most of it transitioned to OFSS).

Table 4-33: Direct effects for forest structure for alternative 3

Forest Structural Stage	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
SI: Stand Initiation	150	1	150	1	0	0
SE: Stem Exclusion	4,280	37	7,050	61	150	1
UR: Understory Reinitiation	4,670	40	1,900	16	0	0
OFSS: Old Forest Single Stratum	970	8	1,370	12	10,000	87
OFMS: Old Forest Multi-Strata	1,340	12	940	8	1,250	11
Nonforest	130	1	130	1	130	1
Total	11,540	99	11,540	99	11,530	100

Notes: Summarized from the Kahler vegetation database, but only for the portion of the affected environment to be modified by alternative 2 – approximately 11,540 acres. Acreages totals shown are not the same due to rounding.

Table 4-35 shows that direct effects of implementing alternative 3 influenced the Kahler affected environment in 2015 in a similar way as for the Kahler proposed action acreage – the old forest structural stages (OFMS and OFSS) changed by equivalent amounts, the UR stage declines, and the SE stage increases.

By 2065, near-term beneficial effects of alternative 3 (reflecting the 2015 information in Table 4-35) on the forest vegetation affected environment are maintained or actually improved: (1) both of the old forest stages increase; (2) stem exclusion declines to a moderate proportion of the affected environment acreage; (3) stand initiation (SI) decreases somewhat, reflecting slow but ongoing recovery of the Wheeler Point fire area; and (4) understory reinitiation is maintained at moderate levels. These findings reflect the overall structural stage situation for the Kahler affected environment – HRV results (Table 4-35) demonstrate whether the 2015 and 2065 structural stage conditions are ecologically appropriate.

Table 4-34: Indirect effects for forest structure for alternative 3

Forest Structural Stage	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
SI: Stand Initiation	5,140	17	5,130	16	3,360	11
SE: Stem Exclusion	9,330	30	12,660	41	3,700	12
UR: Understory Reinitiation	8,690	28	5,360	17	5,490	18
OFSS: Old Forest Single Stratum	1,550	5	1,950	6	10,000	32
OFMS: Old Forest Multi-Strata	2,580	8	2,180	7	4,730	15
Nonforest	3,840	12	3,840	12	3,840	12
Total	31,130	100	31,120	99	31,120	100

Notes: Summarized from the Kahler vegetation database for the entire affected environment (approximately 31,120 acres; see table 6), and reflecting the direct effects of implementing alternative 2 on approximately 11,540 acres of the Kahler affected environment. Acreages totals shown are not the same due to rounding.

This forest vegetation analysis is informed by an analytical technique referred to as the Historical Range of Variation (HRV) (see Historical Range of Variation Analytical Technique section on page 12). HRV is used to examine the consequences of implementing the proposed action on forest structure.

Table 4-36 presents 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 acreage, other than periodic underburning); it suggests 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. But as described above, 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 – see table 12) and OFSS (which is dramatically under-represented for Kahler – see table 12).

By 2065, Table 4-36 suggests that the structural stage distribution is worse than it was in 2015 (because more of the 2065 boxes have gray shading than is true for the 2015 boxes). 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%).

Table 4-35: HRV analysis for forest structural stages of the Kahler forest vegetation affected environment

Forest Structural Stage	DRY UPLAND FOREST POTENTIAL VEGETATION GROUP					
	Historical Range		Post-Treatment (2015)		Post-Treatment (2065)	
	Percent	Acres	Percent	Acres	Percent	Acres
SI: Stand Initiation	15-25	4,050-6,750	19	5,130	12	3,360
SE: Stem Exclusion	10-20	2,700-5,400	47	12,660	14	3,700
UR: Understory Reinitiation	5-10	1,350-2,700	20	5,280	20	5,350
OFSS: Old Forest Single Stratum	40-60	10,800-16,200	7	1,950	37	9,970
OFMS: Old Forest Multi-Strata	5-15	1,350-4,050	7	1,960	17	4,600
Total			100	26,980	100	26,980

Notes: Existing amounts are taken from the Kahler vegetation database. Gray shading indicates cover types that are either above or below the historical range of variation. Historical ranges were taken from Martin (2010). Lodgepole pine, subalpine fir and spruce, and whitebark pine have zeroes for historical ranges because they would not be expected to occur on the dry upland forest biophysical environment. This analysis includes unsuitable NFS lands included in the Kahler proposed action (see table 6, footnote 2). This analysis does not include Dry UF acreage located outside of the affected environment but within the Kahler planning area, or Moist UF PVG or nonforest acreage.

Stand Density (Density Classes)

Stand density, as represented by using stand density classes, is expected to change in response to implementation of silvicultural activities proposed for alternative 3 (see the post-implementation column in Table 4-37). Inspection of Table 4-37 quickly shows that the alternative 3 silvicultural

activities are expected to transform all of the moderate and high density class to the low density class.

The post-implementation changes in stand density classes (2015) are viewed as beneficial because they directly support the Kahler project’s purpose and need (e.g., “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”).

By 2065, near-term (2015) implementation effects of alternative 3 are not maintained – without follow-up thinning treatments during the intervening 50 years, most of the low density class is expected to transition to the moderate density class.

Note that follow-up thinning treatments were not assumed for this analysis as they might be considered speculative; prescribed fire may occur during this 50-year timeframe (Marshall 2014), however, and it would be partially effective at preventing a wholesale transition from low density to moderate density.

Table 4-36: Direct effects for stand density for alternative 3

Stand Density Class	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Low	1,650	14	11,410	99	270	2
Moderate	2,120	18	0	0	11,140	97
High	7,640	66	0	0	0	0
Nonforest	130	1	130	1	130	1
Total	11,540	99	11,540	100	11,540	100

Notes: Summarized from the Kahler vegetation database, but only for the portion of the affected environment to be modified by alternative 3 – approximately 11,540 acres. Percentages do not add up to 100 percent due to rounding.

Table 4-38 shows that direct effects of implementing alternative 3 have a similar influence on the affected environment (AE) in 2015 as they did on the proposed action acreage – the low density class almost doubled, while the moderate and high density classes decline dramatically.

By 2065, near-term beneficial effects of alternative 3 (reflecting the 2015 information in Table 4-38) on the Kahler affected environment are not maintained – low density declines to a point where it is substantially less than either the moderate or high density classes (and the amount of low density in 2065 is substantially less than the 2012 baseline condition).

Table 4-37: Indirect effects for stand density for alternative 3

Stand Density Class	Pre-Implementation (2012)		Post-Implementation (2015)		Post-Implementation (2065)	
	Acres	Percent	Acres	Percent	Acres	Percent
Low	10,190	33	19,950	64	4,220	14
Moderate	4,540	15	2,430	8	12,320	40
High	12,550	40	4,900	16	10,750	35
Nonforest	3,840	12	3,840	12	3,840	12

Total	31,120	100	31,120	100	31,130	101
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Notes: Summarized from the Kahler vegetation database for the entire affected environment (approximately 31,120 acres; see table 6), and reflecting the direct effects of implementing alternative 3 on approximately 11,540 acres of the Kahler affected environment. Acreages totals shown are not the same due to rounding.

This forest vegetation analysis is informed by an analytical technique referred to as the Historical Range of Variation (HRV) (see Historical Range of Variation Analytical Technique section on page 12). HRV is used to examine the consequences of implementing the proposed action on stand density.

Table 4-39 presents 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); it 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 shown in Table 4-39, is well within its range of variation (and this is certainly a positive outcome of implementing alternative 3), whereas the moderate and high density classes are both outside of their historical ranges (but high is above its range by just 3%).

By 2065, Table 4-39 suggests that 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.

Note that follow-up thinning treatments were not assumed for this analysis as they might be considered speculative; prescribed fire may occur during this 50-year timeframe (Marshall 2014), however, and it would be partially effective at preventing a progression from low density back to moderate or high density conditions.

Table 4-38: HRV analysis for stand density classes of the Kahler forest vegetation affected environment

Stand Density Class	DRY UPLAND FOREST POTENTIAL VEGETATION GROUP					
	Historical Range		Post-Treatment (2015)		Post-Treatment (2065)	
	Percent	Acres	Percent	Acres	Percent	Acres
Low	40-85	10,790-22,930	73	19,820	16	4,220
Moderate	15-30	4,050-8,090	9	2,410	45	12,190
High	5-15	1,350-4,050	18	4,750	39	10,570
Total			100	26,980	100	26,980

Notes: Existing amounts are taken from the Kahler vegetation database. Gray shading indicates cover types that are either above or below the historical range of variation. Historical ranges were taken from Martin (2010). This analysis includes unsuitable NFS lands included in the Kahler proposed action (see table 6, footnote 2). This analysis does not include Dry UF acreage located outside of the affected environment but within the Kahler planning area, or Moist UF PVG or nonforest acreage.

Project Design Features and Mitigation Measures

Project design features pertaining to silvicultural activities and upland-forest treatments are provided in a separate Kahler environmental assessment document containing design elements for all resource areas. The silviculture design features are contained in a section called ‘Vegetation’.

Cumulative Effects

Past actions, including timber harvest (Figure 8 of the Forest Vegetation Report), tree planting, and noncommercial thinning, helped create existing conditions in the planning area. Silvicultural 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 include noncommercial thinning and prescribed fire activities authorized by categorical exclusions (CE) in 2009 and 2010; some of the CE-authorized noncommercial thinning occurred in the Kahler planning area between 2010 and 2012 (fig. 15). 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 SOPA.

When considering direct and indirect effects of alternative 3’s silvicultural activities on species composition, forest structure, and stand density, 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 3 are considered to be mostly positive (because present/ongoing actions also utilize design criteria similar to those for alternative 3’s silvicultural activities).

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

Regulatory Framework

Land and Resource Management Plan

The Umatilla National Forest Land and Resource Management Plan (LRMP) provides standards and guidelines for forest vegetation. Management direction pertaining to forest vegetation, including desired conditions for individual Forest Plan management areas occurring in the

Kahler planning area, are provided in a Management Direction section presented earlier in this report.

Consistency of Proposed Silvicultural Activities with the National Forest Management Act of 1976 (NFMA)

The National Forest Management Act (NFMA; Public Law 94-588; 16 U.S.C. 1600) requires specific findings to be made and documented when considering the implementation of certain management practices. The following is documentation of specific NFMA compliance findings for proposed silvicultural activities in the Kahler planning area. Based on analyses described in this report, and on proposed silvicultural prescriptions for the Kahler project, the following findings pursuant to NFMA are made.

Fuels

Alternative 1 – No Action

Direct and Indirect Effects

Because Alternative 1 does not include any silvicultural or fuels activities, it is not expected to result in direct or indirect effects on HRV as it pertains to species composition, forest structure, and stand density. Nor is it expected to result in direct or indirect effects on FRCC, fuel loading, and fire behavior. No harvest or prescribed fire activities would occur under the direction of this environmental analysis. Fire suppression would continue as it has increasing the amount of fire return intervals missed.

Historical Range and Variability

Species composition

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

Forest Structure

HRV analysis for forest structure as it is estimated to exist in 2065, suggests that without implementing silviculture and fuel reduction activities included in the Kahler proposed action, we can expect the old forest multi-strata and understory reinitiation structural stages to be substantially over-represented on dry-forest sites, old forest single stratum to be substantially under-represented on dry-forest sites, and stand initiation to be slightly under-represented on dry-forest sites. In the absence of treatment (no action), only the stem exclusion structural stage is estimated to occur within its historical range in 2065. In addition, late-seral, multi-cohort

(multi-layer) stand conditions (as represented by the old forest multi-strata (OFMS) and understory reinitiation (UR) forest structural stages) are replacing the historically dominant early-seral, single-cohort (single-layer) forest structures (the old forest single stratum (OFSS), stem exclusion (SE), and stand initiation (SI) stages). Transitions from early-seral structures to late-seral structures are associated with the No Action alternative because thinning and prescribed fire are not being used to periodically interrupt this natural successional progression. Since an assumption is that wildfire continues to be suppressed for the No Action alternative, then a keystone ecosystem process referred to as short-interval surface fire is not available to function as a natural thinning agent. (Powell, Forest Vegetation Report, 2014)

Stand Density

Results of an HRV analysis for stand density as it exists in 2065 suggests that without implementing silvicultural and fuel reduction activities in the Kahler proposed action on dry-forest sites, we can expect the low and moderate stand density classes to be substantially under-represented, and high stand density to be substantially over-represented. In the absence of treatment (no action), none of the stand density classes are estimated to occur within their historical ranges in 2065. Relatively open stand conditions (low and moderate stand density classes) are replaced with dense stand conditions because thinning and prescribed fire are not being used to periodically reduce density. Since an assumption is that wildfire continues to be suppressed for the No Action alternative, then a keystone ecosystem process referred to as short-interval surface fire is not available to function as a natural thinning agent. (Powell, Forest Vegetation Report, 2014)

Fire Regime Condition Class

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

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

Fuel Loading

Without fire, horizontal and vertical fuel loads would continue to increase. Table 4-40 displays the change in fuel models from 2015 to 2065. By 2065, the more open pine and Douglas fir stands with grass understory would transition to denser, closed canopy stands with increased down woody material (FM 9 and 10). The fuel load for Fuel Model 10 exceeds the Forest standard of 9 tons/acre for most management areas (12 tons/acre in Dedicated Old Growth). The loss of open grassy, shrub areas occurs due to ingrowth in Fuel Model 1; the area transitions to a Fuel Model 2 by 2065.

Table 4-39. No Action Alternative: Fuel Models years 2015, 2021, and 2065

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

Fire Behavior

Due to continued increases in stand density and changes in stand composition toward fire intolerant species, fire intensity levels would remain outside their historic norms. Forested environments would accumulate more dead and down material. Stand density would continue to be high. The area would continue to have a risk of crowning, spotting, and torching. See tables 4-41 and 4-42 for a comparison between flame lengths and fire type for the years 2015 to 2065.

Table 4-40. Predicted flame lengths for the No Action Alternative (years 2015, 2021, and 2065).

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

Table 4-41. Predicted fire type for the No Action Alternative (years 2015, 2021, and 2065)

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

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

Cumulative Effects

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

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

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

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

Alternative 2 – Proposed Action

Design Features and Mitigation Measures

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

Direct and Indirect Effects

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

In addition, this alternative proposes 31,019 acres of low intensity prescribed fire to be accomplished in increments of a few hundred to a few thousand acres 5 to 10 years post thinning treatments. Prescribed fire is anticipated to directly effect 50 to 70% of the proposed landscape burn acres in Kahler (approximately 21,700 acres burned). It is recommended that maintenance

burning be implemented every 10-15 years following treatment. Table 4-43 summarizes the proposed activities for all alternatives.

Table 4-42. Proposed silviculture and fuels activities for No Action, Alternative 2, and Alternative 3

Proposed Activity	No Action Alternative	Alternative 2 (Acres)	Alternative 3 (Acres)
Upland forest commercial thinning	0	9,435	8,629
Noncommercial thinning outside of harvest units	0	638	638
Noncommercial thinning in harvest units	0	4,718*	4,315*
Juniper thinning and shrub/steppe enhancement	0	1,426	1,426
Juniper noncommercial thinning	0	0	153
Shrub/steppe noncommercial thinning	0	38	38
Dry forest Riparian Treatment (Class 4 Buffers)	0	682*	657*
Aspen restoration	0	10*	10*
Reforestation in VDT gaps	0	1,000*	920*
Reforestation in Wheeler Point fire	0	5,000	5,000
Mechanical Line (miles)	0	6.1	6.1
Handline (miles)	0	2.0	2.0
Activity fuels treatment (mechanical)	0	1,770*	1,678*
Activity fuels treatment (burning)	0	6,605*	6,040*
Landscape underburning	0	31,019	31,019

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

Tamarack Lookout and Rental Cabin

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

Historical Range and Variability

Composition

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

Forest structure

HRV analysis for forest structure as it exists in 2015 (post-implementation) and 2065 (reflecting 50 years of vegetation development without any future retreatment of the 2012 acre-age, other than periodic underburning) suggests that alternative 2 is only moderately effective at addressing the Kahler purpose and need for forest structure –immediately after treatment (2015), the OFSS structural stage is under-represented, whereas the SE and UR stages are both over-represented. This result is expected because the predicted increase in SE is only a stepping stone between UR (which is substantially over-represented as a Kahler existing condition) and OFSS (which is dramatically under-represented for Kahler). By 2065, the structural stage distribution is worse than it was in 2015. This conclusion is somewhat misleading, however, because close inspection of the 2065 results shows that the OFMS stage is just slightly above HRV (by only 1%), and that the OFSS stage is just slightly below HRV (by only 1%). (Powell, Forest Vegetation Report, 2014)

Stand Density

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

Fire Regime Condition Class

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

Fuel Loading

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

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

Table 4-43. Caparison table of Fuel Models for No Action and Alternative 2 (years 2015, 2021, and 2065)

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

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

Fire Behavior

When looking at the direct effects from the thinning treatments and prescribed fire (year 2015 to 2021), the Kahler area is very likely to experience flame lengths greater than 4 feet in height; however, the risk of passive crown fire in both moderate and severe conditions is significantly decreased by 2021. In comparison to the No Action alternative, the proposed treatment decreases the likelihood of a passive crown fire by 4,816 acres in 2021. Over the long-term (2065) flame lengths are decreased under severe conditions across 13% of the landscape (approximately 4,270 acres). That results in an improvement in predicted fire behavior of 4,405 acres when compared to the No Action alternative. The likelihood of passive crown fire is reduced, as well. The combination of thinning and prescribed fire is shown to effectively reduce surface fuels, increase the height to live crown ratio, and decrease crown density.

Table 4-44. Comparison table for flame lengths under No Action and Alternative 2 (years 2015, 2021, and 2065)

No Action (% of Area)	Flame Length					
	Moderate 2015		Moderate 2021		Moderate 2065	
	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
	67	33	66	34	79	21
No Action (% of Area)	Severe 2015		Severe 2021		Severe 2065	
	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft

	24	76	30	70	60	40
Alternative 2 (% of Area)	Flame Length					
	Moderate 2015		Moderate 2021		Moderate 2065	
	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
	68	32	71	29	83	17
	Severe 2015		Severe 2021		Severe 2065	
	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 4-45. Comparison table for fire type under No Action and Alternative 2 (years 2015, 2021, and 2065)

No Action (% of Area)	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	
	Surface	Passive	Surface	Passive	Surface	Passive
	48	52	52	48	85	15
Alternative 2 (% of Area)	Fire Type					
	Moderate 2015		Moderate 2021		Moderate 2065	
	Surface	Passive	Surface	Passive	Surface	Passive
	56	44	85	15	88	12*
	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 noncommercial thinning, helped create existing conditions in the planning area. Proposed activities associated with alternative 2 are designed to address the project’s purpose and need by helping to move species composition, forest structure, and stand density back within their historical ranges of variability. Moving these ecosystem components back within their historical ranges is expected to improve forest health, vegetation vigor, and ecosystem resilience to fire, insects, and disease.

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

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

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

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

Alternative 3

Design Features and Mitigation Measures

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

Direct and Indirect Effects

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

In addition, this alternative proposes 31,020 acres of low intensity prescribed fire to be accomplished in increments of a few hundred to a few thousand acres 5 to 10 years post thinning treatments. Prescribed fire is anticipated to directly effect 50 to 70% of the proposed landscape burn acres in Kahler (approximately 21,713 acres burned). It is recommended that maintenance burning be implemented every 10-15 years following treatment. Table 4-47 summarizes the proposed activities for all alternatives.

Table 4-46. Proposed silviculture and fuels activities for No Action, Alternative 2, and Alternative 3

Proposed Activity	No Action Alternative	Alternative 2 (Acres)	Alternative 3 (Acres)
Upland forest commercial thinning	0	9,435	8,629
Noncommercial thinning outside of harvest units	0	638	638
Noncommercial thinning in harvest units	0	4,718*	4,315*

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

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

Tamarack Lookout and Rental Cabin

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

would reduce the risk of direct flame to the cabin (see Figure 14 of Fire and Fuels Report). Further, access and egress on Forest Service road 2407-040 would be improved.

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

Historical Range and Variability

Species Composition

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

Forest Structure

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

Stand Density

HRV analysis for stand density as it exists in 2015 (post-implementation) and 2065 (reflecting 50 years of vegetation development without any future retreatment of the 2012 acre-age, other than periodic underburning) suggests that alternative 3 is only moderately effective at addressing the Kahler purpose and need for stand density –immediately after treatment (2015), low density, which was predominant historically as evidenced by the historical ranges is well within its range of variation (and this is certainly a positive outcome of implementing alternative 3), whereas the moderate and high density classes are both outside of their historical ranges (but high is above its range by just 3%). By 2065, follow-up treatments are needed if an objective is to maintain forest vegetation within its historical range of variation for stand density –all three of the density classes are outside of their historical ranges. . For more information on changes to HRV under Alternative 3, refer to the Forest Vegetation Report, Alternative 3 (Powell 2014).

Fire Regime Condition Class

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

Fuel Loading

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

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

Table 4-47. Comparison table of Fuel Models for No Action and Alternative 3 (years 2015, 2021, and 2065)

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

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

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

Fire Behavior

When looking at the direct effects from the thinning treatments and prescribed fire (year 2015 to 2021), the Kahler area is very likely to experience flame lengths greater than 4 feet in height; however, the risk of passive crown fire in both moderate and severe conditions is significantly decreased by 2021 (Table 4-49). In comparison to the No Action alternative, the proposed treatment decreases the likelihood of a passive crown fire by 4,761 acres in 2021. Over the long-term (2065) flame lengths are decreased under severe conditions across 13% of the landscape (approximately 4,270 acres) in comparison to the No Action alternative. That results in an improvement in predicted fire behavior of 4,242 acres when compared to the No Action alternative. The likelihood of passive crown fire is reduced, as well (Table 4-20). The combination of thinning and prescribed fire is shown to effectively reduce surface fuels, increase the height to live crown ratio, and decrease crown density.

Table 4-48. Comparison table for flame lengths under No Action and Alternative 3 (years 2015, 2021, and 2065)

	Flame Length					
	Moderate 2015		Moderate 2021		Moderate 2065	
No Action (% of Area)	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
		67	33	66	34	79
Severe 2015	Severe 2021		Severe 2065			
	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft	Under 4 ft	Over 4 ft
	24	76	30	70	60	40
Alternative 3 (% of Area)	Flame Length					
	Moderate 2015		Moderate 2021		Moderate 2065	
Alternative 3 (% of Area)	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			
	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 4-49. Comparison table for fire type under No Action and Alternative 3 (years 2015, 2021, and 2065)

No Action	Fire Type
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(% of Area)	Moderate 2015		Moderate 2021		Moderate 2065	
	Surface	Passive	Surface	Passive	Surface	Passive
	57	43	57	43	88	12*
	Severe 2015		Severe 2021		Severe 2065	
	Surface	Passive	Surface	Passive	Surface	Passive
	48	52	52	48	85	15
Alternative 3 (% of Area)	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	
	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 SOPA.

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

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

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

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 through 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.

Air Quality

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 (see Figure 1 of Air Quality Report). 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 (see Figure 1 of Air Quality Report). 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.

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 SOPA, no reasonably foreseeable actions potentially affecting vegetation conditions in the Kahler planning area are anticipated over the next 5 years.

Alternative 1 – No Action

Direct and Indirect Effects

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

Cumulative Effects

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

Alternative 2 – Proposed Action

Design Features and Mitigation Measures

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

Direct and Indirect Effects

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

In addition, this alternative proposes 31,019 acres of low intensity prescribed fire to be accomplished in increments of a few hundred to a few thousand acres 5 to 10 years post thinning treatments. Prescribed fire is anticipated to directly affect 50 to 70% of the proposed landscape burn acres in Kahler (approximately 21,700 acres burned). It is recommended that maintenance burning be implemented every 10-15 years following treatment. Table 4-51 summarizes the proposed activities for all alternatives.

Table 4-50 Proposed silviculture and fuels activities for No Action, Alternative 2, and Alternative 3

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

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

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

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

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.

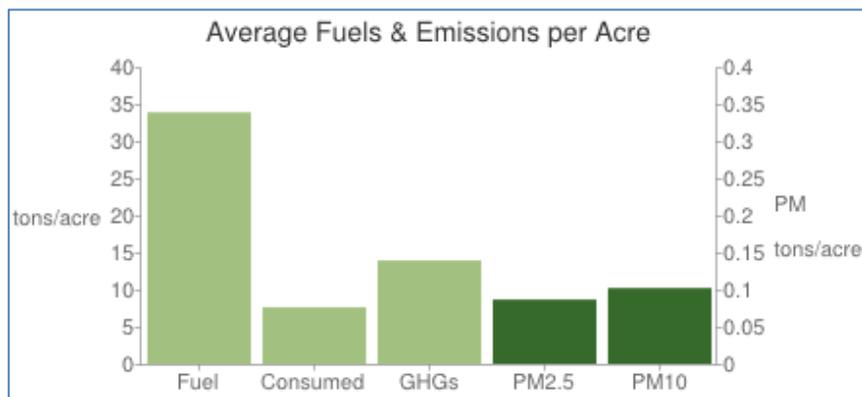


Figure 4-2 shows the average fuels and emissions per acre for the predicted 4,000 acre prescribed fire. Green House Gasses (GHGs), PM_{2.5} and PM₁₀ are predicted to be less than 0.15 tons/acre.

Figure 4-2 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 4-3 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.

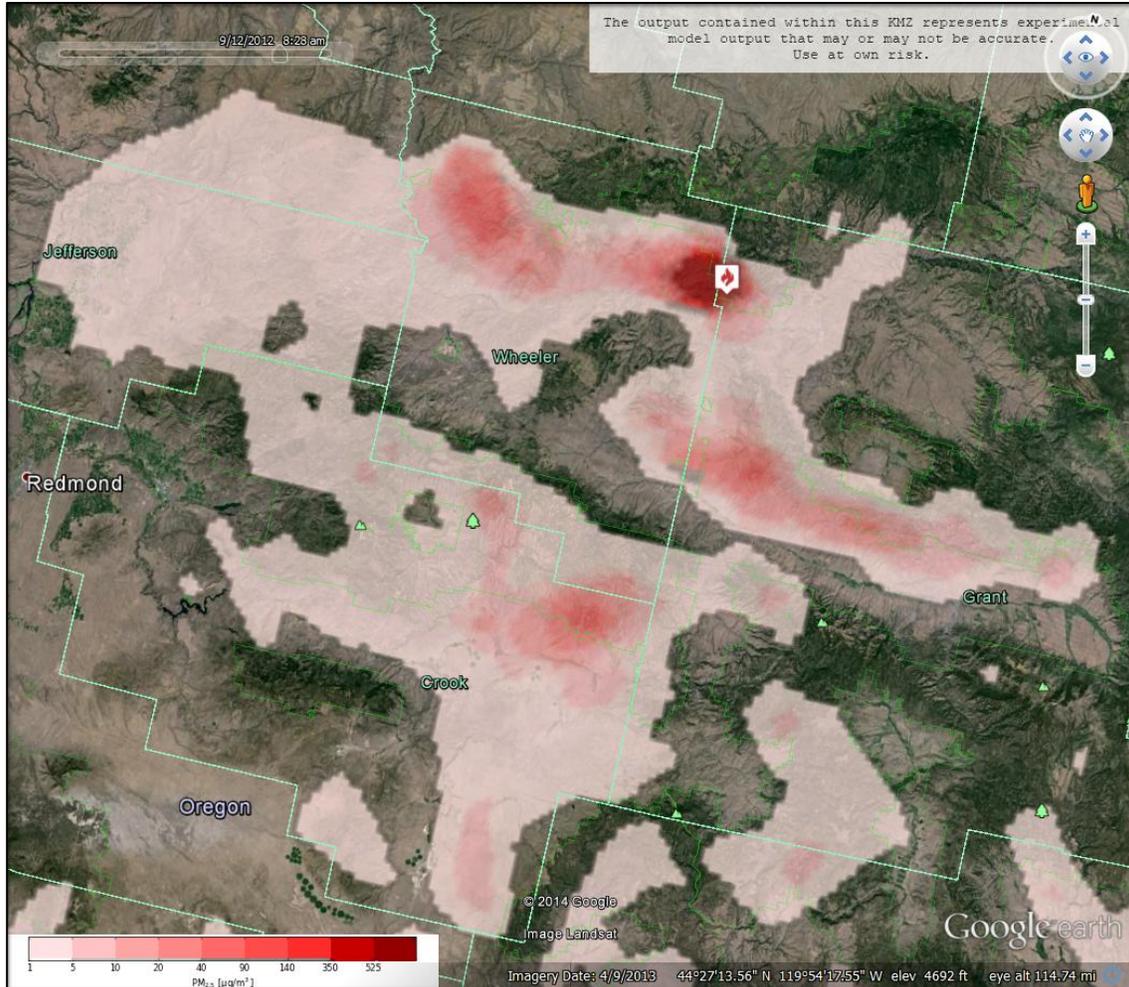


Figure 4-3 Smoke dispersion scenario under typical fall burn conditions for a 4,000 acre prescribed fire. Heavy smoke is displayed in dark red at the ignition source and moves south into the John Day river valley. Smoke impacts to communities will be of short duration (2-3 days).

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

Cumulative Effects

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

Alternative 3 – Proposed Action

Design Features and Mitigation Measures

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

Direct and Indirect Effects

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

In addition, this alternative proposes 31,020 acres of low intensity prescribed fire to be accomplished in increments of a few hundred to a few thousand acres 5 to 10 years post thinning treatments. Prescribed fire is anticipated to directly affect 50 to 70% of the proposed landscape burn acres in Kahler (approximately 21,700 acres burned). It is recommended that maintenance burning be implemented every 10-15 years following treatment. Table 1 summarizes the proposed activities for all alternatives.

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

Cumulative Effects

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

See Air Quality Report for Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans.

Botanical Resources

Environmental Consequences

Alternative 1 – No Action

Under Alternative 1, the Kahler project would not be implemented. There are no sensitive plant species listed on the RFSSSL known to occur in the project area and the three rare plant species described under 'existing conditions' above would likely continue to occupy their current niches but may not have been discovered and documented without the surveys associated with the

proposed Kahler project. The fuels reduction associated with the logging units proximal to the Kahler Creek Butte proposed Research Natural Area would not occur which would increase the risk of wildfire burning the rigid sage plant community with the resultant risk of ventenata grass further degrading this already endangered plant community. The proposed Henry Creek Botanical Area would likely continue to thrive in its unique habitat under the 'no action' alternative.

Action Alternatives 2 (Proposed Action) and 3

Complete descriptions of the Proposed Action (Alternative 2) and Alternative 3 are located in Chapter 2. A brief overview of both action alternatives is included here.

The Kahler project proposes to use variable density thinning with skips and gaps to reduce tree density, shift species composition, and promote old forest structure across approximately 10,680 acres within the project area.

Western juniper and other conifer species (including ponderosa pine and Douglas-fir) have spread from historically occupied habitat into grassland and shrub-steppe habitats in the Kahler area, based on examination of 1939 aerial photographs. Grassland/shrub-steppe enhancement through conifer reduction would occur on approximately 330 acres in the project area.

Following mechanical treatment, approximately 27,420 acres of the project area will be treated using prescribed fire. This treatment would reintroduce fire to a fire-dependent ecosystem blackening about 50-75% of the area to lessen the impact of a future wildfire, improve forage quality for big game, and encourage ponderosa pine recruitment.

Noncommercial thinning would occur on approximately 6,135 acres; 1,080 acres outside harvest units and 5,060 acres within harvest units. The noncommercial thinning treatment will cut conifer seedlings, saplings, and small poles, generally up to 7 inches DBH, and western juniper trees less than 12 inches diameter, to help meet forest vegetation needs identified in the Kahler project's purpose and need, including tree vigor improvement for insect and disease resistance, restoring and maintaining a sustainable species composition, increasing forage for native and domestic ungulates, and addressing fire hazard by reducing ladder fuels.

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

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

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

Direct and Indirect Effects

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

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

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

Cumulative Effects

Spatial and Temporal Context for Effects Analysis

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

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

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

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

Regulatory Framework

Land and Resource Management Plan

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

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

Management Areas

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

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

Invasive Plants

This section 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 4-52 displays what is being proposed in each alternative.

Table 4-51 Activities by Alternative (Acres)

Treatment	Alt. 1	*Alternative 2	*Alternative 3	Total Harvest Acres Proposed Alt 2.	Total Harvest Acres Proposed Alt 3.
Ground Base	0	496 acres on 64 sites	450 acres on 56 sites	10484	9119
Helicopter	0	3 acres on 5 sites	3 acres on 5 sites	661	490
Sky/ Ground	0	96 acres on 6 sites	96 acres on 6 sites	431	431

Base					
Sky/Helicopter	0	5 acres on 4 sites	5 acres on 4 sites	395	395
Skyline	0	42 acres on 10 sites	51 acres on 10 sites	477	380

***Acres on numbers of sites is calculated by combining multiple species of high priority noxious weeds that occur within a single noxious weed polygon. This will inflate the actual acreage effected by noxious weeds because unit polygons also overlap noxious weed polygon and there may be multiple sites within a harvest unit polygon.**

Effects Unique to Alternative 1 (No Action)

If the no action alternative was selected, no activities would be implemented. Existing native vegetation would continue to stabilize soil and consume resources (i.e. nutrients, water, and space), which would help reduce invasion by noxious weed species. There would be no affects to existing infestations due to harvest or burning activities. There would be no risk of equipment transporting new invasive species into the project area due to harvest or burning activities.

There would continue to be a risk of recreationist transporting invasive plants into the project area. Livestock and wildlife could continue to spread invasive plants within the project area. High priority noxious weeds would continue to be treated consistent with current environmental analysis decisions. Low priority weed species would likely continue to spread within the project area, unless treatment efforts became available and were effective (Biological Control Agent).

Effects Common to all Action Alternatives

Direct and Indirect Effects

Harvest Activities--Areas where the soil surface is disturbed can promote the establishment of noxious weeds. The harvest activities in each action alternative may cause soil disturbance that could cause noxious weeds to become established in the project area. The risk is proportional to the amount of acres treated.

Design criteria that will be implemented to reduce soil disturbance, which therefore reduces the risk of noxious weed establishment and spread, are listed below. These prevention measures will be applied to all action alternatives and are consisted with the Umatilla National Forest LRMP as amended by the Pacific Northwest Region Invasive Plant Program Final Environmental Impact Statement, Record of Decision, October 2005.

- 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 free seed (listed in the State of Oregon). Native plant materials are the first choice in revegetation for restoration and rehabilitation where timely regeneration of the native plant community is not likely to occur (Prevention Standard #13).
 - 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 inventories 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 remove mature seeds.

Monitoring similar projects on the Forest found that equipment only caused soil compaction and/or displaced soils (Hydrology Report). The least amount of ground disturbance by heavy equipment used in proposed harvest areas presents the least amount of risk (additional mitigation to minimize soil disturbance described above in landings and skid trails) for the establishment and spread of noxious weeds due to ground disturbance caused by harvest activities.

As the amount of ground disturbance increases, the potential for the spread and establishment of noxious weed increases. Alternative 2 proposes the most acres of potential disturbance using ground base harvest activities (Table 3). Alternative 3 also proposes the use of ground base equipment. There are approximately 1365 acres difference between the two ground base treatments in alternative 2 and alternative 3. Alternative 3 will have less potential to introduce or potentially spread priority noxious weed species (Table 2) within the sale area.

Low priority noxious weeds are those species that are considered widespread throughout the forest and generally are less competitive. Low priority noxious weeds within the analysis area (bull thistle, Canada thistle, and St. Johnswort) are generally less persistent than high priority weeds. These species tend to decrease as forest canopy increases. As a result, these weed species are generally absent in higher succession stage forested stands. The proposed activity methods and mitigation would minimize ground disturbance, which would allow the existing competing vegetation to reduce the spread and establishment of low priority weeds. However, due to the presence of low priority species within the project area, it is likely that there will be a short term increase in low priority species due to harvest and burning activities. As canopy cover increases, there will likely be a corresponding decrease in low priority invasive species.

Road Use--Monitoring on the district has found that noxious weeds often become established due to vehicles and equipment along road right of ways. Actions conducted or authorized by written permit by the Forest Service that will operate outside the limits of the road prism

(including public works and service contracts), require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering National Forest System Lands (Prevention Standard #2). This will reduce the potential for noxious weed seed to be transported onto the project site. It also reduces the potential establishment of noxious weeds in areas where soil disturbance may occur.

Rock pits used for this project were considered in this analysis. Though high priority noxious weed species are found at rock pits within the analysis area, they have not been found at the rock sources that were identified to be used in this project. All gravel, fill, sand stockpiles, quarry sites, and borrow material will be inspected for invasive plants before use and transport (Prevention Standard #7).

Alternative 2 and 3 propose to open closed roads and construct temporary roads. This activity directly affects the potential for the establishment and spread of noxious weeds. Reducing the use of motorized vehicles reduces the potential spread of noxious weeds. Alternative 2, and 3 propose the use of temporary roads. These temporary roads should be placed in areas where there are no infestations of noxious weeds. Closed roads that are opened to implement this project will need to be closed after project activities have been completed.

Burning Activities—Burning activities are common to all alternatives. Broadcast burning would occur in the spring or the fall. Burning could also occur within the proposed harvest units to reduce hazardous fuels.

The purpose of the prescribed burning within the project area is to restore low intensity fire to the ecosystem and to restore the area to within the historic range of variability for vegetative structure. This will result in more fire resistant plant communities within the proposed burn blocks. The short term 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 a tractor in all action alternatives. Fire line construction removes vegetation down to bare soil creating a condition that promotes the establishment of invasive plants. If equipment is used to construct fire lines, the equipment will be washed prior to off road travel to prevent the spread of invasive plant seeds. All constructed fire control lines on steeper slopes (35% +) will be hand line to bare mineral soil. Fire line will be rehabilitated as needed after the burn by returning displaced soil to the line, constructing waterbars, seeding, and/or replacement of downed wood.

Cumulative Effects

Past and present activities within the project area have resulted in the presence of invasive plants within the project area. Past road construction and maintenance, recreation, grazing, wildfire, timber harvest and other soil disturbance have provided:

- environments for noxious weed species establishment,
- vectors for noxious weed dispersal,

- and infestations of noxious weeds for seed sources.

Existing infestations are a result of past harvest activities, domestic livestock grazing, road construction and maintenance, past wildfires, and other ground disturbing activities. See Chapter 3 for a description of past, present, and future projects that could cumulatively interact with the action alternative treatments. Design criteria for the action alternatives have been designed to reduce the risk of the proposed activities affecting existing infestations.

Domestic livestock and wildlife can spread invasive plant seeds throughout the project area. The project area is located within an several active cattle allotment (See Range Report for specific allotment information). As a result, cattle and wildlife are within the project area when seed maturity occurs and are a vector for seed spread. Cattle and wildlife trails are high risk areas for invasive plants. There will likely be cumulative effects associated with livestock grazing, wildlife, and activities associated with this project. Those effects are the spread of existing infestations of low and high priority weed species and the establishment of new invasive species. Though design criteria will reduce the cumulative effects, they will not be eliminated.

Inventorying and monitoring noxious weeds on the Heppner Ranger District has found that roads are high risk areas for noxious weed infestations. The ongoing maintenance of roads within the project area and the use of roads by the public increases the risk of invasive plants becoming established in the project area. The design criteria being implemented for harvest activities and prescribed fire will reduce but not eliminate the potential for road maintenance and public use of roads and to spread invasive plants within the disturbed areas cause by the proposed activities.

Recreation activities will continue to occur within the project area. Recreationists can be a vector of noxious weeds. This area is primarily used for hunting by recreationists. Dispersed camps and road use by recreationists are considered high risk areas. There will continue to be a risk of recreationists spreading invasive plants within the project area.

Wildlife

Environmental Consequences

Dedicated Old Growth Habitat

No Action

Direct and Indirect Effects

In the short term, the structure and composition of existing C1 old growth would be maintained. In the mid and long term, shade tolerant conifers would continue to invade these stands, and would compete with ponderosa pine for resources. As understory trees grow that would normally be thinned by fire, they would maintain or move stands toward a multi-strata condition. Perpetuating this conversion to multi-layered old growth conditions would benefit species such as the pileated woodpecker and Williamson's sapsucker. These stands would become increasingly susceptible to insect and disease outbreaks and high-severity wildfire. These events could result in long-term loss of large-diameter ponderosa pine and Douglas-fir. In the event that large overstory ponderosa pine is lost to fire or insects, species such as white-headed woodpecker, flammulated owl, and pygmy nuthatch could suffer setbacks, while species associated with post-burn habitats (such as Lewis', three-toed, and black-backed woodpecker) would benefit. A fire of this type would result in reduced quantity and connectivity of old growth habitat within the project and larger landscape area. Infrastructure at the Tamarack site

may also be impacted by an uncharacteristically severe wildfire.

Common to All Action Alternatives

Direct and Indirect Effects

Under Alternatives 2 and 3, approximately 12 acres of existing C1 immediately adjacent to the Tamarack administrative site would move into the E1 management area. Approximately 16 acres in the stand immediately north of the existing old growth unit would move from the E1 management area to the C1 management area designation. There would be a net increase of 4 acres of C1 old growth under these alternatives. The acres that would move into the E1 management area allocation are similar in structure and composition to those that would become C1. At the scale of the Forest, the dedicated old growth network (size/amount and distribution) would be maintained under both of these alternatives. As a result, this project would be consistent with Forest Plan direction and guidance for the C1 management area.

Landscape underburning would not change the overstory tree composition or stand structure in Dedicated Old Growth habitat because prescribed fire would be low intensity. It is expected that prescribed burning would result in some level of mortality of green trees. Elsewhere in the Blue Mountains, research has found that immediate and delayed mortality occurred in 14% of all live trees and up to 5% of all large diameter live trees (>21 inches DBH) following underburning (Thies et al. 2008). Fire-caused mortality would improve snag and downed wood habitat in the short and mid-term. While there is a potential for large-diameter snags and downed wood to be consumed during burning (especially those in later stages of decay), these potential impacts are not quantifiable due to the many variables involved. Burning conditions (weather, fuel conditions, and general oversight of burning operations) would be such as to minimize the risk of losing larger-diameter green trees, logs, and snags. Burns would be designed and implemented such that Forest Plan standards for snags and downed wood would be met in burned C1 habitat after treatment. Not all acres within burn blocks would be blackened. While it is difficult to accurately assess the actual number of acres that would be blackened, a general estimate would be 70%. Underburning would be consistent with the goals and desired future conditions for the C1 management area.

Cumulative Effects

Past activities, actions, and events in the Kahler analysis area that affected the quality, amount, and distribution of C1 old growth habitat include Forest Plan management area allocation, timber harvest, fire suppression, wildfire, and disease and insect infestations. The Umatilla National Forest Land and Resource Management Plan designated existing C1 DOG stands in 1990. These stands have been protected from extractive activities since this time. Past (and ongoing) fire suppression resulted in in-growth of shade tolerant tree species in dry forest portions of DOG stands 1971, 1871, 1902, 1922, and 1841, resulting in an increase in multi-strata conditions where single-stratum old growth was historically more prevalent. In those portions of these DOG stands composed of moist upland forest, these conditions were perpetuated by fire suppression. Past timber harvest reduced habitat connectivity and reduced the amount of late and old structure habitat available for designation under the Land and Resource Management Plan as C1 old growth. A portion of one DOG lies within a harvested stand, and does not currently provide old growth habitat features desired by old growth-dependent wildlife. Disease and insect infestations have impacted C1 old growth habitat by impacting the composition of these stands. Spruce budworm infestation in the late 1980s and early 1990s caused mortality of Douglas-fir and grand fir in C1 habitat. Snags created by these events are still standing in some cases. Past wildfire also has contributed to the condition of Dedicated Old Growth habitat in the

analysis area. DOG 1871 burned at high severity in the Wheeler Point Fire and was subsequently salvage harvested. This stand was replaced with DOG 1971 to the east. DOG 1971 contains some non-capable habitat and is smaller in size than DOG 1871 was; while DOG 1871 still exists currently in the GIS database, it was removed from the C1 management area in 1996 by a Forest Plan amendment associated with the Wheeler Point Salvage EA. There are no ongoing or reasonably foreseeable future activities that would occur within C1 habitat within the project area.

When the expected effects of the Forest Plan amendment to swap C1 acres immediately adjacent to Tamarack Lookout with acres to the north that share a coincident boundary with DOG 1841 and burning are combined with the residual and expected effects of past, present, and reasonably foreseeable future activities, actions, and events in the analysis area, there would be no cumulative reduction in the quality of C1 old growth habitat in the project area. Underburns would be low intensity ground fires; impacts to overstory vegetation, large snags, and large downed wood would not be quantifiable. Acres that would move into the C1 Management Area would be similar in structure and composition to those that would pass out of the C1 designation. There would be a small net increase (+ 4 acres) in C1 habitat under Alternatives 2 and 3. These new C1 acres would be less likely to be affected by illegal woodcutting (which currently occurs adjacent to Tamarack Lookout) due to the fact that they are distant from an open road.

Late and Old Structural Stages

Alternative 1 - No Action

Direct and Indirect Effects

In the short term, late and old structure habitat would maintain its current quality and extent in the analysis area. As a result, single-layer old forest would remain below the historical range of variability in the dry upland PVG. Old forest multi-strata stands would continue to be above HRV in the dry upland forest PVG. Indirectly, the amount of late and old structure would change over time. With the existing management direction, including fire suppression, late and old structure stands (multi- and single-stratum) in the project area would continue to grow into a multistory structure. As understory trees grow that would normally be thinned by fire, they would create a multi-strata canopy where open, single-stratum forest once existed, further reducing single stratum old forest habitat in the dry upland forest PVG. Perpetuating this conversion to multi-layered conditions would benefit species such as the pileated woodpecker and Williamson's sapsucker. These stands would become increasingly susceptible to insect and disease outbreaks and high-severity wildfire. These events could result in long-term loss of large-diameter ponderosa pine and Douglas-fir. This would result in reduced quantity and connectivity of late and old structure habitats in the analysis area. Old forest single-stratum in the dry upland PVG would likely be reduced even further below HRV by an event such as this.

Common to All Action Alternatives

Direct and Indirect Effects

The effects of the two action alternatives would largely be the same; the difference between the alternatives results from varying acres of treatment that would be applied within the project area. Refer to the individual alternative discussions for quantification of these differences. Under all of the action alternatives, there would be no net loss of late and old structure habitat. Under Alternatives 2 and 3, there would be vegetative treatment in Old Forest Single Stratum stands; commercial thinning within these stands would require a Forest Plan amendment to allow these activities. Commercial thinning in these stands has the potential to affect the quality of these

stands for late and old structure-associated wildlife species. The “clumpy” nature of OFSS stands may be impacted by commercial thinning; existing clumps of young and mature trees may be thinned to meet basal area targets, which would reduce stand heterogeneity. While trees ≥ 21 inches DBH (of all species) would not be removed from these stands, young and mature trees less than 21 inches DBH may be removed, reducing the recruitment of trees (and eventually snags) ≥ 21 inches DBH in the mid and long term. Large snags indicative of old forest conditions and vital to OFSS-associated wildlife species may also be impacted by hazard tree felling in these stands. Under all of the action alternatives, multi-strata late and old structure habitat in the dry upland forest PVG would be commercially thinned with a skip-gap prescription to meet silvicultural and wildlife habitat goals. Treatment would promote increased growth rates in residual trees by reducing competition for resources and resulting stress in dense dry forest stands. Studies show a positive growth response in residual stands following restoration thinning treatments in dry upland forest (ponderosa pine) stands (Kolb et al. 2007, Sala et al. 2005, Skov et al. 2005, Feeney et al. 1998). Treatment of dry upland forest late and old structure habitat would promote the creation or maintenance of single-layered old forest dominated by ponderosa pine, Douglas-fir, and western larch. The oldest trees (including all ponderosa pine and western larch trees greater than 21 inches DBH) in these stands would be retained; smaller, competing understory and overstory trees and those uncharacteristic of the potential vegetation group would be removed. This may include some Douglas-fir and white fir that exceed 21 inches DBH that are less than 150 years old, based on visual assessment procedures described in the Forest Vegetation Report and the marking guides for the Kahler Project. In the short term, some larger diameter trees that would provide future snag habitat would be removed. Design criteria would be applied to ensure that a portion of these trees are retained as large standing or downed woody structure for wildlife benefit; the District wildlife biologist would be consulted regarding the disposition of these structures. Species adapted to late and old structure, single-strata ponderosa pine stands (e.g., white-headed woodpecker, flammulated owl, Lewis’ woodpecker) would benefit in the mid and long term through the restoration of appropriate structural stages and species compositions. Maintenance of skips (up to 15% of unit acres) would maintain potential foraging habitat in close proximity to potential white-headed woodpecker nesting habitat. Reductions in canopy closure, canopy layers, and shade-tolerant tree species would reduce habitat for multi-strata adapted species currently using these habitats. At the unit scale, skips would provide small patches of dense dry forest habitat that may be utilized by dense-forest associated species for some aspects of their life history. Treatment in dry forest multi-stratum old forest stands would increase the proportion of old forest single-strata habitat within the Kahler planning area under all of the action alternatives. Refer to individual alternative discussions for these changes.

Snags would not be felled in any proposed treatment units unless they pose a safety hazard. For this reason, snags would be retained to the greatest extent possible. The impact of hazard and danger tree felling on late and old structure habitat quality would therefore be minimal. If felled within treatment units, they would be left within units to provide downed woody debris (see Project Design Criteria, EIS Chapter 2). The District wildlife biologist would be consulted regarding the disposition of felled hazard and danger trees. Snags and downed dead wood would not be impacted in non-commercial thinning units.

Burning would occur within LOS habitat within and outside treatment units under all of the action alternatives. The entire analysis area would be burned. Burning would largely be restricted to the dry upland forest PVG, where fire historically contributed to the structure and composition of habitat. Pockets of moist and cold upland forest lying within the analysis area would also be underburned. Landscape underburning (including burning in activity units) would not change the overstory tree composition or stand structure on affected acres because prescribed

fire would be low intensity (Harrod et al. 2009). While there is a potential for mortality of individual green overstory trees, and large-diameter snags and downed wood to be consumed during burning (especially those in later stages of decay), these potential impacts are not quantifiable due to the many variables involved. New snags created by burning would partially compensate for those lost. Burning conditions (weather, fuel conditions, general oversight of burning operations) would minimize the risk of losing larger-diameter green trees, logs, and snags. Design criteria would also be implemented to minimize the loss of large, old trees that are retained. Burns would be designed and implemented such that Forest Plan standards for snags and downed wood would be met in all treated LOS habitat, where pre-burn densities exceed the minimum Forest Plan standards. Not all acres within burn blocks would be blackened. While it is difficult to accurately assess the proportion of acres that would be blackened, a general estimate would be 70%.

Non-commercial thinning and temporary road construction would not impact the structure or composition of existing late and old structure habitat under any of the action alternatives. The majority of temporary roads would use existing non-system roadbeds. Where new temporary road construction occurs, existing openings would be followed where available. The width of proposed temporary roads (approximately 15 feet wide) would minimize impacts to overstory vegetation. The structure and composition of late and old structure stands would not be affected by temporary road construction and use.

Cumulative Effects

Past activities, actions, and events in the Kahler analysis area that affected the quality, amount, and distribution of late and old structure habitat include fire suppression, commercial timber harvest (commercial thinning, overstory removal, and regeneration harvest), wildfire (Wheeler Point), disease and insect infestations, and firewood cutting. Past (and ongoing) fire suppression resulted in in-growth of shade tolerant tree species in dry forest stands, resulting in an increase in old-forest multi-strata (OFMS) stands and a reduction in old forest single-stratum (OFSS) habitat. Past commercial thinning and regeneration harvest affected the structure, composition, and distribution of late and old structure stands. The amount of LOS affected by past timber harvest could not be queried from the GIS database because pre-harvest stand data is not available. Since 1975, there have been 9,640 acres of commercial thinning, 4,084 acres of regeneration harvest, and 4,826 acres of overstory removal in the analysis area. Within harvested stands, large trees were targeted for removal; snags and downed wood (density and average size) were also reduced in these stands. Commercial and regeneration harvest reduced connectivity of late and old structure habitats, causing fragmentation of late and old structure wildlife habitat that was historically large and relatively homogeneous. These impacts are still evident on the landscape currently. Wildfire has also affected late and old structure habitat in the analysis area. The Wheeler Point Fire (2006) burned approximately 6,540 acres within the analysis area, with a portion occurring in late and old structure habitat. The majority of the burned acres on NFS lands do not provide a structure and composition suitable for late and old structure-associated wildlife that require high stand densities and multiple canopy layers. Disease and insect infestations have impacted late and old structure habitat in the analysis area to a small degree. These events have primarily impacted pockets of moist upland forest and overstocked dry forest stands. These events have resulted in fragmentation of late and old structure habitat. Conversely, these events created excellent foraging habitat for some late and old structure-associated species (including black-backed and pileated woodpecker) by creating large numbers of large-diameter snags in understory reinitiation and old forest stands. Firewood cutting also reduced the standing dead wood component in late and old structure stands. This activity occurs adjacent to open roads within the analysis area. Snag densities adjacent to open roads have been reduced through this activity. These activities and events have contributed to

the existing condition of late and old structure habitat in the allotment.

Present and reasonably foreseeable future activities, actions, and events that affect late and old structure habitat include firewood cutting and fire suppression. These activities would have the same effects as those described under the past activities section.

When the expected effects of this alternative are combined with the residual and expected effects of past, present, and reasonably foreseeable future activities, actions, and events in the analysis area, there would be no cumulative reduction of late and old structure habitat in the analysis area. All of the action alternatives would contribute to cumulative effects in old forest stands by reducing canopy closure and structural complexity; this would positively impact some species while negatively impacting others. Thinning of OFMS habitat to restore or move stands towards an OFSS structural condition would begin to reverse the impacts of past management activities and fire suppression in the dry upland forest potential vegetation group. Moving OFSS toward the levels identified in the HRV would benefit those species dependent on these habitats, particularly the white-headed woodpecker, flammulated owl, and Lewis' woodpecker. Treatment of stands currently in an OFSS structural condition has the potential to cumulatively impact the quality of these stands. Desired features, including snags, tree clumps, medium-sized ponderosa pine, and others would likely be reduced by these activities, further exacerbating past habitat changes resulting from harvest and fire suppression. The negative effects of reduced structural complexity (canopy layers, understory vegetation, felling of snags that are a hazard) could result in reduced use of available habitat by some species.

Alternative 2

Direct and Indirect Effects

The effects under this alternative would be similar to those described under *Common to All Action Alternatives*. Alternative 2 would move approximately 400 acres into a single-stratum old forest (OFSS) structural condition (See Silviculture Report), increasing the proportion of this structure type to 7% (from 6%) in the analysis area in the short term. In the long term (year 2065), the proportion of OFSS in the analysis area would increase to 39% (from the existing of 6%) in response to treatment. This level is just below the range identified in the HRV.

Alternative 2 would have a greater impact on habitat used by multi-strata old-growth associated wildlife than the other action alternatives in the short and mid-term since it reduces canopy closure and structural complexity on more acres (400 acres) of dry upland forest OFMS than Alternative 3.

Under this alternative, the most acres of late and old structure habitat would be treated. Fuels created by harvest activities (slash) would increase the risk of large diameter green tree, snags, and downed wood being affected during underburns. Because this alternative would treat commercial-sized vegetation on the most acres and create the most slash, it would also have the greatest risk to these features. Project design criteria would be implemented to reduce these risks.

This alternative would be consistent with the Eastside Screens (Scenario A) with regard to late and old structure habitat. Amendment of the Forest Plan to treat vegetation with an LOS stage (OFSS) currently below the HRV would be consistent with Regional direction (USDA 2003).

Cumulative Effects

The cumulative effects under this alternative would be similar to those described under *Common*

to All Action Alternatives. When the expected effects of this alternative are combined with the residual and expected effects of past, present, and reasonably foreseeable future activities, actions, and events in the analysis area, there would be no cumulative reduction of late and old structure habitat. This alternative would do the most to reverse the impacts of past fire exclusion and harvest activities in the Kahler analysis area. By treating the most acres of existing OFSS habitat, it would also impact the quality of existing OFSS to a greater degree than would Alternative 3. This alternative would also have the most short-term impacts to snags in late and old structure habitat (through hazard and danger tree abatement) when compared to Alternative 3.

Alternative 3

Direct and Indirect Effects

The effects under this alternative would be similar to those described under *Common to All Action Alternatives.* Alternative 3 would have less short and mid-term impacts on late and old structure habitat and associated wildlife than Alternative 2, due to a slight decrease in the number of acres treated. Conversely, fewer acres would be moved toward a single-stratum late and old structure condition in the dry upland forest PVG under this alternative. Alternative 3 would move approximately 400 acres of multi-strata late and old structure (OFMS) habitat in the dry upland forest PVG into a single-stratum old forest (OFSS) structural condition (See Silviculture Report). At the scale of the Kahler analysis area, these activities would increase the proportion of this structure type to 7% (from 6%) in the analysis area in the short term. In the long term (year 2065), the proportion of OFSS in the analysis area would increase to 37% (from the existing of 6%) in response to treatment.

This alternative would be consistent with the Eastside Screens (Scenario A) with regard to late and old structure habitat. Amendment of the Forest Plan to treat vegetation with an LOS stage (OFSS) currently below the HRV would be consistent with Regional direction (USDA 2003).

Connectivity

No Action

Direct and Indirect Effects

In the short term, late and old structure stands and old growth stands would remain connected across the landscape and within the project area with dense stands composed of medium to large trees, corridor widths greater than 400 feet, and by two or more corridors (where these attributes are available). Indirectly, connectivity habitat would change over time. With the existing management direction including fire suppression, stands in the project area would continue to grow into dense, multi-layered stands, improving the quality of connections for some LOS associated species (e.g., pileated woodpecker). This condition would increase the susceptibility to wildfire, and insect and disease outbreaks. A major disturbance on the landscape would change the composition and structure of connectivity habitat. As a result, the connectivity of late and old structure and old growth stands may be reduced to some degree. This may limit the “free movement” of wildlife species between late and old structure and old growth stands within and outside the analysis area.

Common to All Action Alternatives

Direct and Indirect Effects

Commercial thinning would occur in stands identified as connectivity corridors during project development. Forest Plan standards for connectivity habitat (canopy closure in the upper 1/3 of

the site potential, at least two connections, at least 400 feet wide, medium and large trees “common”) would be met following implementation, where these attributes are available. As the majority of the analysis area is composed of dry upland forest, the upper 1/3 of the site potential would be relatively low (approximately 25 to 30% canopy cover for ponderosa pine stands). The proposed treatments would move stands towards the historic, more open condition. Design criteria would be implemented that maintain a higher basal area (and therefore canopy cover) or provide a higher proportion of skips (untreated areas) in stands within connectivity corridors than those stands outside connectivity corridors. These corridors would continue to provide connections between late and old structure habitat and Forest Plan old growth habitat and facilitate the movement of wildlife between these habitats following implementation. Non-commercial thinning would have no impact on the quality of connectivity habitat because overstory composition and structure would not be affected. Untreated patches of small-diameter conifers would be maintained in non-commercially thinned units to provide hiding cover for wildlife.

Landscape underburning would not change overstory composition or structure in connectivity habitat or the late and old structure these stands are providing connections between. Burning would reduce a portion of understory vegetation in connectivity habitat; however, patches of unburned understory would be maintained due to the low intensity of underburning. Occasional overstory trees would likely be killed by underburning. Impacts to snags and downed wood are also expected to be minor due to the low intensity of proposed underburns.

Existing roads (open and closed) used for harvest would not change the composition or structure of connective habitat in the project area.

Under both of the action alternatives, there would be one connectivity corridor impacted by new temporary road construction. However, the new temporary road would be constructed through an opening at the margin of the identified connectivity corridor. There would be no impacts to the quality of the connectivity corridor through construction and decommissioning of this temporary road. There are also three existing temporary roads that would intersect identified connectivity corridors. Two of these are situated in openings or very sparse stands and the third is located in intermingled timber and openings. Where necessary, clearing of vegetation would be required to permit vehicle use. It is not expected that clearing along existing temporary roads (to a maximum of 15 feet wide) would impact the quality of connectivity corridors because these routes exist on the ground currently.

Cumulative Effects

Past activities, actions, and events in the Kahler analysis area that affected the connectivity of late and old structure habitat include fire suppression, commercial timber harvest (regeneration harvest, overstory removals, commercial thinning), wildfire (Wheeler Point), and disease and insect infestations. Past (and ongoing) fire suppression has resulted in in-growth of shade tolerant tree species in dry forest stands, resulting in an increase in old forest multi-strata stands and a reduction in old forest single-stratum habitat. This has resulted in improved connectivity for some multi-strata and dense overstory-associated wildlife. Since 1975, there have been 9,640 acres of commercial thinning, 4,084 acres of regeneration harvest, and 4,826 acres of overstory removal in the analysis area. Data from prior to this time period is unreliable and incomplete. These activities have affected the structure and composition of forested stands. Commercial and regeneration harvest reduced connectivity of late and old structure habitats, causing fragmentation of late and old structure wildlife habitat. These impacts are still evident on the landscape currently. Wildfire has also affected connectivity habitat within the analysis area. The Wheeler Point Fire generally burned at high severity within the analysis area. A large

proportion of the acres within this fire no longer provides a structure and composition that would satisfy the connectivity requirements of the Regional Forester's Forest Plan Amendment #2 (Eastside Screens, USDA 1995). Disease and insect infestations have impacted forested stands in the analysis area to a small degree. In general, these events did not result in complete mortality of overstory trees in dense dry upland forest stands; overstory structure was generally maintained on affected acres. These activities and events have combined to create the existing condition of connectivity habitat in the analysis area.

There are no ongoing or reasonably foreseeable future activities, actions, and events that are affecting or would affect connectivity habitat in the analysis area.

When the expected effects of these alternatives are combined with the residual and expected effects of past, present, and future actions in the analysis area, there would be no cumulative reduction in connectivity between late and old structure and designated old growth habitats. Connectivity habitat would continue to meet the intent of the amended Forest Plan standards under these alternatives. While the density (canopy cover) of connectivity corridors would be reduced, they would continue to allow for the free movement of wildlife between late and old structure stands and Dedicated Old Growth stands.

Snag Replacement Trees

No Action

Direct and Indirect Effects

Within the next five years, snag replacement trees (live/green) would continue to occupy the project area at or near current densities and size classes. In the mid and long term (5 to 15+ years), green tree replacements may increase or decrease depending on the events that occur. Green tree replacements would be reduced by disease and insect outbreaks in proposed commercial thinning stands. Disease and insect outbreaks have the potential to affect dense, multi-strata stands. Although green tree replacements may decrease in the future due to mortality, it is unlikely that green tree replacement levels would fall below Forest Plan objectives. Growth and development over time would tend to increase green tree replacements. In the long term, mortality of overstory trees would increase standing and downed fuel loads, increasing the risk of high-severity wildfire. Wildfire of this type would change the composition and structure of forested stands in the analysis area. Depending on the intensity and severity of the fire, this would reduce or even eliminate green replacement trees currently occupying the site. After a severe fire event, it would take in excess of 80-100 years to regain sufficient quantities of replacement trees, in appropriate size classes, to meet the Forest Plan objectives for green tree replacements and Forest Plan standards for snags.

Common to All Action Alternatives

Direct and Indirect Effects

Proposed harvest activities (commercial thinning, shrub-steppe enhancement, and non-commercial thinning) would directly and indirectly affect green trees in the project area. Commercial thinning and shrub-steppe enhancement would reduce the density of green trees in treatment units; however, all treated stands would meet or exceed objectives for green tree replacements (USDA 1996) following treatment, where appropriate. Shrub-steppe enhancement units are located in areas where overstory trees were sparse under the HRV. These stands may be below green tree replacement objectives following implementation due to the fact that this condition would have occurred in these areas historically. Commercially thinned stands would provide densities of green trees that would meet these objectives due to the fact they would be

thinned using a basal area objective. Skips with treatment units would provide for high levels of green tree replacements and the potential for endemic or greater snag recruitment. Small diameter conifer thinning (non-commercial thinning) would also reduce stand densities. This activity would affect small diameter green trees that do not currently contribute to green tree replacements because if they were to die, they would be largely unusable to primary cavity excavators. This activity would improve growing conditions for residual trees. While green tree replacement objectives would continue to be met, there would be a reduction in the number of trees available in harvest units for eventual recruitment as snags. Refer to the *Primary Cavity Excavator* section for a description of potential impacts to future snag habitat.

Low-intensity landscape burning would reduce fuels (slash) created from harvest and thinning activities, and reduce understory vegetation. Prescribed fire could cause mortality of small-diameter conifers and an occasional overstory tree; however, overstory composition would generally be unaffected by low-intensity underburning. Green tree replacements would be expected to remain above objectives after landscape burning.

Cumulative Effects

Past activities, actions, and events in the Kahler analysis area that have affected green tree replacements include timber harvest (9,640 acres commercial thinning, 4,084 acres regeneration harvest, and 4,826 acres overstory removal since 1975), wildfire (Wheeler Point), and insect and disease outbreaks. Past harvest activities have directly affected green tree replacements by reducing stand densities. Some of these harvested acres continue to be deficient in green trees and snags due to past harvest methods and the time that has passed since these stands were treated. Past wildfire caused heavy overstory mortality in the western portion of the analysis area, affecting snag dynamics. There is a considerable lag time between when fire-created snags fall and when the regenerating stand contains large enough trees to produce effective snags. Insect outbreaks (spruce budworm) have resulted in varying levels of mortality in grand fir and Douglas-fir in some stands within the analysis area; generally green tree replacements are available in these stands. These activities have combined to create the existing condition of green tree replacements in the analysis area.

There are no ongoing or reasonably foreseeable future activities, actions, and events in the analysis area with a potential to affect green tree replacements.

When the expected effects of these alternatives are combined with the residual effects of past activities, actions, and events, there would be no cumulative increase in acres below green tree replacement objectives.

Downed Wood Habitat

No Action

Direct and Indirect Effects

Over the next five years, dead downed wood would continue to occupy the analysis area at or near the current density in the dry upland and moist upland forest potential vegetation groups. Over the next five to fifteen years, falling snags would be the primary factor contributing to the recruitment of downed wood habitat, potentially increasing downed wood densities across the analysis area. In the long term, stands would continue to develop multi-layered conditions, resulting in stress and competition for resources. Potential increases in the incidence of insects and disease would cause mortality in these stands, increasing potential standing and downed wood, and the risk of high-severity wildfire. Large-scale, high-severity wildfire would reduce

downed wood densities in the short term by consuming downed wood. Downed wood would eventually increase as snags created by a fire of this type began to fall. After a series of continued disturbances on the site, downed wood densities would likely fall below the Forest Plan standard because of the diminished source of green trees and snags. Replacing the downed wood component after a series of disturbance events could take up to 80 to 100 years to develop replacement trees greater than 12 inches DBH, depending on growing conditions and other factors.

Common to All Action Alternatives

Direct and Indirect Effects

Proposed commercial harvest, non-commercial thinning, shrub-steppe enhancement treatments, burning of activity and natural fuels, and temporary road construction under each of the action alternatives would have the same effects on downed wood habitat; the extent of these activities would vary by alternative. Since downed wood would be impacted in proposed treatment units by machinery use, activity fuels treatment (if necessary), landscape underburning, and indirectly through hazard/danger tree felling, it stands to reason that an increase in the acres and miles impacted by these activities would have a greater impact on downed wood.

Proposed commercial and non-commercial thinning and shrub-steppe enhancement treatment would not directly reduce large (>12 inches) downed wood densities because downed wood would not be harvested or removed from treatment units. Where concentrations of small diameter downed wood are present and would increase fire risk to residual vegetation, some small diameter downed wood may be removed. Indirectly, dead wood (>12 inches) may be affected by harvest operations (skidding, skid trails, landings, etc.) in proposed units. Downed wood may be moved, cut into pieces, or broken apart as a result of harvest activities. Downed wood that meets individual size requirements (>12 inches small end diameter and >6 feet long) and overall densities that minimally meet the levels prescribed by the Forest Plan would be maintained in treatment units as singles, groups, and piles, where available. Where no downed wood >12 inches is available, smaller material would be maintained to meet the intent of the minimum Forest Plan standards. Mechanical activity fuels treatment (mastication), if necessary, would not affect the density of existing downed woody material. Only harvest-created debris would be affected by this activity.

Under both of the action alternatives, approximately 31,000 acres would be burned over a period of 5 to 10 years. For this reason, the impacts associated with burning would be virtually the same for Alternatives 2 and 3; any differences between alternatives are described in individual alternative discussions. Burning treatments have the potential to affect downed wood retained after vegetative treatment. Burning would occur in either the spring or fall. The timing of burning largely depends on burn windows associated with weather and fuel moisture. Fuel moisture and weather would be used to create a low-intensity underburn that would blacken approximately 50% to 75% (average 70%) of burn acres. Wood in later stages of decay and fine woody material would be the most likely to be consumed by burning. The potential for consumption of larger diameter material would be greater during fall burning, when the moisture of downed material is the lowest. Design criteria (PF1, PF2, and PF3) would be implemented to reduce impacts to downed woody material. Underburns would also be expected to create snags within the burn area, partially compensating for wood lost to burning in the short and mid-term. Due to the fact that impacts to downed wood are expected to be relatively minor in commercial thin, shrub-steppe, and non-commercial thin units and consumption of larger diameter downed wood during burning is also expected to be minimal, it is unlikely that wildlife requiring large downed wood would be appreciably impacted. Primarily wood in later stages of

decay, and smaller diameter, fine material would be affected by these activities. While charring of downed wood may impact the availability of potential prey (i.e. ants) to some degree, burning would also result in the immediate and delayed mortality of some live trees. Insects would colonize these trees and provide foraging opportunities for some species, particularly insectivorous birds (i.e. woodpeckers and Neotropical migratory birds). Based on research, it is expected that as much as 5% of large trees and 14% of all live trees (Thies et al. 2008) may be killed by prescribed fire; given design criteria and the structure and composition of post-harvest stands that will be burned, it is expected that mortality in the Kahler area would be less than levels reported by Thies and others (2008).

Danger tree felling along roads used for harvest would also indirectly impact future downed wood densities by removing dead and structurally deficient trees that would be expected to fall to the ground in the short and mid term. It is not expected that this activity would appreciably impact downed wood densities at the analysis area scale due to the amount and location of the areas that would be impacted. The areas affected by this activity would be relatively narrow, and situated along roads, where standing and downed wood densities are generally lower due to firewood cutting and past danger tree abatement activities. Road construction (temporary and new system road) generally would not result in reductions in downed wood. These temporary roads are generally located in existing man-made and natural openings. Downed wood may be crushed or pushed out of the road prism to allow for this activity, but it would not be removed.

The proposed treatment activities would reduce the density of standing green trees, which would in turn reduce stress and resulting density-dependent mortality (insects, disease, etc.). Reductions in these agents would reduce mortality in treated stands, ultimately reducing snag recruitment and downed wood levels in these stands. As downed wood habitat was not modeled into the future, the degree to which this would occur is unknown.

Downed wood densities are expected to meet or exceed Forest Plan standards in the dry upland forest PVG within treatment units under Alternatives 2 and 3 following vegetative treatment and burning. Design element WL1 prescribes higher levels of downed woody material retention than minimum levels provided by the Forest Plan; these levels would be met (where material is available) following implementation.

Cumulative Effects

Past activities and events in the Kahler analysis area that have affected downed wood include insect and disease outbreaks, timber harvest and fuels treatment, wildfire, fire salvage, underburning/site-prep burning, and personal-use firewood collection. Insect outbreaks in the late 1980s and early 1990s have contributed to downed wood densities in portions of the analysis area. Overstory vegetation in portions of the analysis area (primarily overstocked dry upland forest stands and pockets of moist and cold upland forest) was killed by spruce budworm infestations. Downed wood densities well in excess of the Forest Plan standards are available in some areas. Past harvest activities affected downed wood densities by removing or piling and burning dead wood within treatment units prior to the existence of Forest Plan standards. Activity fuels burning after harvest (and other underburning) also impacted downed wood densities to varying degrees. Fuels treatment activities in the Wildcat II planning area have impacted downed wood densities in stands impacted by the spruce budworm in the 1980s and 1990s. Downed wood was removed to decrease risk of high severity wildfire in these stands. Minimum downed wood standards, with an emphasis on retention of large diameter material, are being met in these treatment units. Underburns generally had minor impacts on dead wood densities due to the timing and weather conditions that existed during burning. Wildfire

(Wheeler Point, Monument Complex, and Sunflower) within the project area generally consumed downed wood within affected areas, especially small diameter material. While immediate and delayed fire mortality created numerous snags (and eventually downed wood) in the Wheeler Point Fire, the majority of the fire area on NFS lands that was affected by high severity fire was salvaged (2,614 acres). Approximately 250 acres of salvage also occurred in the Monument Fire. Salvage harvest of dead and dying trees impacted future recruitment of downed wood within the fire area and reduced the potential for high density downed wood patches in this portion of the analysis area. The Sunflower Fire (2014) burned approximately 7,200 acres in the analysis area, with the majority burning at a low severity; downed wood recruitment will increase in the years following the fire. Personal use firewood cutting has reduced snag and downed wood densities adjacent to open roads in the analysis area. A reduction in snags adjacent to open roads ultimately reduces future downed wood recruitment. Past activities, actions, and events have combined to create the existing condition of downed wood habitat in the analysis area.

Present and reasonably foreseeable future activities that affect downed wood include firewood cutting, prescribed burning, and fuels treatment activities. The Wildcat II Project would have the same impacts as those described above. While downed wood densities would be reduced, they are expected to meet Forest Plan standards following treatment at both the unit and landscape scales where dead wood is currently available. It is expected that prescribed underburning in the Rim Rock, Sunflower Bacon, and Wildcat II planning areas, as well as the desire to burn the Kahler area on a regular (maintenance) basis, would impact downed wood to some degree, especially in areas where harvest-created slash is present. The burns would largely impact smaller diameter downed wood. Prescribed fires would be timed to create low severity ground fires; as a result, existing larger material would largely be maintained. Firewood cutting impacts future recruitment of downed wood by removing standing dead trees and along roadways. Relatively few snags and downed logs of desirable firewood species are present along some roads in the analysis area due to firewood cutting and the natural growing potential of some areas.

When the expected effects of these alternatives are combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be an incremental reduction in downed woody material in the project area in the short and mid-term. This would be the result of underburning, hazard/danger tree felling (and removal of those danger trees <20 inches DBH along existing and temporary roads), and reduced recruitment of dead wood following treatment. The impacts associated with the proposed activities are expected to have minor impacts on downed wood habitat. Because snags would be minimally impacted, green tree replacement objectives met, and burning would be low intensity, Forest Plan downed wood standards are expected to be met (where material is currently available and meeting standards) at the stand and landscape scale following treatment. In the long term, the amount and intensity of treatment that would be applied to the Kahler Project area, when combined with future burning in the Kahler area (maintenance burning on a 10 to 15 year rotation), may result in downed wood levels that fall below Forest Plan standards for a time. As snag recruitment increases in the long term, downed wood is also expected to rebound.

Management Indicator Species

Rocky Mountain Elk

No Action

Direct and Indirect Effects

In the short term, elk habitat would remain unchanged. The amount of satisfactory and total cover and the HEI value in the E1 East, E1 West, and C3 management areas would remain the same in the short term. In the mid and long term, stands would continue to grow, recover from past disturbance, and develop a multistory structure, increasing the amount of total cover in the E1 and C3 management areas to a small degree. Satisfactory and total cover levels in the C3 management area would approach Forest Plan standards in the long term as stands regenerate from past disturbance and stands develop in the absence of fire. In the mid and long term, HEI in the E1 East, E1 West, and C3 management areas would likely increase as the cover-to-forage ratio increases, and the distribution of cover and forage across these management areas changes.

An increase in cover and multi-layer condition would increase the risk of high-severity wildland fires and insect or disease outbreaks. A disturbance event similar to the Wheeler Point or Monument Fire is possible given that the stands proposed for treatment have similar vegetative conditions. A fire of this type would result in a reduction of total cover and satisfactory cover in the analysis area, and an increase in foraging habitat. If a fire of this type occurred in the E1 or C3 management area, HEI would decrease due to an increased abundance of forage habitat and a reduction in cover. Elk populations would likely decrease (due to a redistribution of the population within their range, not direct impacts of a fire to individuals) soon after a disturbance such as this, but would increase in response to forage created by the fire. Open road densities are not expected to change in the short or long term.

Common to All Action Alternatives

Direct and Indirect Effects

Vegetation that provides elk habitat would be treated by both of the action alternatives. Table W-09 shows post-treatment HEI and cover levels under Alternatives 2 and 3. While HEI would continue to meet Forest Plan standards in the E1 East, it would fall below the Forest Plan standard in the E1 West under these alternatives. In the C3 management area, satisfactory cover, total cover, and HEI would be reduced further below Forest Plan standards under these alternatives. Forest Plan amendments would be required to implement the proposed activities in the E1 West and C3 management areas. These amendments would change the standards for total cover, satisfactory cover, and HEI to the post-treatment levels described below in Table W-09 for the duration of the project. Refer to the individual alternative discussions below for specific impacts related to the activities proposed under these alternatives.

Table 4-52 Post-harvest condition of Rocky Mountain elk habitat in the Kahler analysis area.

Management Area	HEI	% Satisfactory Cover	% Total Cover
C3 – Monument and Kahler			

Winter Ranges, combined			
Existing Condition/No Action	58	1.5	13.9
Alternative 2 (Proposed Action)	57	1.4	12.9
Alternative 3	57	1.4	13.0
E1 East – Timber and Forage			
Existing Condition/No Action	55	1.3	28.6
Alternative 2 (Proposed Action)	51	0.5	8.2
Alternative 3	52	0.6	11.2
E1 West – Timber and Forage			
Existing Condition/No Action	30	0.0	4.9
Alternative 2 (Proposed Action)	29	0.0	1.4
Alternative 3	29	0.0	2.2

Dark-gray shaded fields indicate values below Forest Plan standards.

Dense stands (cover) are selected by elk for bedding and escape from predators or other disturbances. Cover stands are also used for foraging. Cover is evaluated as a component of HEI; however, evaluation of impacts to the availability and distribution of cover habitat across a planning area can be helpful in determining potential impacts to elk distribution. Table W-10 shows impacts to cover habitat under the action alternatives.

Table 4-53 Impacts to cover habitat by alternative

Management Area	Key Indicators	Alternative		
		1	2	3
C3	Satisfactory cover converted to forage (acres)	0	93	93
	Marginal cover converted to forage (acres)	0	599	512
E1 East	Satisfactory cover converted to forage (acres)	0	111	91
	Marginal cover converted to forage (acres)	0	2,654	2,258

E1 West	Satisfactory cover converted to forage (acres)	0	0	0
	Marginal cover converted to forage (acres)	0	237	184

Commercial thinning (with skips and gaps) would reduce stand densities and increase sight distances in cover stands under all of the action alternatives. Commercial thinning (ground based, skyline, and helicopter) would convert cover stands to foraging habitat. Refer to Table W-10 above for the impacts of the alternatives on existing cover habitat. Approximately 10 to 15% of commercially thinned stands would be retained in untreated skips. These skips would generally be small (0.5 acres up to several acres), with a few larger. They would largely not provide effective cover, but would help in reducing sight distances in treated stands to some degree. Prior to treatment, elk would have used these areas for bedding during the day, and hiding cover to escape predators or other disturbances. Reduced stem densities, reduced small-diameter conifer patches (hiding cover), and stand complexity resulting from commercial thinning would alter elk distribution in the project area in the short and mid-term. Elk would be less likely to linger in these stands because they would be more visible, especially where treated stands are adjacent to roads. Elk would be more vulnerable to hunting due to increased sight distances. At the scale of the Heppner and Fossil Big Game Management Units, population level impacts would not be measurable. Given the already low cover levels in the project area, elk would likely spend less time on public (National Forest System) lands following treatment. The degree to which this may occur would vary by alternative based on acres of cover converted to a forage condition and other activities that would reduce disturbance and elk vulnerability (i.e., road closures). Forage would be stimulated by thinning activities (and accentuating existing openings with gaps) that open up closed canopy dry upland forest stands. Forage improvement would largely be realized in the spring and early summer; more open stand conditions would likely accelerate the curing out of vegetation in treated stands. Cover stands and other untreated, dense stands (riparian areas, dry and moist upland stands) would continue to provide green forage in the summer and early fall; elk may use these stands earlier due to accelerated curing of vegetation in treated stands.

Shrub-steppe enhancement treatments would also reduce stand densities. This treatment would thin and/or remove invading conifers (young juniper, ponderosa pine, Douglas-fir, etc.) from historically open shrublands, grasslands, and open woodlands to improve upland shrub vigor and recruitment. This activity would also make elk more visible; however, winter and spring forage would improve in response to these treatments. Alternatives 2 and 3 would non-commercially thin and enhance shrub-steppe habitat on the same number of acres. As a result, the impacts associated with these activities would be the same under these alternatives.

Non-commercial thinning (NCT) would reduce small-diameter tree densities in past harvest units and other areas where conifer encroachment (in the absence of fire) has occurred. Sight distances would increase and hiding cover would decrease as a result of this activity. Vulnerability of elk would increase, especially where NCT units are adjacent to open roads. Non-commercial thinning would also occur in some commercial thin units; vulnerability would increase the most on these acres because they would have the greatest impact on low-level cover and increase in sight distances. Maintenance of untreated islands of regenerating conifers within non-commercially thinned stands (Design Criteria WL14) would reduce potential impacts to some degree. Removal of a portion of the small-diameter trees in these stands would stimulate grass and forb growth where overstory canopy closure allows, improving forage for elk.

The proposed activities have the potential to affect elk calving habitat through the disturbance of understory vegetation and downed wood used for cover during calving season. Spring burning would generally be limited to activity fuels treatment. As a result, the potential to disturb calving activities would be quite low. Fall burning has the potential to impact low vegetation and downed wood potentially used for cover. Low-intensity underburning would consume accumulated small-diameter litter, dead vegetation and grass, and logging slash. Larger diameter downed wood may also be impacted; however, fuel moisture, weather, and careful application (hand, ATV torch, or helicopter) of fire by experienced personnel would combine to limit charring and consumption of these habitat features. It is not expected that treatment activities would negatively impact calving habitat or result in reductions in calf survival due to the availability of untreated areas (unburned habitat adjacent to active burn units) in the project area, and the fact that only a portion of the acres within the burn blocks (average approximately 70%) are expected to be blackened. Burning proposed in all action alternatives would have neutral or beneficial effects on elk cover and foraging habitat. Growth of grasses and forbs would be stimulated by burning, improving forage conditions for elk in the short term, especially during the spring and early summer (Long et al. 2008). Low-level cover provided by shrubs and small diameter trees may be reduced in the short and early mid-term, but would recover over time. The quality of marginal and satisfactory cover would not be affected by low-intensity underburning due to the fact that overstory vegetation generally would not be impacted (Harrod et al. 2009). Design criteria would be implemented to reduce potential impacts to cover habitat. Burning would occur over a 5 to 10 year period; as a result, fall and winter forage for big game would be available and well distributed through the project area.

Use of the road system, particularly closed system roads, would increase road-related disturbance in the project area. Elk would likely avoid these roads during implementation in favor of areas with fewer disturbances. After implementation, these roads would be closed with the existing closure device (sign, gate, or barricade). Because these roads would be cleared, the potential for non-permitted OHV use would increase following implementation. Temporary road construction, new road construction (0.3 miles that would be closed year-round), and use of these roads would cause disturbance and result in potential non-permitted use. Temporary roads would be decommissioned to the greatest degree possible following implementation. In addition, existing temporary roads that are added back into the road system (all would be closed to motorized travel year-round) would be blocked, barricaded, and/or signed to reduce the risk of non-permitted use. All of the action alternatives would reduce road related disturbance to some degree though the closure of open forest roads. Miles of temporary road, closed roads used, haul routes, and proposed road closures will vary by alternative. Refer to individual alternative descriptions for specific details related to these activities.

Tables 4-55, 4-56, and 4-57 below show the post-implementation (vegetative treatment and road closure) availability of habitat greater than 0.5 miles from open roads. Under Alternatives 2 and 3, there would be varying levels of security habitat available in the analysis area. Refer to individual alternatives discussions for a full discussion of this road proximity analysis.

Table 4-54 Post treatment road proximity analysis: habitat greater than 0.5 miles from open roads in the E1 Management Area (West).

Alternative	Forage* (acres)	Marginal Cover (acres)*	Satisfactory Cover (acres)*
Existing Condition/No Action	80	0	0

Alt 2 (Proposed Action)	165	0	0
Alt 3	175	9	0

***Includes impacts associated with vegetative treatment under the Kahler Project**

Table 4-55 Post treatment road proximity analysis: habitat greater than 0.5 miles from open roads in the E1 Management Area (East).

Alternative	Forage* (acres)	Marginal Cover (acres)*	Satisfactory Cover (acres)*
Existing Condition/No Action	648	327	0
Alt 2 (Proposed Action)	1,418	89	0
Alt 3	1,434	179	0

***Includes impacts associated with vegetative treatment under the Kahler Project**

Table 4-56 Post treatment road proximity analysis: habitat greater than 0.5 miles from open roads in the C3 Management Area (within the Project Area).

Alternative	Forage* (acres)	Marginal Cover (acres)*	Satisfactory Cover (acres)*
Existing Condition/No Action	4,004	492	152
Alt 2 (Proposed Action)	4,511	283	87
Alt 3	4,415	368	87

**Includes impacts associated with vegetative treatment under the Kahler Project*

Overall, Tables 4-55, 4-56, and 4-57 indicate that there would be an increase in total acres (forage and cover combined) that are greater than 0.5 miles from an open road in the C3, E1 West, and E1 East management areas within the project area (C3 acres here do not extend outside the project area as it did in the HEI analysis). This increase would be due to road closures that would be implemented under Alternatives 2 and 3. Increased forage that is distant from open roads would improve late spring and early summer forage for elk by reducing motorized disturbance and access in these areas. While the acres of forage greater than 0.5 miles from an open road would increase, the amount of cover greater than 0.5 miles from an open road would generally decrease under Alternatives 2 and 3 due to effects related to mechanical vegetative treatment. In the late summer and fall, once hunting seasons begin, it would be less likely that elk would linger in these stands. This reduction may contribute to the tendency for elk to move elsewhere (off NFS lands or to National Forest lands outside the Kahler area) during the late summer and fall during high disturbance periods (hunting seasons). As these levels vary by alternative, refer to individual alternative discussions for details.

Cumulative Effects

Past activities and events in the analysis area that affected elk habitat include timber harvest (commercial thinning, overstory removal, and regeneration harvest), road construction, road

closures (Access and Travel Management), ATV trail use, wildfire, and livestock grazing. Timber harvest has affected forest structure and composition on approximately 18,550 acres in the project area since the year 1975. Timber harvest (commercial thinning, regeneration harvest, and overstory removal) has occurred on approximately 33,000 acres within the Monument Winter Range (analysis area for C3 management area) since 1980. This figure includes recent treatments under the Falls-Meadowbrook, Rimrock, Sunflower Bacon, and Wildcat II projects. Considerable overlap is present between treatments (e.g. commercial thinning is followed by regeneration harvest on the same acres), so the actual acres affected by these activities would be less. Elk cover habitat was reduced through these activities. Conversely, the amount of foraging habitat for big game has increased in response to past harvest. Timber harvest has also fragmented habitat, creating a mosaic of forested stands and man-made openings. Road construction associated with timber harvest increased road densities and disturbance within the analysis area. Increased open road densities make elk more vulnerable; research has found that they tend to select for habitats further away from open roads. More recently, road closures associated with access and travel management activities on the south end of the Umatilla National Forest (mid-1990s) and prohibition of cross-country ATV travel in the Kahler area (2009) have reduced road densities and disturbance. ATV trail construction and trail designation on closed system roads has resulted in disturbance during the summer riding season and hunting season. Wildfire within the analysis area has impacted elk habitat. The Wheeler Point Fire impacted approximately 6,540 acres of NFS lands in the Kahler analysis area. The Monument Complex Fire also affected elk habitat in the Monument Winter Range. Dense cover habitat was generally consumed in these fires; forage was stimulated, and remains high quality in some areas. Most recently, the Sunflower Fire affected vegetation providing elk cover in the southern portion of the winter range (outside of the Kahler Project Area). Approximately 162 acres of marginal cover lying within the winter range burned at a high or moderate severity. This represents approximately 2% of the cover that is currently available in the Monument Winter Range. It is assumed that immediate and delayed overstory mortality in these stands would convert these stands to a forage condition. As stands in these fire areas are quite dry, they are still very open; little structure capable of hiding a standing elk is available. Historic livestock grazing (sheep and cattle) around the early part of the 20th century negatively impacted range condition in the three allotments that currently lie within the analysis area. Grazing altered the structure and composition of foraging habitat through repeated overgrazing of rangelands. More recent grazing (approximately 1960 to present) ensures a shared allocation of forage between wild and domestic ungulates. Current grazing is consistent with Forest Plan direction, and is meeting Forest Plan utilization and stubble height standards. Past activities have resulted in the current condition of elk habitat in the Kahler analysis area.

Ongoing activities, actions, and events that affect elk and elk habitat include cattle grazing. Current grazing is not adversely affecting rangeland condition or adversely affecting wild ungulate (elk) populations. Livestock grazing still has the potential to compete with big game for forage habitat, particularly when forage is scarce (late summer/early fall). Current allotment management plans balance livestock utilization with big game management objectives, resulting in a shared utilization of the forage resource. Current grazing is consistent with Forest Plan direction and is meeting Forest Plan utilization and stubble height standards.

Reasonably foreseeable future activities, actions, and events that have the potential to affect elk and elk habitat include cattle grazing and prescribed burning. Cattle grazing would have the same effects as those discussed in the present activities section. Prescribed burning in winter range and summer range would generally have beneficial impacts on forage quantity and quality for elk.

When the expected effects of these alternatives are combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be a large cumulative reduction in elk cover habitat under all of the action alternatives. This would be the result of harvest impacts on stand structure, composition, and canopy closure in dry and moist upland forest stands. This incremental reduction in cover would add to past reductions in the project area (and larger winter range area for the C3 Management Area) resulting from timber harvest and wildfire, maintaining or moving some management areas below Forest Plan standards for elk habitat. This cumulative reduction in cover habitat would increase elk vulnerability to hunting and may alter elk distribution at the analysis area scale during the hunting and non-hunting seasons. Road closures proposed under the action alternatives would partially compensate for this loss of cover by cumulatively reducing motorized disturbance in the analysis area. Refer to individual alternative discussions for additional information.

Alternative 2

Direct and Indirect Effects

The effects of this alternative would be similar to those described under *Common to All Action Alternatives*. This alternative would commercially thin (with skips and gaps) the most acres when compared to the other action alternatives. This alternative would also have a larger impact on cover habitat (3,694 acres) than Alternative 3. Of this total, approximately 691 acres occur in C3, 237 acres in E1 (West), and 2,766 acres in E1 (East). In terms of cover availability, this would equate to an 8% reduction in the C3, a 71% reduction in the E1 (West), and a 71% reduction in the E1 (East) area. Cover patches would be less numerous across the landscape and would be smaller when compared to the existing condition. In general, cover patches would be available in riparian areas, C1 old growth stands, and a few untreated moist and dense dry forest patches following implementation.

This alternative would also use the most miles of closed system roads to access proposed treatment units. Approximately 58 miles of closed road would be used under this alternative. This alternative would also require the most temporary road to implement. Approximately 3 miles of new temporary road would be constructed and 7 miles of existing temporary roads would be required for implementation. As a result, short term disturbance to elk in the vicinity of these reopened and temporary routes would be greatest under this alternative. Because this alternative would reopen the most miles of closed road and construct the most temporary road, it would also have the greatest potential for non-permitted OHV use following treatment. Under this alternative, 9 miles of road would be closed year round and 7.5 miles closed seasonally (during the winter period December 1 thru April 14) to mitigate for cover lost through vegetative treatment activities. A portion of these roads pass through or access proposed treatment units; closure of several others would reduce disturbance to big game in the winter range management area and general forest habitat used during the late winter, spring, and early summer. These closures would improve post-treatment elk habitat to some degree by reducing potential disturbance associated with motorized vehicle use.

The road proximity analysis indicates that there would be no change in the availability of satisfactory cover that is greater than 0.5 miles from an open road in the E1 (East and West) management area. In the C3 management area, satisfactory cover greater than 0.5 miles from an open road would decrease from 152 to 87 acres (-43%) under this alternative. There would be no change in the availability of marginal cover that is greater than 0.5 miles from an open road in the E1 (West). Marginal cover greater than 0.5 miles from an open road would drop from 327 to 89 acres (-73%) and 492 to 283 acres (-42%) in the E1 (East) and C3 management areas,

respectively. In the E1 (East), E1 (West), and C3 management areas, the availability of forage greater than 0.5 miles from an open road would increase 84%, 100%, and 13%, respectively.

When the impacts to cover habitat, HEI, the road system, and security habitat are combined, Alternative 2 would have the most impact on elk and their habitat when compared to the other alternatives. Alternative 2 would impact the most acres of cover, result in the greatest reduction in security habitat (cover), and reduce disturbance to a lesser degree than would Alternative 3. Reductions in cover availability, security habitat (cover), and the availability of spring and summer forage would likely impact the distribution of elk. In the late winter, spring, and early summer, the improvement in the quality and quantity of forage resulting from vegetative treatment and burning and road closures (seasonal and year-round) would improve elk distribution and may pull elk off of adjacent private lands. Elk would likely be concentrated in and around untreated cover stands and riparian areas where green, nutritious forage is present in the late summer. With the onset of fall hunting seasons (high disturbance period starting in late August), it is likely that elk would spend a greater proportion of their time, and longer periods of time, on private lands adjacent to the Forest, or on NFS lands adjacent to the Kahler Project area due to reductions in cover in the project area.

Alternative 2 would require a site-specific, non-significant Forest Plan amendment to treat cover habitat in the E1 (West) and C3 management areas. In the C3 management area, the total cover, satisfactory cover, and HEI standards would be amended to the post treatment levels of 12.9%, 1.4%, and 57 for the duration of the Kahler Project. In the E1 (West) management area, the HEI standard would be amended to the post treatment level of 29 for the duration of the Kahler Project. The direct and indirect effect of the amendment is that elk habitat quality would be reduced further below existing Forest Plan standards, with consequent changes in elk distribution described above.

Cumulative Effects

The cumulative effects of this alternative on elk and elk habitat would be similar to those described under *Common to All Action Alternatives*. When the expected effects of Alternative 2 are combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be an incremental reduction in cover that would add to past reductions in the project area resulting from timber harvest and wildfire. Impacts to elk cover, elk vulnerability, and elk distribution in the short and early mid term would be the greatest under this alternative. Given the already low cover values and HEI in a portion of the analysis area, further reduction of cover under this alternative would result in shifts in the distribution of elk during the summer and fall hunting season. Elk would likely spend more time in the remaining dense dry and moist upland forest patches that persist following implementation. These stands would generally be situated along streams (RHCAs), in Dedicated Old Growth stands, or in the few dense moist and dry upland forest stands dropped during project development. When disturbed, it is likely that elk would move off of NFS lands more often and for longer periods of time, largely due to a lack of stands where they can feel secure when confronted with a disturbance (i.e. motorized vehicles, hunters, etc.).

Forest Plan Consistency

Because Alternative 2 would reduce cover habitat for elk, the overall direct, indirect and cumulative effects would result in a negative habitat trend at the Forest scale. At the Forest scale, cumulative impacts associated with implementation of Alternative 2 would not result in short or long term population reductions due to the size of the affected area. While this alternative would require a Forest Plan amendment to meet silvicultural goals of moving the

analysis area toward the HRV for the structure and composition of dry upland forest vegetation, it would provide for a relatively high level of HEI in the C3 and E1 (East) management areas, and would contribute toward meeting the numerical management objectives of the Oregon Department of Fish and Wildlife, which are well in excess of minimum viable populations. Thus, the continued viability of elk is expected on the Umatilla National Forest, and hunting opportunities will be available at similar levels to those currently available in the Heppner and Fossil Management Units. The Forest Plan would be amended to permit treatment of satisfactory and marginal cover and to reduce HEI. This would be consistent with the overall goals of the E1 management area, which are to emphasize production of wood fiber (timber) and encourage forage production (USDA 1990, pg 4-178). This alternative would also be consistent with the goals of the C3 management area, which are to provide high levels of potential habitat effectiveness and high quality forage for big game species.

Alternative 3

Direct and Indirect Effects

The effects of this alternative would be similar to those described under *Common to All Action Alternatives*. This alternative would commercially thin fewer acres than Alternative 2. Alternative 3 would convert approximately 3,138 acres of cover to forage. Of this total, approximately 605 acres occur in C3, 184 acres in E1 (West), and 2,349 acres in E1 (East). In terms of cover availability, this would equate to an 7% reduction in the C3, a 55% reduction in the E1 (West), and a 61% reduction in the E1 (East) area. Cover patches would be less numerous across the landscape and would be smaller when compared to the existing condition. Cover patches would be available in riparian areas, C1 old growth stands, untreated moist forest stands, and dense dry forest patches distributed through the analysis area. Retention of dense dry upland forest stands (often these are associated with water and springs) distributed across the landscape would provide for areas where elk would be able to escape during high use periods (i.e. hunting seasons), and provide green, palatable forage in the late summer. This alternative would also retain several units in the Wheeler Point burn that are providing structure in the middle of the otherwise open burn area. While these areas do not currently provide marginal cover, they will in the mid and long term.

Under this alternative, 9.9 miles of road would be closed year round (slightly more than Alternative 2) and 5.7 miles closed seasonally (less than Alternative 2) to partially compensate for cover lost through vegetative treatment activities. A portion of these roads pass through or access proposed treatment units; closure of several others would reduce disturbance to big game in the winter range management area and general forest habitat used during the winter and early spring. These closures would improve post-treatment elk habitat to some degree by reducing potential disturbance associated with motorized vehicle use in winter range and summer range/general forest. A portion of the proposed seasonal road closure on the 2408-020 road would be dropped under this alternative due to the fact that it would not occur in winter range habitat; year round closure of the last 0.5 miles of this road would improve post-treatment habitat conditions for elk due to the proximity of treatment units in this area. This alternative would utilize 4.7 fewer miles of closed roads (53.5 miles total), 1.6 fewer miles of existing temporary road (8.4), and the same miles of new temporary road construction. As a result, the direct and indirect effects on elk resulting from road use and construction and potential non-permitted OHV use would be less than those under Alternative 2.

The road proximity analysis indicates that Alternative 3 would provide the same number of acres of satisfactory cover greater than 0.5 miles from an open road as Alternative 2. Alternative 3

would provide more acres (+9, +90, and +85 acres in the E1 West, E1 East, and C3 areas, respectively) of marginal cover greater than 0.5 miles from an open road than Alternative 2. Alternative 3 would provide more acres of forage (+10 west, +16 east) in the E1 and fewer acres of forage (-96) in the C3 that are distant from open roads. These differences are largely due to acres dropped from treatment and to a lesser extent additional road closures under Alternative 3. As a result, the expected impacts to elk habitat and elk distribution would likely be less than those expected under Alternative 2.

When the impacts to cover habitat, HEI, the road system, and security habitat are combined, Alternative 3 would have less impact on elk and their habitat than Alternative 2. Alternative 3 would provide larger patches of cover distributed across the landscape, generally result in more acres of security habitat (cover and forage) being available, and reduce disturbance to a greater degree than would Alternative 2. Reductions in cover availability, security habitat (cover), and the availability of spring and summer forage would likely impact the distribution of elk. In the late winter, spring, and early summer, the improvement in the quality and quantity of forage resulting from vegetative treatment and burning and seasonal closure of roads in C3 winter range would improve elk distribution and may pull elk off of adjacent private lands. Elk would likely be concentrated in and around untreated cover stands and riparian areas where green, nutritious forage is present in the late summer. With the onset of fall hunting seasons (high disturbance period starting in late August), it is likely that elk would spend a greater proportion of their time, and longer periods of time, on private lands adjacent to the Forest, or on NFS lands adjacent to the Kahler Project area due to reductions in cover in the project area. The greater availability of cover stands under this alternative would provide more area than Alternative 2 in terms of hiding and escape cover.

Alternative 3 would require a site-specific, non-significant Forest Plan amendment to treat cover habitat in the E1 (West) and C3 management areas. In the C3 management area, the total cover, satisfactory cover, and HEI standards would be amended to the post treatment levels of 13.0%, 1.4%, and 57 for the duration of the Kahler Project. In the E1 (West) management area, the HEI standard would be amended to the post treatment level of 29 for the duration of the Kahler Project. The direct and indirect effect of the amendment is that elk habitat quality would be reduced further below existing Forest Plan standards, with consequent changes in elk distribution.

Cumulative Effects

The cumulative effects of this alternative on elk and elk habitat would be similar to those described under *Common to All Action Alternatives*. When the expected effects of Alternative 3 are combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be an incremental reduction in cover that would add to past reductions in the analysis area resulting from timber harvest, wildfire, and other activities. The expected impacts to elk cover, elk vulnerability, and elk distribution would be less under this alternative than Alternative 2. While elk would still be likely to move off NFS lands (or at least out of the project area) more often and for longer periods due to low cover levels and motorized disturbance, the retention of larger cover patches distributed across the landscape under Alternative 3 would provide for areas where elk could feel secure during high use periods like hunting season. This alternative would have the most impact on potential motorized disturbance by closing 9.9 miles of year-round open road.

Forest Plan Consistency

Because Alternative 3 would reduce cover habitat for elk, the overall direct, indirect and cumulative effects would result in a negative habitat trend at the Forest scale. At the Forest scale, cumulative impacts associated with implementation of Alternative 3 would not result in short or long term population reductions due to the size of the affected area. While this alternative would require a Forest Plan amendment, it would provide for a high level of HEI in the C3 and E1 (East) management areas, and would contribute toward meeting the numerical management objectives of the Oregon Department of Fish and Wildlife, which are well in excess of minimum viable populations. Thus, the continued viability of elk is expected on the Umatilla National Forest, and hunting opportunities will be available at similar levels to those currently available in the Heppner and Fossil Management Units. The Forest Plan would be amended to permit treatment of satisfactory and marginal cover and to reduce HEI. This would be consistent with the overall goals of the E1 management area, which are to emphasize production of wood fiber (timber) and encourage forage production (USDA 1990, pg 4-178). This alternative would also be consistent with the goals of the C3 management area, which are to provide high levels of potential habitat effectiveness and high quality forage for big game species.

Primary Cavity Excavators

No Action

Direct and Indirect Effects

Within the next five years, dead standing trees (snags) would continue to occupy the project area at current densities and size classes, barring disturbance such as a large scale, high severity wildfire. Although snags would continue to be lost and created on the landscape in the short term, the existing snag density distribution in the Kahler Analysis Area (See Figures W-03, W-04, W-05, and W-06 in the Terrestrial Wildlife Report) would not be expected to change in this short timeframe.

In the mid and long term (5 to 15+ years), existing snags would decay and fall to the ground, increasing downed wood in the analysis area. In the mid and long term, snag densities have the potential to increase in the analysis area through naturally occurring (background) mortality and mortality caused by insect and disease outbreaks and wildfire. As previously managed stands grow, naturally occurring mortality would reduce the proportion of stands with zero to few snags at the Analysis Area and Forest scale. Mortality caused by insects and disease would be patchy, creating small to moderately sized “islands” with high densities of snags in the early stages of decay. These islands would provide habitat for primary cavity excavators (e.g., black-backed woodpecker, three-toed woodpeckers, and Lewis’ woodpecker) and other wildlife that require pulses of high-density snags. These events would contribute to high fuel loading in some areas (generally isolated moist and cold upland forest stands, and dense dry upland forest stands), and increase the risk of high-severity wildfire. Snag densities would initially increase due to fire-caused mortality; species that show an affinity for post-fire conditions (e.g., black-backed, three-toed, and hairy woodpeckers) would benefit in the short term following this type of event. Ultimately, snags resulting from this event would fall and snags would be relatively scarce until the regenerating stand becomes old enough to produce large trees, a time period ranging from 80 to 100 years. Continued fire suppression would exacerbate the change in the context of snag habitat from more open stands to closed canopy, multiple-layer stands. Under the no action alternative, species requiring snags in open forests would have less available habitat; those desiring large snags in more dense stands would benefit (in the absence of large scale fire).

Common to All Action Alternatives

Direct and Indirect Effects

Proposed commercial harvest (with skips and gaps), shrub-steppe enhancement treatments, burning, new system road construction, road use (open, closed, seasonal, and existing temporary roads), and temporary road construction activities would have the same effects on snag habitat; the extent of these activities would vary by alternative, however. Since snags would potentially be lost in proposed treatment units from hazard/danger tree felling, temporary road construction, and landscape burning, and in the future through a reduction in density-dependent mortality, it stands to reason that an increase in acres treated or burned, and miles of road impacted (used, constructed) by these activities would have a greater impact on snags, and potentially the species that depend on these habitat features.

Under Alternatives 2 and 3, proposed commercial thinning (with skips and gaps) and shrub-steppe enhancement treatment would target green trees for removal to meet silvicultural and wildlife habitat goals for structure and composition. Snags would not be felled in proposed commercial thinning or shrub-steppe enhancement units unless they pose a danger to operators (See Chapter 2, Project Design Criteria); as a result, snags would be maintained to the greatest extent possible (given safety constraints). Potential primary cavity excavator roosting, foraging, and nesting habitat would be lost to provide for safety within treatment units. If snags are felled within treatment units, they would largely be left in place to provide dead downed wood habitat (See Chapter 2, Project Design Criteria). Those less than 12 inches DBH would be permitted for removal only when downed wood densities in a unit meet or exceed levels prescribed in the Project Design Criteria. Monitoring of impacts to snags in timber harvest units on the south end of the Umatilla National Forest has found that danger tree felling impacts a small percentage of the existing snags within commercially treated stands. Monitoring elsewhere on the south end of the Forest indicates that between 4% and 6% of the existing snags within treatment units are felled as hazards (Scarlett 2011). It is expected that a similar level of impact (associated with hazard tree felling) to snags would occur in the Kahler Project Area due to the fact that similar stands (in terms of composition and structure) are being treated. The impact associated with hazard tree felling would not be expected to appreciably change the abundance or density of snags in treatment units, the availability of habitat meeting the 80% tolerance level (for snags ≥ 10 and ≥ 20 inches in either the Ponderosa pine/Douglas-fir or Eastside Mixed Conifer/Blue Mountains habitat types), or the distribution of snag density classes at the analysis area or Forest scale. It is expected that stands that are currently meeting or exceeding Forest Plan minimum standards for snag density will continue to do so following treatment.

Commercial thinning (with skips and gaps) would alter the effectiveness of available snag habitat because the context of these stands would change from a closed canopy to a more open setting. In general, managing forests within or towards the historical range of variability should provide habitat for a wide range of cavity excavator species. Commercial thinning would generally occur in dry upland forest stands where open conditions are more representative of the historic condition. These changes would benefit species like the white-headed woodpecker, Lewis' woodpecker, northern flicker, and pygmy nuthatch. Species associated with closed canopy forest that are using dry sites to a greater degree as a consequence of past fire suppression and the resulting ingrowth of shade tolerant tree species (e.g., pileated woodpecker and Williamson's sapsucker) would be less likely to use these stands even though potential nesting, foraging, and roosting structures (snags) would largely be maintained. While habitat for dense-forest associated species would be reduced in the near term, untreated moderate to high density areas, including riparian areas, C1 old growth, some moist and cold upland forest stands,

and other areas dropped from consideration for treatment during project development would be available for these species. These dense forest stands would provide habitat for a variety of dense-forest associated wildlife species, and would provide for abundant dead wood recruitment in the future. Treatment would promote increased growth rates in residual trees by reducing competition for resources and resulting stress in dense dry forest stands. Studies show a positive growth response in residual stands following restoration thinning treatments in dry upland forest (ponderosa pine) stands (Kolb et al. 2007, Sala et al. 2005, Skov et al. 2005, Feeney et al. 1998). Retention of skips (untreated areas ranging from 0.5 to 2.0 acres and larger, as appropriate) within proposed treatment units would also provide for small patches of dense forest at the stand scale that will provide for higher density-dependent mortality than the surrounding heavily-thinned dry forest matrix.

In the mid and long term, the recruitment of snags would likely be reduced as a consequence of thinning of live trees in dense forested stands (reduced density-dependent mortality). As existing snags within affected stands age and fall, recruitment of new snags may be inadequate to maintain snag densities in treatment units above Forest Plan minimum standards in the long term. For both size classes of snags modeling indicates that burning would increase snag densities, especially the density of smaller snags, in the period immediately following this activity (approximately year 2025). Modeling of snags ≥ 10 inches DBH indicates that in chosen units snag densities would fall after this initial increase in treated stands for a period of years prior to increasing. In several of the modeled stands, average densities (weighted) were projected to fall below the Forest Plan standard for several decades (approximately 2045 to 2065) before increasing. In others, this trough was projected to be less deep and have a shorter duration; snag densities were projected to meet or exceed those projected for “no treatment” stands prior to the end of the modeling period. Modeling of snags ≥ 20 inches DBH indicates that in the chosen units, snag densities would continue to meet Forest Plan standards over the modeling period. Following the fire-induced increase, snag densities in several of the modeled units were projected to decrease till about year 2055 when they would increase, in some cases approaching the projected snag densities in “no treatment” runs by 2105. Other modeled stands projected a similar slight increase related to burning, then closely tracked the snag densities projected for “no treatment” runs through the modeling period. Unpredictable events, such as insect and disease activity and fire-related mortality, which are not accounted for in stand models, would likely recruit additional snags above what is projected in the model runs. It is expected that the impacts on future snag recruitment and the snag density distribution at the analysis area scale would be small. It is expected that snag densities at the analysis area scale would continue to meet Forest Plan standards following implementation.

See the Terrestrial Wildlife Specialist’s Report for further descriptions of stand modeling output (pages 67-71).

Although not a purpose and need for action in the Kahler project area, commercial thinning may reduce the susceptibility of treated stands to high severity wildfire and insect infestations/disease. It is not expected that the proposed activities would adversely impact species that rely on these events (e.g., black-backed and American three-toed woodpeckers) due to the fact that the proposed activities are not designed to eliminate fire or other disturbances on the landscape; in fact, the treatment activities in dry forest habitat would aid in reestablishing fire as a management tool in these stands. Small, untreated skips within proposed units and untreated stands elsewhere in the analysis area (primarily riparian areas, C1 old growth, and a few moist and cold upland forest stands) would provide dense, overstocked conditions with a potential to be impacted by high severity wildfire and disease/insect events in the future. These

habitats would also be available at the Forest scale, where over 50% of the land area is composed of unmanaged habitat, including wilderness and inventoried roadless areas.

Use of the road system also has the potential to affect snags potentially used by primary cavity excavators. Danger tree abatement would occur along open, seasonal, closed, new temporary, existing temporary, and new system roads accessing commercial thin and shrub-steppe units; no danger tree abatement would occur along roads used solely to access non-commercial thin units (See Project Design Criteria, EIS Chapter 2). Often those snags that pose a danger along roads are the most valuable to primary cavity excavators due to extensive decay. In the short and mid term, cavity excavators may use the areas adjacent to roads less due to this impact. Due to the linear nature of roads and associated danger tree felling (generally occurring within 150 feet of roads), the impact is not expected to be measureable at the analysis area scale. Large (≥ 20 inch) danger trees that are felled adjacent to roads would be felled and left to provide for wildlife habitat. Temporary roads would generally follow existing openings where possible, so the impact to snags is expected to be minor.

Burning would occur over the entire project area under Alternatives 2 and 3; dense moist forest stands and old growth habitat may be excluded to prevent undesired impacts to vegetation in these areas (see Project Design Criteria). Burning of activity fuels and landscape underburning would be likely to affect a portion of the existing snags on affected acres. Harrod and others (2009) and Hessburg and others (2012) found that thinning and burning treatments and burning only treatments in ponderosa pine/Douglas-fir stands affected primarily smaller diameter snags (those less than 8" to 10" DBH) and snags in late stages of decay. Although more resilient to burning, larger snags were lost (felled by fire) at a modest rate to prescribed burning treatments (Hessburg et al. 2010, Harrod et al. 2009). Losses of snags in burned stands were generally offset or exceeded by new snag creation (Hessburg et al. 2010, Harrod et al. 2009). While largely composed of snags smaller than 10" DBH, a portion of medium (10" to 15.9") and large trees (≥ 16 " DBH) were killed by prescribed fire (2% and 1%, respectively) (Harrod et al. 2009). Thies and others (2008) found that as high as 5% of large trees were killed by fire in dry forest stands. Burning in the Kahler area would be expected to have similar impacts on existing snags and snag recruitment (new mortality). Snag modeling indicates that snag creation (≥ 10 inches DBH) would be greater than snag loss during burning. The mosaic nature of planned low intensity landscape burning and snag modeling results indicate that the impact of landscape burning on snags would be minor. Expected impacts to snag-associated birds (including white-headed and Lewis' woodpecker, pygmy nuthatch, and others in the ponderosa pine/Douglas fir and EMC_ECB forest types) would also be minor. Large snags (≥ 20 inches DBH) would be protected where necessary to ensure that these structure are not lost during burning (see Project Design Criteria). Slash would be pulled away from the base of these snags and they may be scratch lined down to mineral soil if necessary.

Cumulative Effects

Past activities, actions, and events in the Kahler analysis area (Kahler Creek-John Day River, Upper Rock Creek, and Wall Creek watersheds, combined) that have contributed to the existing condition of snag habitat include commercial thinning (approximately 43,466 acres since 1975), regeneration harvest (8,902 acres), and overstory removal (12,858 acres) on National Forest system lands since approximately 1975 (overlap is present on these acres between treatment types), an unknown number of acres of various harvest activities on private and State of Oregon lands, wildfire (including the Wheeler Point, Monument, and Sunflower Fires), fire salvage (approx. 2,864 acres, with most included in commercial thinning acres above), insect and disease outbreaks, danger tree abatement along roads, and firewood cutting. Past harvest and salvage

activities throughout the analysis area have directly affected snag density through the removal of dead standing trees ≥ 10 inches DBH. Some of these harvested acres are currently deficient in snags due to past harvest methods. Past harvest is largely responsible for the existing snag density distribution in the analysis area (see affected environment for the ponderosa pine/Douglas fir and EMC/ECB forest types). These activities also reduced potential recruitment of snags by removing green trees; typically, the largest trees in treatment units were harvested. Past wildfire created snags through direct and delayed fire mortality. Excellent high-density snag patches were created within the Wheeler Point, Monument, and Sunflower Fire areas. Fire salvage subsequently impacted high severity-burned forests; the majority of high mortality areas on NFS lands in the Wheeler Point Fire were salvaged (2,614 acres), while only 250 acres in the Monument Fire area was salvaged. At this time, it is unknown whether salvage would occur in the Sunflower Fire area. Insect outbreaks (spruce budworm) have resulted in high mortality of grand fir and Douglas-fir in some stands within the analysis area, resulting in high quality understory regeneration structure stands with high snag densities. Fuels treatment in the northern portion of the Wildcat II planning area has substantially reduced high snag density habitat in both moist and dry upland forest in the Wall watershed. Danger tree abatement along roads (open and some closed roads) has affected dead standing and green trees that would have become snags in the near future. Past firewood cutting removed snags adjacent to open roads within the analysis area, reducing the density of snags < 24 inches (at stump height) in these areas. Korol and others (2002) noted that management and roads (and associated firewood cutting and hazard tree felling) contributed to large snag declines on Forest Service lands in the Interior Columbia Basin. These activities and events have combined to create the existing condition for snag habitat in the analysis area.

Present and reasonably foreseeable future activities, actions, and events in the analysis area that affect snags include personal use firewood cutting and danger tree abatement along roads, and prescribed fire. Firewood cutting would have the same effects as those described above. Danger tree abatement in the Ditch Danger Tree Project continues along open and closed system roads in the Wall Watershed. When combined with firewood cutting, danger tree felling is significantly reducing existing and future snag densities along roads. Prescribed fire is planned for the Wildcat II, Sunflower Bacon, and Rimrock areas. This activity impacts snags to a small degree; some snags, especially smaller snags and those in later stages of decay are lost, while new snags are created.

When the expected effects of the action alternatives are combined with the residual and expected effects of past, present, and reasonably foreseeable future actions in the analysis area, they would all add to past reductions in snag habitat. The incremental reduction in existing snags that would occur in commercially thinned stands would be small due to the fact that snags would only be felled where they are a danger to operations within units or along roads. At the stand scale, structural habitat (nesting, foraging, and roosting) for primary cavity excavating birds may be reduced slightly in the short and mid term through hazard/danger tree felling. The loss of snags through prescribed burning would also be relatively minor given measures that would be taken to create a low intensity ground fire. New snags created by burning would partially off-set any loss associated with this activity. In the mid and long term, reductions in snag recruitment (through reduced density-dependent mortality) would occur over a large area due to the extent of treatment in the Kahler Project area. It is likely that population levels of some primary cavity excavators (those adapted to higher snag densities in denser stands) would be reduced at this time scale. It is expected that average snag densities at the scale of the Kahler Creek-John Day River, Upper Rock Creek, and Wall Creek watersheds may decrease to a small degree, but would continue to meet Forest Plan standards after treatment. The snag density distribution at the

analysis area scale (for both the Ponderosa Pine/Douglas-fir and Eastside Mixed Conifer/Blue Mountains Forest types) may change slightly. It is expected that there will be slight increases in the proportion of these habitat types in the lower density groups, and slight reductions in the mid-density groups. The analysis area would maintain a snag density distribution that resembles the DecAID reference condition; by doing so, habitat for the primary cavity excavator group will be maintained and will contribute towards the viability of this group at the Forest scale (Landres et al. 1999).

Commercially thinned (with skips and gaps) dry upland forest stands (ponderosa pine/Douglas fir DecAID type), would have a more appropriate structure, composition, and density after implementation, when compared to historic conditions. When this is combined with the reintroduction of frequent low severity fire, it is expected that snag size and density would also be moved toward historic conditions described in DecAID and other science. Treatment activities would also reduce the susceptibility of treated stands to high severity wildfire. The availability of post-fire snag habitat is not expected to be cumulatively reduced due to the fact that fire risk in treated stands would not be eliminated. In addition, areas outside of treatment units (including riparian areas, Dedicated Old Growth, and other areas) would remain susceptible to high severity wildfire due to vegetative structure and composition and disturbance factors such as insects and disease. Potential habitat for black-backed woodpecker, three-toed woodpecker, and other species that utilize burned forests would therefore be maintained at the analysis area and Forest scale.

Alternative 2

Direct and Indirect Effects

The effects under this alternative would be similar to those described under *Common to All Action Alternatives*. This alternative would have the greatest impact on snags and those species that depend on this habitat feature due to the fact that it would impact the most acres when compared to the other alternatives. A total of 11,494 acres would be commercially thinned (with skips and gaps) and treated to enhance shrub-steppe habitat (includes commercial and non-commercial sized material). Impacts to existing snags on these treatment acres units would be entirely due to hazard tree felling and losses to burning that may occur. The snag density distribution at the analysis area scale (for both the Ponderosa Pine/Douglas-fir and Eastside Mixed Conifer/Blue Mountains Forest types) may change slightly. It is expected that there will be slight increases in the proportion of these habitat types in the lower density groups, and slight reductions in the mid-density groups. The analysis area would maintain a snag density distribution that resembles the DecAID reference condition. This alternative would have the greatest long-term impact on future snag densities due to the fact that it would impact stand density on the most acres when compared to Alternative 3.

Danger tree felling along existing open, seasonal, and closed system roads and temporary roads would also contribute to additional loss of snags. Under this alternative, danger tree abatement would occur along 80.4 miles of open road, 58.2 miles of closed road, and 10.0 miles of temporary road (3.0 miles new temp, 6.9 miles existing temp roads). As this alternative would utilize the most miles of open, seasonal, closed, and temporary roads, the expected impact associated with danger tree felling would be the greatest when compared to the other action alternatives. Under this alternative, approximately 9.0 miles of existing open road would be closed to motorized vehicles year round and an additional 7.5 miles closed seasonally (during winter). Dead wood along these roads would no longer be available for firewood gathering, slightly reducing future impacts to dead wood in the analysis area.

Cumulative Effects

The cumulative effects under this alternative would be similar to those described under *Common to All Action Alternatives*. This alternative would contribute the most to past reductions in snag habitat due to the fact that it would treat the most acres of all of the action alternatives. Under this alternative, a large proportion of the forested acreage in the Project Area would be treated. Short and mid term impacts to snag habitat would therefore occur over a large, contiguous area (with small skips). This impact, over such a large area, in a relatively short amount of time may cumulatively impact population levels of some primary cavity excavators, especially those that utilize dense upland forest habitat with high snag densities. While skips would provide for untreated habitat within the larger matrix of heavily thinned stands, these patches would be small, and may not be adequate to compensate for losses in snag habitat (through reduced recruitment) that would occur following treatment. The snag density distribution at the analysis area scale (for both the Ponderosa Pine/Douglas-fir and Eastside Mixed Conifer/Blue Mountains Forest types) may change slightly. It is expected that there will be slight increases in the proportion of these habitat types in the lower density groups, and slight reductions in the mid-density groups. The analysis area would maintain a snag density distribution that resembles the DecAID reference condition.

Forest Plan Consistency

Because the Kahler project (commercial thinning, shrub-steppe enhancement, and burning) would approximately 2% (1% mechanical treatment, 2% low intensity underburning) of the land on the Umatilla National Forest, the overall direct, indirect, and cumulative effects under this project would result in a small negative habitat trend for the primary cavity excavator group. The loss of snags resulting from hazard tree felling in proposed commercial thin and shrub-steppe enhancement units, danger tree felling along roads, reduced recruitment through a reduction in density-dependent mortality, and burning would be minor at the analysis area scale and insignificant at the scale of the Forest. Snag densities in treatment units are expected to exceed Forest Plan minimum standards in the short and mid term. In the long term, snag densities in some treatment units may fall below Forest Plan standards. It is expected that the distribution of snag density classes in the analysis area would be maintained at levels similar to the reference condition provided by DecAID. By providing a distribution of snag density classes that closely resembles the reference condition, it is expected that the analysis area will contribute toward the viability of primary cavity excavators at the Forest scale. The activities proposed under the Kahler Project (Alternative 2) would also move the project area toward the Historic Range of Variability (HRV) for vegetation. By managing habitat for the HRV, it is expected that adequate habitat will be provided for cavity excavating species because these species survived those levels of habitat in the past (Haufler et al. 1996, Agee 2002, Landres et al. 1999). Under this alternative, the Kahler Project would be consistent with the Forest Plan and subsequent direction relating to habitat management, and thus the continued viability of the primary cavity excavator group is expected on the Umatilla National Forest.

Alternative 3

Direct and Indirect Effects

The effects under this alternative would be similar to those described under *Common to All Action Alternatives*. This alternative would have less impact on snags and associated wildlife than Alternative 2 due to reduced treatment acres. A total of 10,662 acres would be commercially thinned (with skips and gaps) and treated to enhance shrub-steppe habitat (includes commercial and non-commercial sized material). Impacts to existing snags on these

treatment acres units would be entirely due to hazard/danger tree felling and losses to burning that may occur. Under this alternative, larger blocks of dense dry forest habitat would be dropped to address a number of issues identified during scoping. This alternative would provide larger skips distributed across the landscape for dense dry forest-associated wildlife; these larger blocks would provide areas where density-dependent snag mortality (primarily insects and disease) would persist. The snag density distribution at the analysis area scale (for both the Ponderosa Pine/Douglas-fir and Eastside Mixed Conifer/Blue Mountains Forest types) may change slightly. It is expected that there will be slight increases in the proportion of these habitat types in the lower density groups, and slight reductions in the mid-density groups. The analysis area would maintain a snag density distribution that resembles the DecAID reference condition.

The expected impact associated with burning would be virtually the same as described under the *Common to All Action Alternatives* section above. The same number of acres would be burned under this alternative as Alternative 2. Prescribed burning impacts on acres dropped from treatment activities under this alternative would have varying effects. As there was no vegetative treatment in these units, there is no harvest-created slash mat that may pose a risk to snags during burning.

Under this alternative, danger tree abatement would occur along 73.9 miles of open road, 53.5 miles of closed road, and 8.4 miles of temporary road (3.0 miles new temp, 5.4 miles existing temp roads) within the analysis area. As this alternative would utilize the least miles of open, seasonal, closed, and temporary roads, the expected impact associated with danger tree felling would be less than that under Alternative 2. Under this alternative, approximately 9.9 miles of existing open road would be closed to motorized vehicles year round and an additional 5.7 miles closed seasonally (during winter). Dead wood along these roads would no longer be available for firewood gathering, slightly reducing future impacts to dead wood in the analysis area.

Cumulative Effects

The expected impact on snags under this alternative would be less than that of Alternative 2 due to a reduction in treatment acres and miles of road used to access units and retention of larger patches of high and moderate density dry upland forest across the landscape. As a result, the incremental effect on snags would be slightly less than under Alternative 2. The cumulative reduction in snags would in turn be less as well; it is not expected that the activities proposed under this alternative would negatively impact primary cavity excavators and their habitat in the long term.

Forest Plan Consistency

Because the Kahler project (commercial thinning, shrub-steppe enhancement, and burning) would impact approximately 2% (1% mechanical treatment, 2% low intensity underburning) of the land on the Umatilla National Forest, the overall direct, indirect, and cumulative effects under this project would result in a negative habitat trend for the primary cavity excavator group. The loss of snags resulting from hazard tree felling in proposed commercial thin and shrub-steppe enhancement units, danger tree felling along roads, reduced recruitment through a reduction in density-dependent mortality, and burning would be minor at the analysis area scale and insignificant at the scale of the Forest. Snag densities in treatment units are expected to exceed Forest Plan minimum standards in the short and mid term. In the long term, snag densities may fall below Forest Plan standards in treatment units due to a reduction in density-dependent mortality in overstocked dry forest stands. It is expected that the distribution of snag density classes in the analysis area would be maintained at levels similar to the reference condition provided by DecAID. By providing a distribution of snag density classes that closely

resembles the reference condition, it is expected that the analysis area will contribute toward the viability of primary cavity excavators at the Forest scale. The activities proposed under the Kahler Project (Alternative 3) would also move the project area toward the Historic Range of Variability (HRV) for vegetation. By managing habitat for the HRV, it is expected that adequate habitat will be provided for cavity excavating species because these species survived those levels of habitat in the past (Haufler et al. 1996, Agee 2002, Landres et al. 1999). Under this alternative, the Kahler Dry Forest Restoration Project would be consistent with the Forest Plan and subsequent direction relating to habitat management; therefore, the continued viability of the primary cavity excavator group is expected on the Umatilla National Forest.

Pileated Woodpecker

No Action

Direct and Indirect Effects

In the short term, pileated woodpecker source habitat would maintain its current quality and extent in the analysis area. In the mid and long term (5 to 15+ years), the structure and composition of pileated woodpecker habitat would change. In this time frame, multi-strata conditions in pileated woodpecker source habitat would continue to develop; stand densities would increase, and locally high concentrations of insects and disease would provide foraging and nesting habitat by creating snags. Young dry and moist upland forest stands in an unsuitable condition for pileated woodpecker foraging or nesting would also develop multi-strata characteristics in the mid and long term, increasing the amount of source habitat in the analysis area and improving its distribution. Higher stand densities and increased standing and downed fuel loads would increase the risk of wildfire in these stands. A high-severity wildfire would change the composition and structure of pileated woodpecker source habitat to an open shrubland/grassland with little or no tree cover and cause fragmentation of existing habitat. Pileated would be unlikely to use these habitats due to their structure and composition. This condition would last for as long as 80-100 years as stands reseeded themselves, and grew into a structural stage and size class that would provide snags large enough for nest cavities and foraging activity.

Common to All Action Alternatives

Direct and Indirect Effects

Dedicated Old Growth (management area C1) habitat would be affected in the vicinity of Tamarack Lookout. Vegetative treatment would occur within 12 acres of existing DOG 1841 to protect the Lookout and other infrastructure from wildfire and clear sight lines from the lookout. These acres would be moved from the C1 management area allocation to the E1 management area allocation under this project; 16 acres adjacent to DOG 1841 would be moved from the E1 management area into the C1 allocation. The replacement acres currently show evidence of pileated woodpecker use, and are similar in structure and composition to those acres adjacent to the lookout that would be treated. As there would be a net increase of 4 acres in the C1 management area, and these acres are similar in structure and composition to those proposed for treatment, it is not expected that this activity will appreciably impact pileated woodpecker that are present in the stand. DOG 1841 would continue to provide for the survival and reproduction of

the pileated woodpecker, and contribute to the viability of this species at the Forest scale. At the scale of the Forest, the dedicated old growth network (size/amount and distribution) would be maintained under both of the action alternatives. As a result, this project would be consistent with Forest Plan direction and guidance for the C1 management area.

Proposed commercial harvest (with skips and gaps), shrub steppe enhancement treatments, burning of activity and natural fuels, and hazard/danger tree felling activities under all of the action alternatives would have the same general effects on pileated woodpecker habitat; only the extent of the various treatments and activities would vary by alternative. Since pileated woodpecker habitat would be impacted by these activities to some extent, it stands to reason that an increase in the acres (or miles) impacted by these activities would have a greater impact on the pileated woodpecker and its habitat.

Snags ≥ 10 inches DBH would not be affected in treatment units except where individual snags pose a hazard to workers. Snags would be retained to the greatest degree possible given safety concerns. Where snags are felled to meet operational requirements for safety, all snags ≥ 12 inches DBH would be left on the ground to contribute toward downed wood densities. Monitoring elsewhere on the south end of the Umatilla National Forest has found that danger tree felling impacts a small percentage (4% to 6%) of the existing snags within commercially treated stands (Wildcat II Timber Sale, Scarlett 2011). Because snag densities would largely be maintained in commercially thinned stands, it is expected that pileated woodpecker would continue to utilize snag and downed wood habitat in these areas following implementation. It is expected that foraging would occur at lower levels than currently may occur due to reductions in canopy closure and complexity; the majority of use would be expected to occur at the fringes of these stands. See the *MIS: Primary Cavity Excavator* section for a full discussion of the impacts of the alternatives on standing dead wood habitat. Refer to Table W-25 for acres of treatment within pileated woodpecker source habitat by treatment type.

Table 4-57 Expected effects on pileated woodpecker source habitat by treatment type.

Alternative	Source Habitat Treated (acres)	Treatment Type	
		Commercial Thinning (with skips and gaps)	Shrub Steppe Enhancement
Alternative 2	2,348	2,328	20
Alternative 3	1,994	1,974	20

It is likely that commercially thinned stands would not be used for nesting after treatment (in the short and early long term) due to reductions in canopy density. These stands would be used less by foraging pileated woodpecker due to this reduction in canopy density and shift in the context of the stand from more dense to more open habitat. After treatment, the structure and composition of these dry forest PVG stands would be more representative of what would have been present historically. In the long

term, treated stands would likely be used for nesting as canopy density increases, larger trees develop, and larger snags and downed wood are recruited. Untreated skips within commercially thinned stands would provide for within-stand heterogeneity and dense pockets where endemic or greater insect and disease may occur. Due to the size of these skips (generally 0.5 to 2 acres with some larger where vegetation and other factors make this appropriate) and the density of the surrounding post-treatment forest matrix, it is unlikely that these skips would be used for nesting. Foraging would likely occur in these patches, especially where they are in close proximity to untreated dry and moist upland forest stands with high canopy closure.

Under both of the action alternatives, ground-based mechanical thinning to improve steppe-shrubland habitat would occur. Shrub-steppe enhancement treatments would impact areas where historic shrublands and grasslands have been encroached by conifers, including juniper, ponderosa pine, and Douglas-fir. These areas would be quite open after treatment; only old, large trees would be retained in the overstory. These areas would not be used for nesting following treatment; potential foraging would likely be greatly reduced in these stands. Approximately 20 acres of source habitat would be affected under Alternatives 2 and 3.

Landscape underburning under Alternatives 2 and 3 would affect snags and downed wood (particularly smaller diameter material and those in later stages of decay) over the same area, 31,000 acres. The potential loss of medium and large diameter dead standing trees from landscape and activity fuels burning is expected to be minimal based on the impacts of similar activities in similar habitat types (Harrod et al. 2009, Hessburg et al. 2010). Thies and others (2008) found that as much as 5% of existing large diameter green trees may be killed by immediate and delayed fire impacts. Stand structure would not be affected by landscape underburning or activity fuels burning (Harrod et al. 2009). Charring of downed wood and snags would reduce the abundance of ants utilizing these structural elements, reducing potential forage for this species. Overall, underburning is expected to have minor impacts on forage (ant) availability due to the intensity, timing, and mosaic nature of proposed underburns.

New system road construction and temporary road construction (new temporary roads and existing temporary roads) would not measurably impact the pileated woodpecker or source habitat. New road construction would generally occur in existing openings; impacts to overstory vegetation would be minor. Danger tree felling along and adjacent to haul routes (including open, closed, seasonal, new system road, new temporary roads, and existing temporary roads) may impact snags and green trees. This activity would reduce potential nesting and foraging sites adjacent to these roads. The footprint of new temporary roads would exist for a number of years; in the long term, these areas would be re-seeded by trees and shrubs, filling in openings. Pileated woodpeckers would readily cross them; they would not increase fragmentation of pileated habitat. Danger tree felling along open roads and closed system roads used to access treatment units would also impact snags to a small degree. Due to the linear nature of roads and associated danger tree felling, the impact is expected to be minor. All large diameter (≥ 20 inches) danger trees that are felled would be retained to provide downed woody material for wildlife.

Cumulative Effects

Refer to the primary cavity excavator section for discussion of the cumulative impacts of the proposed alternatives on snag habitat within the Kahler snag analysis area. Past activities, actions, and events in the Kahler analysis area that have impacted pileated woodpecker source habitat include timber harvest (9,640 acres since 1975), wildfire (Wheeler Point Fire), fire suppression, firewood gathering, and insect and disease activity. Past harvest activities impacted the quality, quantity, and distribution of pileated woodpecker source habitat. These activities altered stand structure, reducing the amount of late and old structure habitat in the analysis area, and the size of available habitat patches in the already dry upland forest-dominated analysis area. Large trees were generally targeted in these stands. In general, commercially thinned, regeneration harvested, and overstory removal stands are not currently providing source habitat or late and old structure habitat features desired by this species. These activities also reduced potential recruitment of snags by removing green trees. Firewood gathering has also reduced snag densities (<24 inches measured 1 foot above the ground) adjacent to open roads, in accordance with the terms and conditions of personal use firewood permits. Past wildfire also reduced the amount of source habitat within the analysis area. High and moderate severity portions of the Wheeler Point Fire are not typically used by the pileated woodpecker due to the lack of overstory canopy cover. Fire suppression has allowed for the ingrowth of shade-tolerant vegetation in dry upland forest stands, increasing canopy density and stand complexity (multiple layers). Pileated woodpecker are currently using some dry forest stands that historically would have been open, single-stratum stands. Insect outbreaks (spruce budworm) have resulted in patchy mortality of grand fir and Douglas-fir in the analysis area. As a result, there are scattered stands with high snag densities. These activities have combined to create the existing condition of pileated woodpecker habitat in the analysis area.

There are currently no ongoing or reasonably foreseeable future activities, actions, and events in the analysis area that would affect pileated woodpecker source habitat.

When the expected effects of these alternatives are combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be an incremental reduction in source habitat and potential nesting, foraging, and roosting structures under all of the action alternatives. The abundance and distribution of the pileated woodpecker may be impacted under the proposed action alternatives due to impacts (reduced quantity, quality, and distribution of source habitat) associated with proposed vegetative treatments. Refer to individual alternative discussions for details. Hazard tree felling, danger tree abatement along roads, and burning would impact snags to some degree. It is expected that this cumulative impact would be minor given burning conditions, and Project Design Criteria (see EIS Chapter 2) that will be implemented to protect snags within treatment units and along open, closed, and temporary roads used to access the project area. Density reduction would reduce future recruitment of snags (primarily smaller diameter) resulting from density-dependent factors by an unknown degree. It is possible that these stands may fall below Forest Plan standards in the long term as lower recruitment in affected dry forest stands fails to keep pace with the rate at which existing snags decay and fall. In the long term, it is expected that as vegetation within treated stands develops (higher density, larger

trees, higher crown closure, etc.), and moves towards a source habitat condition, snag recruitment would also increase, and Forest Plan standards would again be met. The proposed activities would generally occur in dry forest habitat. Treated stands would move toward a more appropriate (expected historically to occur in greater abundance than the existing state) dry forest structure and composition.

Alternative 2

Direct and Indirect Effects

The effects under this alternative would be similar to those described under *Common to All Action Alternatives*. This alternative would commercially thin the most acres of pileated woodpecker source habitat when compared to Alternative 3. This alternative would therefore have the greatest impact on pileated woodpecker and their habitat in the short, mid, and long term. This alternative would impact approximately 2,348 acres of pileated woodpecker source habitat. This represents approximately 66% of the existing pileated woodpecker habitat in the analysis area. Due to the fragmented nature of the analysis area, the dominance of dry upland forest stands containing high proportions of ponderosa pine, and the fact that pileated source habitat is spread throughout the analysis area, it is likely that the affected acres represent a number of individual territories. This level of impact equates to 1% of the source habitat across the Forest. The distribution of pileated woodpecker source habitat would be impacted to a high degree under this alternative. Source habitat that remains would largely be in narrow strips along riparian areas, in C1 old growth stands, and in a few moist and cold stands dropped from consideration during project development. Some concentrations of pileated woodpecker source habitat would be completely converted to an unsuitable condition for nesting. It is likely that overall use of the area would be reduced due to this reduction in the quantity, size, and distribution of pileated woodpecker source habitat.

This alternative would require the most miles of closed road, seasonal road, and existing temporary roads than Alternative 3; as a result, the impacts to existing snags adjacent to roads would be greatest under this alternative.

Cumulative Effects

The cumulative effects under this alternative would be similar to those described under *Common to All Action Alternatives*. When the expected effects of this alternative are combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be incremental reduction in the quantity, quality, and patch size of source habitat. This alternative would also contribute to fragmentation of pileated source habitat by affecting the landscape distribution of source habitat. Hazard and danger tree abatement and vegetative treatment would also contribute to past losses in standing dead wood habitat, reducing potential roosting, foraging, and nesting habitat for this species. It is likely that pileated woodpecker may use the Kahler Project area less after harvest due to impacts to the quality and quantity of source habitat, the landscape distribution of these habitats, and short and long term direct and indirect impacts to standing dead wood. This alternative would have a greater impact on this species than Alternative 3.

Forest Plan Consistency

Because the Kahler Dry Forest Restoration Project would impact approximately 1% of the pileated source habitat on the forest, the overall direct, indirect, and cumulative effects would result in a small negative habitat trend at the Forest scale. This impact to habitat would be insignificant at the scale of the Umatilla National Forest. At the Forest scale, impacts associated with implementation of Alternative 2 would not result in short or long term population reductions due to the size of the affected area, and the expected level of impact to source habitat. C1 Dedicated Old Growth habitat would be revised (through a Forest Plan amendment) to allow for protection of Tamarack Lookout, Tamarack cabin, communication infrastructure, and to clear sight lines from the tower. The size and distribution of C1 old growth habitat would provide for the survival and reproduction of the pileated woodpecker, and meet Forest Plan direction and guidance under this alternative. This management area would contribute to the viability of this species at the Forest scale. Existing dead wood habitat would be maintained at the highest levels possible in proposed treatment units, as only those snags that are a hazard to operators or a danger to road use would be felled. At the analysis area scale, it is expected that snag densities would meet or exceed those required by the Forest Plan in the short long term. Snag densities may fall below Forest Plan minimum standards in some treatment units due to a reduction in density-dependent mortality. It is expected that the distribution of snag density classes in the snag analysis area (see Primary Cavity Excavator section, EMC/Blues habitat type) would change to a small degree. In the short and mid-term, there would be a decrease in the proportion of the analysis area providing moderate snag densities, primarily due to reduced snag recruitment. The snag density distribution would be expected to be similar to that expected under the reference condition provided by DecAID. For these reasons, the Kahler Project would be consistent with the Forest Plan as it relates to pileated woodpecker management; the continued viability of the pileated woodpecker is expected on the Umatilla National Forest under this alternative.

Alternative 3

Direct and Indirect Effects

This alternative would commercially thin fewer acres of source habitat than Alternative 2. As a result, potential impacts on the pileated woodpecker would be reduced under this alternative. This alternative would impact approximately 1,994 acres of pileated woodpecker source habitat, 354 acres less than Alternative 2. This represents approximately 56% of the existing pileated woodpecker source habitat in the analysis area. Due to the fragmented nature of the analysis area, the dominance of dry upland forest stands containing high proportions of ponderosa pine, and the fact that pileated source habitat is spread throughout the analysis area, it is likely that the affected acres represent a number of individual territories. This level of impact equates to approximately 1% of the source habitat across the Forest. The distribution of pileated woodpecker source habitat would be impacted to a lesser degree under Alternative 3 than Alternative 2. Under Alternative 3, source habitat patches ranging in size from 15 to 100 acres would be dropped from commercial harvest to maintain high density dry and moist upland forest stands distributed across the landscape (in addition to narrow strips along riparian areas, patches in C1 old growth stands, and patches in a few moist and cold

stands dropped from consideration during project development). Some concentrations of pileated woodpecker source habitat would be largely converted to an unsuitable nesting condition. It is likely that overall use of the area would be reduced to some degree due to this reduction in the quantity, patch size, and distribution of pileated woodpecker source habitat. This impact is expected to be less than would occur under Alternative 2.

Cumulative Effects

The cumulative effects under this alternative would be similar to those described under *All Action Alternatives*. Alternative 3 would contribute to past reductions in pileated woodpecker habitat (quantity, quality, and distribution across the landscape) by converting source habitat to an unsuitable condition. Alternative 3 would have slightly less cumulative impact on pileated woodpecker source habitat than would Alternative 2. Under this alternative, retention of larger patches of suitable habitat distributed across the landscape would reduce the risks associated with extensive harvesting proposed under Alternative 2. Use of the post-harvest landscape by pileated woodpecker would be reduced to some degree under this alternative; however, this species would continue to persist in the Kahler analysis area post-implementation.

Forest Plan Consistency

Alternative 3 would impact approximately 1% of the pileated source habitat on the forest. The overall direct, indirect, and cumulative effects would result in a small negative habitat trend at the Forest scale. This impact to habitat would be insignificant at the scale of the Umatilla National Forest. At the Forest scale, impacts associated with implementation of Alternative 3 would not result in short or long term population reductions due to the size of the affected area, and the expected level of impact to source habitat. C1 Dedicated Old Growth habitat would be revised (through a Forest Plan amendment) to allow for protection of Tamarack Lookout, Tamarack cabin, communication infrastructure, and clear sight lines from the tower. The size and distribution of C1 old growth habitat would provide for the survival and reproduction of the pileated woodpecker, and meet Forest Plan direction and guidance under this alternative. This management area would contribute to the viability of this species at the Forest scale. Dead wood habitat would be maintained at the highest levels possible in proposed treatment units, as only snags ≥ 10 inches DBH that are a hazard to operators or a danger to road use would be felled. At the analysis area scale, it is expected that snag densities would meet or exceed those required by the Forest Plan in the short long term. Snag densities may fall below Forest Plan minimum standards in some treatment units due to a reduction in density-dependent mortality. It is expected that the distribution of snag density classes in the snag analysis area (see Primary Cavity Excavator section, EMC/Blues habitat type) would change to a small degree. In the short and mid-term, there would be a decrease in the proportion of the analysis area providing moderate snag densities, primarily due to reduced snag recruitment. The snag density distribution would be expected to be similar to that expected under the For these reasons, the Kahler Project would be consistent with the Forest Plan as it relates to pileated woodpecker management; the continued viability of the pileated woodpecker is expected on the Umatilla National Forest under this alternative.

American Marten

No Action

Direct and Indirect Effects

In the short term (0 to 5 years), there would be no change in the quality or distribution of marten source habitat in the analysis area. In the mid (5 to 15 years) and long term (15+ years), the quality and distribution of marten habitat would likely change. In this time frame, old forest and young forest stands in the moist and cold upland forest PVGs would continue to develop multiple canopy layers and greater canopy density. Mortality resulting from insects and disease in stressed stands would increase snag and downed wood densities, improving the condition of foraging habitat for the marten. High fuel loading would increase the risk of wildfire in these stands. A wildfire of this type would cause heavy overstory mortality and consume downed wood used for denning and foraging. It would take upwards of 80-100 years for mixed conifer stands to develop a composition and structure that would provide marten source habitat after a widespread high severity wildfire.

Common to All Action Alternatives

Direct and Indirect Effects

The marten is not known or suspected to occur in the analysis area. Source habitat for this species is scarce and not contiguous, largely due to the fact that dry upland forest stands dominate the area, and this potential vegetation does not contribute to source habitat. As a result, there would be no direct or indirect impacts on this species. Approximately 12 acres of Dedicated Old Growth (management area C1) habitat would be moved into the E1 management area and 16 acres of E1 would become C1 through a Forest Plan Amendment. The affected stand (DOG 1841) is designated “Pileated Woodpecker Suitable”; it was not designated as marten “suitable” or “capable” old growth. The old growth network would continue to meet Forest Plan standards for size and distribution, and provide for the survival and reproduction of the marten, and contribute to the viability of the marten at the Forest scale.

Under Alternative 2, approximately 76 acres of marten source habitat would be commercially thinned. Under Alternative 3, approximately 54 acres of source habitat would be treated. These stands would not be considered source habitat after treatment due to reduced canopy closure and loss of stand complexity (multi-strata to single stratum). Under both alternatives, this accounts for less than one-tenth of one percent of the marten source habitat on the Forest.

Landscape underburning is expected to have minor impacts on marten source habitat. Low intensity underburns would not affect stand structure or composition and would have minimal impacts on large downed wood and snags within source habitat stands. Project Design Criteria (see EIS Chapter 2) would be implemented that would protect source habitat and other moist and cold upland forest stands from undesired fire impacts.

Cumulative Effects

Past activities, actions, and events in the Kahler analysis area that have impacted marten source habitat include commercial thinning, regeneration harvest, and overstory removal

(18,550 acres since 1975), fire suppression, insect and disease outbreaks, and firewood cutting. Past harvest activities have impacted the quality, quantity, and distribution of marten source habitat to a small degree, and impacted dead wood. These activities reduced the amount of late and old structure habitat in the analysis area and fragmented larger late and old structure stands. In general, stands harvested in the past are not currently providing suitable source habitat or late and old structure habitat features desired by this species. These activities also reduced potential recruitment of snags by removing green trees. Fire suppression has allowed for the development of multiple canopy layers and dense overstory structure in moist and cold upland forest pockets within the analysis area. Insect outbreaks (spruce budworm) have resulted in high mortality of grand fir and Douglas-fir in some stands within the analysis area. These events had variable impacts on habitat quality for marten. Where canopy closure was reduced below the published preferences for this species, insect-affected stands would likely not be used for foraging or denning due to increased predation risk. Where overstory canopy closure was maintained to some extent, the resulting stands have high densities of dead wood that could be used for denning, resting, and foraging under snow. Past firewood cutting removed snags adjacent to open roads within the analysis area; it is unlikely that marten would have utilized these features due to their proximity to open roads. These activities have combined to create the existing condition of marten source habitat in the analysis area.

Present and reasonably foreseeable future activities, actions, and events that affect marten source habitat include firewood cutting. Firewood cutting is having similar effects as those described in the past activities section.

When the expected effects of all of the Action Alternatives are combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be a small incremental reduction in source habitat at the analysis area and Forest scale. The proposed vegetative treatment activities would generally occur in dry upland forest stands; treatment in these areas would not affect potential marten source habitat quality. Treatment in scattered moist and cold upland forest stands would reduce the quantity, quality, and distribution of marten source habitat. Since it is very unlikely that the marten is present in the analysis area due to the preponderance of dry forest habitat and the fragmented/scattered nature of moist and cold upland forest stands, it is not expected that the proposed activities would have an adverse cumulative impact on this species; it is not believed to be present in the analysis area.

Forest Plan Consistency (All Action Alternatives)

Under Alternatives 2 and 3, the overall direct, indirect, and cumulative effects (resulting from commercial harvest and underburning) would result in a small negative habitat trend for the marten at the Forest scale. There would be no impacts on C1 Old Growth stands designated by the Land and Resource Plan (USDA 1990) to provide for the viability of the marten. The Kahler Project would therefore be consistent with the Forest Plan; the continued viability of the American marten is expected on the Umatilla National Forest.

American Three-toed Woodpecker

No Action

Direct and Indirect Effects

In the short term (0 to 5 years), there would be no change in the quality or distribution of three-toed woodpecker source habitat. In the mid (5 to 15 years) and long term (15+ years), the quality and distribution of habitat would likely change. In this time frame, stands in the moist and cold upland forest PVGs would continue to develop multiple canopy layers and greater canopy density. Mortality resulting from insects and disease in stressed stands would increase snag and downed wood densities, improving the condition of foraging and nesting habitat for the three-toed woodpecker. High fuel loading would increase the risk of wildfire in these stands. Habitat created by high severity fire would improve the local and landscape distribution of suitable foraging habitat for this fire-dependent species.

Common to All Action Alternatives

Direct and Indirect Effects

The three-toed woodpecker is not known or suspected to occur in the analysis area. Source habitat for this species is scarce and not contiguous, largely due to the fact that dry upland forest stands dominate the area, and this potential vegetation does not contribute to source habitat. As a result, there would be no direct or indirect impacts on this species. Approximately 12 acres of Dedicated Old Growth (management area C1) habitat would be moved into the E1 management area and 16 acres of E1 would become C1 through a Forest Plan Amendment. The affected stand (DOG 1841) is designated “Pileated Woodpecker Suitable”; it was not designated as three-toed woodpecker “suitable” or “capable” old growth. The old growth network would continue to meet Forest Plan standards for size and distribution, and provide for the survival and reproduction of the three-toed woodpecker, and contribute to the viability of the three-toed woodpecker at the Forest scale.

Under Alternative 2, approximately 76 acres of source habitat would be commercially thinned. Under Alternative 3, approximately 54 acres of source habitat would be treated. These stands would not be considered source habitat after treatment due to reduced canopy closure and loss of stand complexity (multi-strata to single stratum). Under both alternatives, this accounts for less than one-tenth of one percent of the three-toed woodpecker source habitat on the Forest.

Landscape underburning is expected to have minor impacts on source habitat. Low intensity underburns would not affect stand structure or composition and would have minimal impacts on large downed wood and snags within source habitat stands. Project Design Criteria (see EIS Chapter 2) would be implemented that would protect source habitat and other moist and cold upland forest stands from undesired fire impacts.

Cumulative Effects

Past activities, actions, and events in the Kahler analysis area that have impacted three-

toed woodpecker source habitat include commercial thinning, regeneration harvest, and overstory removal (18,550 acres since 1975), fire suppression, insect and disease outbreaks, and firewood cutting. Past harvest activities have impacted the quality, quantity, and distribution of three-toed source habitat to a small degree, and impacted dead wood habitat. These activities reduced the amount of late and old structure habitat in the analysis area and fragmented larger late and old structure stands. These activities also reduced potential recruitment of snags by removing green trees. Fire suppression has allowed for the development of multiple canopy layers and dense overstory structure in moist and cold upland forest stands. Insect outbreaks (spruce budworm) have resulted in high mortality of grand fir and Douglas-fir in some stands within the analysis area. These events had variable impacts on habitat quality for the three-toed woodpecker. Past firewood cutting removed potential nesting, roosting habitat adjacent to open roads within the analysis area. These activities have combined to create the existing condition of three-toed woodpecker source habitat in the analysis area.

Present and reasonably foreseeable future activities, actions, and events that affect three-toed source habitat include firewood cutting. Firewood cutting is having similar effects as those described in the past activities section.

When the expected effects of all of Alternatives 2 and 3 combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be a small incremental reduction in source habitat at the analysis area scale. The proposed vegetative treatment activities would generally occur in dry upland forest stands; treatment in these areas would not affect potential three-toed woodpecker habitat quality. Treatment in scattered moist and cold upland forest stands would reduce the quantity, quality, and distribution of three-toed woodpecker source habitat. Since it is very unlikely that the three-toed woodpecker is present in the analysis area due to the preponderance of dry forest habitat and the fragmented/scattered nature of moist and cold upland forest stands, it is not expected that the proposed activities would have an adverse cumulative impact on this species; it is not believed to be present in the analysis area.

Forest Plan Consistency (All Action Alternatives)

Under Alternatives 2 and 3, the overall direct, indirect, and cumulative effects (resulting from commercial harvest and underburning) would result in a small negative habitat trend for the three-toed woodpecker at the Forest scale. There would be no impacts on C1 Old Growth stands designated by the Land and Resource Plan (USDA 1990) to provide for the viability of the three-toed woodpecker. The Kahler Project would therefore be consistent with the Forest Plan; the continued viability of the three-toed woodpecker is expected on the Umatilla National Forest.

Threatened, Endangered, Proposed, Candidate, and Sensitive Species

Species Analyzed In Detail

Bald Eagle - Sensitive

No Action

Direct and Indirect Effects

In the short term, there would be no change in existing bald eagle habitat quality in the vicinity of the Dry Creek nest. In the mid and long term, dry upland forest stands would continue to become denser, and would become more susceptible to large-scale, high-severity fires. If this were to occur, potential roosts (large diameter green trees and snags) in the vicinity of the nest could be lost as a result of fire impacts. A fire of this type could also threaten the nest itself.

Common to All Action Alternatives

Direct and Indirect Effects

The effects of Alternatives 2 and 3 would be the same. All proposed treatment activities would occur at least 0.75 miles from the nest; as a result, there would be no effect on nesting eagles or the nest site. Activities in the Kahler area would largely not be visible from the nest location. Prescribed fire (ground operations and potentially air operations) would be managed such that there would be no impacts at the nest site. Aircraft would not disturb the nest or nesting activities because all use would be > 1,000 feet from the nest. In addition, all proposed helicopter harvest units are located outside of the Bald Eagle Consideration Area. The Kahler project would retain all old trees and trees with old growth characteristics that are desirable to eagles for roosting and/or perching. The Kahler project would also retain all snags >10 inches in diameter, except for those that are a hazard to operations. It is expected that a small number of snags that pose a hazard within treatment units; at the analysis area scale (for snags), it is likely that these impacts to large snags would not be measureable and would not impact the suitability of the area for bald eagles. Activities proposed under the Kahler project would restore dry upland forest stands potentially used by the nesting pair for foraging, moving them toward a more characteristic composition and structure and providing habitat for prey more similar to what occurred there historically. The activities proposed under the Kahler Project would be consistent with the Dry Creek Bald Eagle Nest Management Plan and the National Bald Eagle Management Guidelines (USDI 2007). The activities proposed under the Kahler Project would not agitate or bothers roosting or foraging bald eagles to the degree that causes injury or substantially interferes with breeding, feeding, or sheltering behavior. These activities would not result in a loss of productivity or nest abandonment. These activities would therefore also be consistent with the Bald and Golden Eagle Protection Act. No known communal roosts are known, so there would be no impacts to these features.

Cumulative Effects

Past, present, and future activities that have affected bald eagle habitat in the analysis area include past timber harvest. These activities resulted in the removal of potential roost trees within the analysis area; in some areas, large trees continue to be lacking. The effects of these activities have been incorporated into the existing condition for this species. The activities proposed under the Kahler Project (Alternatives 2 and 3) have the potential to impact potential roost snags as well. The proposed activities would not have an adverse cumulative impact on the bald eagle due to the fact that only a portion of the large (≥ 21 inch DBH) Douglas-fir and grand fir would be affected within treated stands. Large diameter ponderosa pine, old Douglas-fir, old grand fir, and large snags that do not pose a hazard/danger to operations would be retained in proposed units, in addition to large potential roost trees available in untreated stands and skips within treatment units.

Determination and Rationale (All Action Alternatives)

Alternatives 2 and 3 may impact the bald eagle, but are not likely to contribute to a trend towards federal listing or cause a loss of viability to the population or species. The rationale for this determination is as follows:

- A small number of potential roost snags (large diameter snags that pose a hazard/danger) may be affected by the proposed treatment activities. This impact would not be measurable at the scale of the snag analysis area.
- The Kahler project would retain large, old, complex tress and promote the development of these trees in the future.
- All proposed activities would be consistent with the Dry Creek Bald Eagle Nest Management Plan, the National Bald Eagle Management Guidelines (USDI 2007) and Bald and Golden Eagle Protection Act.

*Columbia Spotted Frog – Sensitive**No Action**Direct and Indirect Effects*

In the short term, the quality and extent of Columbia spotted frog habitat would not change. In the mid and long term, continued recovery of riparian habitat would improve habitat quality for this species. Riparian areas would continue to recover from past disturbances, resulting in increased riparian shading (overstory and shrubs) along stream channels and pond edges. In the long term, the risk of high severity wildfire would also increase due to continued multi-strata development and increasing fuel loads. A wildfire of this type would consume riparian vegetation that may be used by the spotted frog for cover. A fire of this type would not alter the suitability of potential breeding habitat (ponds) in the analysis area. These habitats are generally in openings where fire effects would be minimal.

*Common to All Action Alternatives**Direct and Indirect Effects*

Under all of the action alternatives, there would be no commercial thinning or other mechanical treatment activities within Class I, II, or III Riparian Habitat Conservation Areas (RHCAs) potentially used by this species for summer foraging, breeding, or overwintering. Under all of the action alternatives, commercial and non-commercial thinning is proposed in Class IV RHCAs (intermittent, non-fish bearing channels). A minimum 75-foot non-mechanical buffer would be maintained along those Class IV channels that lie within proposed treatment units. Machinery would be allowed to winch or skid hand-felled trees out of these Class IV riparian areas. Because these channels only flow during spring high flows and do not provide potential foraging, breeding, or overwintering habitat for this species, there would be no impacts on the spotted frog through implementation of these activities in these areas. Due to the fact that Columbia spotted frogs rarely venture far from perennial water, vegetative treatment activities proposed outside of RHCAs would have no impacts on this species or its habitat. All potential breeding sites (ponds) and springs would be buffered from treatment activities a distance of 100 feet (see Project Design Criteria). Buffering these sites would eliminate potential impacts to this species. Hand thinning of conifers (small diameter) in aspen stands associated with Class I, II, and III channels would not directly or indirectly impact this species.

While spotted frogs are assumed to be present in the analysis area, potential habitat is largely restricted to man-made ponds. Other activities proposed under all of the action alternatives, including burning, maintenance and clearing of closed system roads, and temporary road construction, would also have no impacts on this species. Habitat quality of ponds would not be impacted due to the fact that proposed underburning would be low intensity, and the vegetation immediately adjacent to potential pond habitat would not be affected by burning. Fuels in these areas would be too moist for fire to carry. Pumping of water from pond sites during underburning or activity fuels treatment activities would also not impact this species. Screens would be utilized on all pumps; tadpoles would not be sucked through pumps or impinged on intake pipes. The amount of water expected to be used from ponds would be negligible.

Cumulative Effects

Past activities that affected potential spotted frog habitat include timber harvest, cattle grazing, aspen restoration, and gravel pit/pond construction. Portions of two grazing allotments are included in the analysis area. Past cattle grazing affected potential habitat by altering the structure and composition of riparian communities. Grazing would likely directly impact spotted frogs at breeding and foraging sites (man-made ponds). Grazed habitats are currently recovering from past overgrazing. Past cattle grazing also created potential breeding habitat through the construction of water sources (ponds) where they previously did not exist. Rock pit ponds created through road construction also increased available habitat for the spotted frog in upland areas. Aspen restoration activities (fencing, planting, etc.) have improved riparian habitat condition by allowing shrub and tree regeneration. Past timber harvest affected riparian areas through the removal of streamside vegetation and disturbance of riparian communities. These activities increased the vulnerability of this species to predation by removing cover and altered suitable habitat (slow moving streams, wet meadows, springs, etc.). These past activities have combined to create the existing condition of spotted frog habitat in the analysis area.

Ongoing activities with the potential to affect the spotted frog include livestock grazing and aspen restoration. Current cattle grazing is occurring at relatively low stocking levels within the analysis area, when compared to historical grazing. Cattle grazing is not adversely affecting potential spotted frog habitat in the analysis area. Direct impacts to spotted frogs are considered negligible. Aspen restoration activities are having the same impacts as those described previously.

Reasonably foreseeable future activities with a potential to affect this species include cattle grazing, aspen restoration, and maintenance of water sources. Future cattle grazing and aspen treatments are expected to have the same effects as those described above. Maintenance of water sources has the potential to affect breeding sites and cause mortality of developing tadpoles and froglets. These effects would not persist beyond the year in which pond cleaning occurs.

When the expected effects of these alternatives are combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be no incremental reduction in suitable breeding, overwintering, or foraging habitat. No mechanical treatment activities would occur in suitable riparian habitat. Burning would also not be expected to impact potential breeding sites due to the timing and oversight of proposed burns. Prescribed fire managers would implement fire to meet the written objectives for a low intensity underburn; moderate and high severity impacts to suitable spotted frog habitat would be very unlikely.

Determination and Rationale (All Action Alternatives)

Under all of the Action Alternatives, there would be no impact on the Columbia spotted frog. The rationale for this determination is as follows:

- Commercial thinning and mechanical activity fuels treatment (if this activity occurs) would not occur within suitable habitat (those with perennial streams) in RHCA's. RHCA treatments proposed under all of the action alternatives would occur along intermittent stream channels that do not provide breeding, summer foraging, or overwintering habitat.
- Potential breeding and overwintering habitat in ponds and springs would not be affected by the proposed activities. These sites would be buffered from treatment activities (see Project Design Criteria, EIS Chapter 2).
- Pumping of water from ponds potentially used for breeding would not impact individuals; screens would eliminate the possibility of direct mortality of developing tadpoles and froglets.
- Burning would not directly impact this species or impact the quality of potential breeding habitat within the project area.
- There would be no cumulative impacts on suitable breeding, overwintering, or foraging habitat under this alternative.

*White-Headed Woodpecker - Sensitive**No Action**Direct and Indirect Effects*

In the short term, there would be no change in existing habitat for this species. In the mid and long term, shade tolerant tree species would continue to encroach into historically open ponderosa pine habitats. The composition of these stands would change; a higher proportion of shade tolerant tree species would be present in these stands. Invading tree species would compete with ponderosa pine for resources. Ultimately, large diameter ponderosa pine trees and snags would be less common, reducing habitat quality for the white-headed woodpecker. As forested stands became denser and more widespread, the risk of high severity wildfire would also increase. A high severity wildfire would likely result in high mortality of existing ponderosa pine, as well as other overstory tree species. While habitat quality in burned stands may initially improve in the short and perhaps mid-term, ultimately, there would be a shortage of nest structures and foraging habitat (large cone-producing ponderosa pine) over a large area in the long term.

*Common to All Action Alternatives**Direct and Indirect Effects*

Generally, the effects associated with each of the action alternatives on the white-headed woodpecker and its habitat would be the same; only the extent, or the number of acres treated would vary between alternatives. Existing suitable habitat (old forest single-stratum stands in dry upland forest dominated by ponderosa pine) would be treated under Alternatives 2 and 3. This treatment would require a Forest Plan amendment to implement, as it would be inconsistent

with the Eastside Screens. This activity has the potential to remove structures and features desired by white-headed woodpeckers, including large diameter snags (through hazard/danger tree felling), medium sized seed-producing ponderosa pine, and existing “clumpiness” and heterogeneity. Harvest prescriptions/design features would reduce the potential for these impacts to occur. The quality of capable white-headed woodpecker habitat would be improved in the short and long term through commercial thinning (with skips and gaps) in dry upland forest habitat. Variable density thinning would retain or promote heterogeneity (interspersion of clumps of varying size, single trees, untreated skips, and small openings) within treated stands, improving habitat quality for this species. Snags >10 inches DBH would be retained to the greatest extent possible in treatment units; only those that pose a hazard would be felled. Danger tree felling along roads used to access units would also affect snags to some degree. Because the impact on snag densities and distribution are expected to be minor at the scale of the analysis area (see Primary Cavity Excavator section), impacts associated with loss of nesting structure would be minor under all of the action alternatives. This activity is not expected to measurably impact this species or the availability of potential nesting snags in the Kahler Creek project area or the larger snag analysis area. Tree species uncharacteristic of old forest single-stratum ponderosa pine habitats would be targeted for removal. Old (>150 years old) ponderosa pine and Douglas-fir would be favored for retention. Reduced stand densities would improve stand health and stimulate growth in residual trees. Skips within commercial thinning units would provide for endemic or greater insect and disease activity that will provide white-headed woodpecker forage in years with poor ponderosa pine seed production.

Non-commercial thinning would not impact habitat quality for this species, as snags and overstory trees would not be impacted by this activity.

Because burning would occur over approximately 31,000 acres under both alternatives, the effects of burning under these alternatives would be virtually the same. Burning has the potential to reduce potential nesting sites through the consumption of snags. Research indicates that burning (with no prior treatment and with prior thinning) in similar habitats resulted in a loss of snags on affected acres (Hessburg et al. 2010, Harrod et al. 2009). These studies found that the vast majority of snags lost to burning were small diameter (<10” DBH); impacts to large snags were relatively minor (Hessburg et al. 2010, Harrod et al. 2009). Thies and others (2008) found that up to 5% of large trees and up to 14% of all trees in pine stands that were prescribed burned were killed immediately or died in the 3 years following burning. Burning is also expected to create snags; losses of existing snags would be offset or exceeded by new snag creation (Hessburg et al. 2010, Harrod et al. 2009). Burning in the Kahler analysis area is expected to have similar impacts as those described above due to the similar habitat conditions and the proposed intensity, timing, and mosaic nature of underburns.

New temporary road construction and new system road construction would occur under all of the action alternatives. Temporary and new system roads would follow existing skid trails or utilize existing openings where possible. Impacts to overstory vegetation and snags would therefore be minimal, and generally associated with hazard tree abatement. This activity would not alter habitat suitability for this species.

Cumulative Effects

Past activities, actions, and events that affect the white-headed woodpecker and its habitat within the analysis area include timber harvest, fire suppression, and post-fire salvage. Past timber harvest targeted large diameter open-grown (single-strata) ponderosa pine that this species is dependent on for foraging, reducing the quality and quantity of suitable habitat for this species.

Harvest also impacted large diameter ponderosa pine snags used for nesting. Fire suppression has allowed for the encroachment of fire-intolerant conifer species into historically open ponderosa pine stands. The composition and structure of these stands has changed, reducing the quality of these stands for the white-headed woodpecker. Fire salvage in the Wheeler Point Fire area also impacted potential nesting and foraging habitat in the high severity portion of the fire. Research indicates that species utilizes post-fire stands where available. Salvaged stands are generally unsuitable for this species due to the level of snag removal. These activities, actions, and events have combined to create the existing condition of white-headed woodpecker habitat in the analysis area.

Ongoing (present) and reasonably foreseeable future activities in the analysis area that affect the white-headed woodpecker or its habitat include fire suppression. This activity is having the same effects as those described previously.

When the effects of these alternatives are combined with the residual and expected effects of past, present, and future activities in the analysis area, there would be an incremental improvement in habitat for the white-headed woodpecker in the mid and long term resulting from old forest ponderosa pine restoration treatments within commercial harvest units. The proposed activities under Alternatives 2 and 3 would have a beneficial effect on white-headed woodpecker habitat in the short and long term. Capable habitat would be moved into a suitable habitat condition by both of the action alternatives; the magnitude (number of acres) would vary by alternative. While there would be a short term reduction in snags due to hazard and danger tree felling, the impact would be minor. By moving these stands toward a condition more characteristic of historical conditions and improving stand health, the proposed vegetative treatment activities may reduce long term snag recruitment to an unknown degree. It is possible that Forest Plan standards for snag density would not be met in treated stands for some period of time. When combined with past activities, it is not expected that there would be an adverse cumulative impact on this species due to reductions in large snags due to the fact that existing snags would largely be retained in treatment units, and snag recruitment in post-treatment stands would be expected to be similar to that which occurred historically in dry forest stands.

Alternative 2

Direct and Indirect Effects

This alternative would have similar impacts as those described in the *Common to All Action Alternatives* section. Approximately 400 acres would be moved into a single-stratum late and old structure condition in the short term, for a total of 1,950 acres of old forest single-stratum structure stands after treatment. In the long term (year 2065 – see *Silviculture Report*), there would be 10,510 acres of old forest single-stratum structure stands in the analysis area. Much of this would be the result of thinning that moves younger stands into an intermediate structure and density, the application of prescribed burning on a regular basis (10-20 year interval), and growth over time. Because this alternative would move the most acres into or toward an OFSS condition in the short and long term, it would have the greatest short and long term impact on the availability and distribution of suitable white-headed woodpecker habitat in the analysis area. In the short term, 7% of the analysis area would be comprised of OFSS habitat. In the long term (year 2065), 39% of the analysis area would be comprised of OFSS habitat. The lower limit of the HRV range for this structure is 40%. While still below HRV, this structural stage would be available at similar levels as those that would be expected historically.

The White-headed Woodpecker Conservation Strategy (Mellen-McLean et al. 2013) recommends maintaining one-third of the dry forest landscape in denser patches for white-headed woodpecker habitat. In the short term, this alternative would retain approximately 22% of the dry forest landscape in a moderate and high density condition (See Silviculture Report). These patches would generally be present in RHCAs, Dedicated Old Growth stands, and moist and cold stands that were dropped during project development. While this is less than the recommended one-third of the dry forest ground recommended by Mellen-McLean and others (2013), there will also be approximately 10 to 15% of proposed units that will not be treated and that will provide moderate and high density dry upland forest habitat that is not accounted for. The remainder of the recommendations made in the Conservation Strategy would be addressed to some extent by the treatment activities proposed in the Kahler area.

Cumulative Effects

This alternative would have the greatest positive incremental effect on habitat for the white-headed woodpecker. It would do the most to reverse past habitat changes resulting from fire suppression and past harvest.

Alternative 3

Direct and Indirect Effects

Approximately 400 acres would be moved into a single-stratum late and old structure condition in the short term, for a total of 1,950 acres of old forest single-stratum structure stands after treatment. This would be the same number of acres and proportion of the analysis area as was described under Alternative 2. In the long term (year 2065 – see Silviculture Report), there would be 9,970 acres of old forest single-stratum structure stands in the analysis area. Much of this would be the result of thinning that moves younger stands into an intermediate structure and density, the application of prescribed burning on a regular basis (10-20 year interval), and growth over time. Alternative 3 would move approximately 540 fewer acres into an OFSS condition in the long term when compared to Alternative 2. In the long term (year 2065), 37% of the analysis area would be comprised of OFSS habitat. The lower limit of the HRV range for this structure is 40%. While still below HRV, this structural stage would be available at similar levels as those that would be expected historically, but at a slightly lesser proportion than Alternative 2.

Because this alternative would treat fewer acres and require less road use (closed, seasonal, and existing/new temporary roads), the potential impacts on existing and future snags (through hazard and danger tree felling and reduced snag recruitment) would be less than Alternative 2.

The White-headed Woodpecker Conservation Strategy (Mellen-McLean et al. 2013) recommends maintaining 1/3 of the dry forest landscape in denser patches for white-headed woodpecker habitat. In the short term, this alternative would retain approximately 24% of the dry forest landscape in a moderate and high density (See Silviculture Report). These patches would generally be present in RHCAs, Dedicated Old Growth stands, moist and cold stands that were dropped during project development, and in dense dry forest patches dropped specifically to address the availability of larger patches of dense dry forest habitat and the distribution of dense dry forest habitat across the landscape following implementation. While this is less than the recommended one-third of the dry forest ground recommended by Mellen-McLean and others (2013), there will also be approximately 10 to 15% of proposed units that will not be treated and that will provide moderate and high density dry upland forest habitat that is not accounted for. The remainder of the recommendations made in the Conservation Strategy would be addressed to some extent by the treatment activities proposed in the Kahler area.

Cumulative Effects

This alternative would have a positive incremental effect on habitat for the white-headed woodpecker. It would improve habitat on slightly fewer acres than Alternative 2. The impact on existing and future snags would be less under this alternative than under Alternative 2 due to fewer acres of commercial harvest; this cumulative reduction would not adversely impact this species.

Determination and Rationale (Alternatives 2 and 3)

Alternatives 2 and 3 may impact individuals or habitat, but are not likely to contribute to a trend towards federal listing or cause a loss of viability to the population or species. The rationale for this determination is as follows:

- The white-headed woodpecker is known to occur in the analysis area.
- Treatment would occur in existing suitable habitat (old forest single stratum stands) for this species. There is a potential that treatment in these stands could impact habitat features (clumps and younger trees used for gleaning) and structure (i.e. large snags) desired by this species to some extent.
- Variable density thinning (with skips and gaps) would move stands into suitable habitat conditions in the short and long term. Treatment activities and haul may impact some large diameter ponderosa pine and Douglas-fir snags that are a hazard/danger to operations. Otherwise, snags >10 inches DBH would be retained where they occur. It is not expected that this activity would measurably impact large snag densities at the analysis area scale.
- Future snag recruitment may be impacted through a reduction in density-dependent mortality. As treated stands would be moved into a more appropriate dry forest structure and composition (moving toward the HRV), and impacts to existing snags are expected to be minor, this long term impact to snags is not expected to adversely impact this species or potential habitat. Snag recruitment in post-treatment stands would be expected to be similar to that which occurred historically.
- Burning has the potential to impact large diameter snags potentially used for nesting. This activity is expected to have minor impacts on snag habitat due to the timing, intensity, and mosaic nature of burning, and research findings in similar habitat.
- Both of the alternatives would largely address the recommendations made in the Conservation Strategy (Mellen-McLean et al. 2013). Alternative 3 would provide larger patches of dense dry forest habitat distributed across the landscape than would Alternative 2. The skips provided in treated stands would aid in providing heterogeneity at the stand scale and contribute somewhat to landscape scale heterogeneity desired by this species.

Lewis' Woodpecker - Sensitive

No Action

Direct and Indirect Effects

In the short term, there would be no change in existing Lewis' woodpecker habitat. In the mid and long term, shade tolerant (fire intolerant) tree species would continue to encroach into historically open ponderosa pine and Douglas-fir habitats. The composition of these stands would change; a higher proportion of shade tolerant tree species would be present in these stands. Increased stand densities would increase competition for resources and stress, making stands more susceptible to insects and disease. Fuel loads would increase due to increased mortality. The risk of high severity wildfire would increase accordingly. Post fire habitats would be utilized by this species for both foraging and nesting.

Common to All Action Alternatives

Direct and Indirect Effects

Generally, the effects associated with each of the action alternatives on the Lewis' woodpecker and its habitat would be the same; only the extent, or the number of acres treated would vary between alternatives. Commercial thinning (with skips and gaps) would occur in currently suitable Lewis' woodpecker habitat. Treatment would not convert suitable habitat to an unsuitable condition. Treatment activities would reduce stand densities in treatment units, shifting these stands to a more appropriate dry forest composition and structure. Tree species uncharacteristic of old forest single-stratum ponderosa pine habitats would be targeted for removal. Old (>150 years) ponderosa pine and Douglas-fir trees with old growth structural features, and smaller more vigorous trees would be favored for retention. Treatment would significantly reduce stand densities in affected units. Reduced stand densities would improve stand health and stimulate growth in residual trees. Skip-gap commercial thinning would provide for heterogeneity within treated stands; individual trees would provide for perching habitat, while larger clumps and skips would provide for endemic or greater insect densities that would be utilized by this species. In the mid and long term, these stands would provide excellent foraging and nesting habitat for this species, and provide large diameter trees for perching.

Felling of hazard/danger trees within units and along roads used to access proposed harvest units may impact potential nest substrates. Snags in later stages of decay would be more likely to be felled than solid snags. Although potential nest snags may be felled for safety, existing large snags would be retained to the greatest extent possible, and all old (>150 years) trees and those exhibiting old growth character would be retained in commercial thinning units. It is not expected that this short term reduction in potential nesting snags would measurably impact the Lewis' woodpecker, the suitability of Lewis's woodpecker habitat, or measurably impact the availability of potential nesting snags in the snag analysis area (see *MIS: Primary Cavity Excavator* section).

Because burning would occur on the same number of acres (approximately 31,000) under Alternatives 2 and 3. The effects of burning under these alternatives would be virtually the same. Burning has the potential to reduce potential nesting habitat through the consumption of snags. Research indicates that burning (with no prior treatment and with prior thinning) in similar habitats resulted in a loss of snags on affected acres (Hessburg et al. 2010, Harrod et al. 2009). These studies found that the vast majority of snags lost to burning were small diameter (<10" DBH); impacts to large snags were relatively minor (Hessburg et al. 2010, Harrod et al.

2009). Thies and others (2008) found that up to 5% of large trees and up to 14% of all trees in pine stands that were prescribed burned were killed immediately or died in the 3 years following burning. Burning is also expected to create snags; losses of existing snags would be offset or exceeded by new snag creation (Hessburg et al. 2010, Harrod et al. 2009). Burning in the Kahler analysis area is expected to have similar impacts as those described above due to the similar habitat conditions and the proposed intensity, timing, and mosaic nature of underburns.

New temporary road construction and new system road construction would occur under all of the action alternatives. Temporary and new system roads would follow existing skid trails or utilize existing openings where possible. Impacts to overstory vegetation and snags would therefore be minimal, and generally associated with hazard tree abatement. This activity would not alter habitat suitability for this species.

Cumulative Effects

Temporal bounding of the cumulative effects analysis area generally goes 40 years into the past; the following analysis includes fire suppression activities that date back as far as the early 1900s. Past activities, actions, and events that affected the Lewis' woodpecker and its habitat include timber harvest, fire suppression, wildfire, and post-fire salvage. Past timber harvest targeted large diameter open-grown (single-strata) ponderosa pine and Douglas-fir that this species is dependent on for foraging and nesting. Harvest also impacted large diameter snags, reducing potential nesting habitat. Fire suppression has allowed for the encroachment of fire-intolerant conifer species into historically open ponderosa pine and Douglas-fir stands. The composition and structure of these stands has changed, reducing the quality of these stands for the Lewis' woodpecker. Fire salvage in the Wheeler Point Fire area also impacted potential nesting and foraging habitat in the high severity portion of the fire. Research indicates that this species utilizes post-fire stands where available, generally 5 to 10 years post-fire. Salvaged stands in the Wheeler Point Fire area would not be considered suitable habitat for this species due to the level of snag removal that occurred. These activities, actions, and events have combined to create the existing condition of Lewis' woodpecker habitat in the analysis area.

Ongoing (present) activities in the analysis area that are affecting the Lewis' woodpecker or its habitat include fire suppression. This activity is having the same effects as those described previously.

When the effects of these alternatives are combined with the residual and expected effects of past, present, and future activities in the analysis area, there would be no cumulative reduction in suitable habitat for the Lewis' woodpecker. Although habitat quality may be reduced to a small degree due to harvest activities and felling of hazard and danger trees, all of the action alternatives would positively impact habitat for this species in the mid and long term, reversing past habitat reductions. When combined with past harvest activities, there would be a reduction in large snags immediately and in the mid and long term through a reduction in snag recruitment. By moving these stands toward a condition more characteristic of historical conditions and improving stand health, the proposed vegetative treatment activities may reduce long term snag recruitment to an unknown degree. It is possible that Forest Plan standards for snag density would not be met in treated stands for some period of time. When combined with past activities, it is not expected that there would be an adverse cumulative impact on this species (due to reductions in large snags) due to the fact that existing snags would largely be retained in treatment units, and snag recruitment in post-treatment stands would be expected to be similar to that which occurred historically in dry forest stands.

Alternative 2

Direct and Indirect Effects

This alternative would have similar impacts as those described in the *Common to All Action Alternatives* section. This alternative would commercially thin (with skips and gaps) the most acres when compared to Alternative 3. Approximately 400 acres would be moved into a single-stratum late and old structure condition in the short term, for a total of 1950 acres of old forest single-stratum structure stands after treatment. In the long term (year 2065 – see *Silviculture Report*), there would be 10,510 acres of old forest single-stratum structure stands in the analysis area. Much of this would be the result of thinning that moves younger stands into an intermediate structure and density, the application of prescribed burning on a regular basis (10-20 year interval), and growth over time. Because this alternative would move the most acres into or toward an OFSS condition in the short and long term, it would have the greatest short and long term impact on the availability and distribution of suitable Lewis' woodpecker habitat in the analysis area. See discussion in the *White-headed Woodpecker* Section. Because this alternative would treat the most acres, it would also have the most potential impact on snags (through hazard/danger tree felling), reductions in snag recruitment, and felling of large diameter, younger Douglas-fir and white fir that currently provide perches in proposed units.

Cumulative Effects

The cumulative effects of this alternative would be similar to those described in the *Common to All Action Alternatives* section. This alternative would treat the most acres of potential Lewis' woodpecker habitat when compared to the other action alternatives. Alternative 2 would contribute the most to past losses of snags potentially used for nesting. This alternative would reverse the effects of past fire suppression (by returning dry forest stands to appropriate structure and composition) on more acres than Alternative 3.

Alternative 3

Direct and Indirect Effects

This alternative would have similar impacts as those described in the *Common to All Action Alternatives* section. Approximately 400 acres would be moved into a single-stratum late and old structure condition in the short term, for a total of 1950 acres of old forest single-stratum structure stands after treatment. This would be the same number of acres and proportion of the analysis area as was described under Alternative 2. In the long term (year 2065 – see *Silviculture Report*), there would be 9,970 acres of old forest single-stratum structure stands in the analysis area. Much of this would be the result of thinning that moves younger stands into an intermediate structure and density, the application of prescribed burning on a regular basis (10-20 year interval), and growth over time. Alternative 3 would move approximately 540 fewer acres into an OFSS condition in the long term when compared to Alternative 2. While still below HRV, this structural stage would be available at similar levels as those that would be expected historically, but at a slightly lesser proportion than Alternative 2.

Because this alternative would treat fewer acres and require less road use (closed, seasonal, and existing/new temporary roads), the potential short and long term impacts on snags (through hazard and danger tree felling and reductions in future recruitment) would be less than Alternative 2. This alternative would also result in less impacts to large diameter, younger grand fir and Douglas-fir that are currently providing perching habitat. This alternative would also drop four proposed units in the Wheeler Point Fire area that currently provide suitable habitat for

this species. Further treatment of these suitable stands (beyond what the fire accomplished) would greatly reduce snag recruitment in the future, and may disrupt breeding in known occupied habitat.

Cumulative Effects

This alternative would have slightly less cumulative impact on snags due to there being fewer acres of potential habitat mechanically treated. It would also reverse past habitat changes resulting from fire suppression of slightly fewer acres than Alternative 2.

Determination and Rationale (All Action Alternatives)

These alternatives may impact individuals or habitat, but are not likely to contribute to a trend towards federal listing or cause a loss of viability to the population or species. The rationale for this determination is as follows:

- The Lewis' woodpecker is present in the analysis area.
- Commercial thinning (with skips and gaps) generally would not alter the suitability of habitat in the analysis area. Habitat quality would improve in capable, unoccupied habitat in the short and long term through the proposed activities. Stand structure and composition would emulate what historically occurred in dry forest habitat.
- Future snag recruitment may be impacted through a reduction in density-dependent mortality. As treated stands would be moved into a more appropriate dry forest structure and composition (moving toward the HRV), and impacts to existing snags are expected to be minor, this long term impact to snags is not expected to adversely impact this species or potential habitat. Snag recruitment in post-treatment stands would be expected to be similar to that which occurred historically.
- Treatment of suitable habitat would have minor short and mid term impacts on snags potentially used for nesting and roosting as a result of landscape burning.

Gray Wolf - Endangered

No Action

Direct and Indirect Effects

The quality of potential gray wolf habitat is not expected to change in the short term. In the mid and long term, open road densities are not expected to change. Big game populations (prey) are also expected to be relatively stable in the mid and long term (meeting or near state management objectives), barring large scale disturbance. It is unlikely given current and expected future management in the analysis area that the gray wolf would establish a territory in the Kahler area.

Common to All Action Alternatives

Direct and Indirect Effects

Vegetative treatments (commercial and noncommercial thinning) and burning would not directly affect the gray wolf because this species is not known to occur in the analysis area or on the District. Dens and rendezvous sites would also not be affected by the proposed activities

because neither of these features is present on the District. Wolves are habitat generalists; commercial thinning, non-commercial thinning, and burning would not directly impact potential habitat quality. The proposed activities would not occur in or impact inventoried roadless areas, scenic areas, wilderness, or potential wilderness in the vicinity of the analysis area. Under all of the action alternatives, open road densities would decrease. While human disturbance associated with vehicle use would decrease following implementation of new road closures, the average open road density in the analysis area would continue to be well above levels desired by the gray wolf. It would remain very unlikely that the gray wolf would establish a territory in the analysis area.

Road closures (seasonal and year-round) associated with treatment activities, totaling 16.5 miles under Alternative 2 and 15.6 miles under Alternative 3, would temper cover loss to some degree by creating low-disturbance areas associated with treated and untreated stands in the Kahler area. Population levels of prey in the vicinity of the project area are not expected to measurably change. Despite this fact, potential prey (elk) would likely spend a greater amount of time on adjacent private lands or adjacent National Forest System lands in response to treatment activities.

Cumulative Effects

Past activities and events in the analysis area that affected potential prey resources and the level of human disturbance in the analysis area include timber harvest, road construction, and road closures (Access and Travel Management Planning). Timber harvest has affected forest structure and composition. This activity impacted habitat for potential prey by reducing the amount of cover habitat in the analysis area. Conversely, the amount of foraging habitat for big game has increased in response to past harvest. Currently, the HEI standard for the E1 West and E1 East management area is being met; it is not being met in the C3 management area. Total cover and satisfactory cover standards are also not being met in the C3 management area. Road construction associated with timber harvest increased road densities and disturbance within the analysis area. The current open road density in the analysis area is 2.0 and 2.5 miles per square mile in the E1 management area (East and West, respectively), and 0.5 miles per square mile in the winter range (MA C3). Due to the fact that wolves generally prefer habitat with less than 1 mile of open road per square mile, much of the project area would be considered poor quality potential gray wolf habitat. In the 1990s, road closures associated with access and travel management planning on the south end of the Umatilla National Forest reduced road densities to their existing condition. Prior to this, most of the roads on the District were open to motorized use. Past activities have resulted in the current condition of gray wolf habitat in the analysis area.

There are no ongoing or reasonably foreseeable future activities, actions, and events that would affect potential wolf habitat or potential prey resources in the analysis area.

When the expected effects of these alternatives are combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be no cumulative impacts on this species (it is not present), and no cumulative reduction in potential gray wolf habitat. Wolves are a habitat generalist; prey resources and disturbance (or lack thereof) are much better indicators of habitat suitability than vegetation. Vegetative treatment would not alter habitat suitability. Road closures proposed under all of the action alternatives would help reverse past and ongoing disturbance associated with construction and use of the existing road system in the analysis area. Treatment activities would cumulatively impact potential prey (elk) habitat.

Determination and Rationale (Alternatives 2 and 3)

Under all of the action alternatives, there would be no effect on the gray wolf. The rationale for this determination is as follows:

- The gray wolf is not currently known to occur in the Kahler analysis area or on the District.
- Open road densities would decrease under Alternatives 2 and 3; densities would remain above what is desired by wolves. There would be no treatment in inventoried roadless, scenic areas, potential wilderness, and designated wilderness areas under these alternatives.
- Potential prey would continue to occur in the area at similar population levels as those that currently occur in the project area.

*Intermountain Sulphur (Butterfly) - Sensitive**No Action**Direct and Indirect Effects*

The quality of potential intermountain sulphur habitat is not expected to change in the short term. Suitable habitat for this species is located at the ecotone between steppe-shrubland and grassland habitats and forested sites. The structure and composition of these habitats generally does not change over short time periods. In the mid and long term, continued encroachment of steppe-shrubland and grassland habitats by conifer species (primarily juniper with lesser amounts of ponderosa pine and Douglas-fir) would alter the structure and composition of these habitats. In the event of large scale disturbance, such as wildfire, impacts to this habitat type would be relatively short-lived, as grassland habitats recover quickly after disturbances. The shrub component of these habitats would require a longer recovery period, but as this species utilizes forb species for foraging and reproduction, effects would only persist in the short term.

*Common to All Action Alternatives**Direct and Indirect Effects*

Under all of the action alternatives, there would be treatment of encroaching conifers in steppe-shrubland sites. Removal of smaller-diameter, younger conifers from areas where they were less abundant historically would improve the structure and composition of steppe shrubland habitat. Under both of the action alternatives, there would be approximately 1,496 acres of ground-based mechanical thinning to improve steppe shrubland habitat; an additional 38 acres of thinning would be accomplished by hand, and would target non-commercial sized encroaching conifers less than 9 inches DBH. In the short term, the use of mechanical skidding equipment in a portion of these stands would cause disturbance to existing herbaceous vegetation and shrubs. The disturbance that would occur in individual units would vary greatly according the amount of encroaching conifers that are present. It is expected that vegetation would recover quickly; these impacts would persist for perhaps one to two growing seasons. Mechanical treatment has the potential to directly affect this species (juveniles and eggs) during implementation. During the summer months, larvae would be actively feeding on *Lathyrus* species in steppe shrubland and grassland sites. Eggs would also be vulnerable to impacts during the winter. Due to the fact that only a portion of the unit acres would be affected by skidding operations, the impact to potential larvae and eggs is expected to be minor. Proposed landscape underburning under Alternatives 2

and 3 would impact approximately 31,000 acres within the analysis area. Broadcast underburning would preferably occur in the fall; however, spring burning may occur if weather and fuel conditions combine to create conditions where goals and objectives of burning would be met. Burning would impact habitat by reducing potential larval host plants; however, most larvae would have metamorphosed by the time a burn window opened in the fall. Eggs deposited on larval host plants would be potentially lost to fall and very early spring burning. The burn area is composed of a number of blocks that utilize existing roads and features to compartmentalize the burn area. Adjacent blocks generally would not be burned in the same year in order to provide a mosaic of burned and unburned habitat across the project area. A reasonable estimation of yearly underburning would be approximately 1,000 to 2,000 acres, of which approximately 70% of the area would actually be blackened. Because burning would not occur in a single calendar year, potential impacts to this species and its habitat would be spread over a longer time period. Habitat for this species would recover in the next year following burning.

It is expected that in the mid and long term, steppe-shrubland treatments would improve potential habitat quality for this species by reducing competition with encroaching conifers for light, water, and other resources, and reducing allelopathic interactions. These stands would be more similar to conditions that would have been expected historically in these areas.

New temporary road construction and clearing of some existing temporary roads would impact habitat for this species. New temporary road construction would impact a maximum of 5.5 acres of ground, with only a portion of this composed of potential habitat. It is not expected that this level of impact on potential habitat would appreciably impact this species, if present in the analysis area. In the long term, new temporary roads and cleared existing temporary roads would recover and provide potential habitat for this species.

Cumulative Effects

Past activities and events in the analysis area that affected potential intermountain sulphur habitat include livestock grazing, road construction, and prescribed underburning. Past grazing occurred at much higher stocking levels than those currently occurring; overutilization and limited forage likely resulted in greater utilization of forbs, including preferred food plants and larval host plants. The time that has passed since overgrazing has likely eliminated any residual impacts associated with this activity. Prescribed underburning directly impacted the quality of potential habitat. However, these impacts were temporary due to the fact that these underburns were low intensity and habitat (larval host plants) likely fully recovered in the season following burning. Road construction occurred in open steppe-shrubland and grassland habitats in the analysis area in the past. This activity permanently removed impacted acres from production. These activities, actions, and events have combined to create the existing condition of intermountain sulphur habitat in the analysis area.

Ongoing and reasonably foreseeable future activities with a potential to impact potential intermountain sulphur habitat include cattle grazing and prescribed fire (Wildcat II, Sunflower Bacon, and Rimrock Projects). Due to the fact that a small portion of cattle diets are comprised of forbs, that the larval host plant (sweet pea) is low growing and may be difficult for cattle to access, and impacts to upland vegetation have been slight to light and consistently met Forest Plan standards, the current and expected impacts to potential intermountain sulphur habitat would be minor.

When the expected effects of these alternatives are combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be no cumulative reduction in habitat for this species or adverse impacts to the species. Expected impacts to potential habitat quality would be temporary, and would be spread through both time and space. Because burning would occur over five to ten years across the analysis area, it is not expected that there would be an adverse cumulative impact on this species (if present).

Determination and Rationale (All Action Alternatives)

Under all of the action alternatives, the proposed activities may impact individuals or habitat, but are not likely to contribute to a trend towards federal listing or cause a loss of viability to the population or species. The rationale for this determination is as follows:

- The intermountain sulphur is not known to occur in the analysis area.
- Commercial and non-commercial thinning to improve steppe-shrubland habitat conditions have the potential to impact habitat in the short term; mechanical treatment activities may result in physical damage/crushing of juveniles and eggs. Based on the expected extent of impacts within proposed steppe-shrubland improvement units, it is unlikely that population levels (if this species is present) would be impacted.
- In the mid and long term, the structure and composition of steppe shrubland habitat would improve with regard to the requirements of this species.
- Burning would affect habitat quality in the short term. Due to the intensity, timing, and mosaic nature of proposed underburns, and the fact that burning would be spread over the analysis area over a number of years, it is not expected that this species or potential habitat would be adversely impacted.

Johnson's Hairstreak (Butterfly) – Sensitive

No Action

Direct and Indirect Effects

The quality of potential Johnson's hairstreak habitat is not expected to change in the short term. In the mid and long term, habitat for this species would increase in some areas and decrease in others. Continued fire suppression would allow for the continued ingrowth of small diameter conifers in dry forest stands. Infection of understory conifers with dwarf mistletoe would increase larval habitat for this species. High severity fire would likely cause heavy overstory mortality, resulting in both short and long term reductions in the abundance and local distribution of dwarf mistletoe.

Common to All Action Alternatives

Direct and Indirect Effects

Under all of the action alternatives, trees infected with dwarf mistletoe would be targeted for removal in commercial thin units to improve stand health and slow the spread of dwarf mistletoe to understory vegetation. All old trees (>150 years old), regardless of size, would be retained. A portion of existing Douglas-fir and grand fir that are greater than 21 inches DBH, but less than

150 years old may be removed in proposed treatment units. Removal of large diameter (but young) Douglas-fir and grand fir would impact potential habitat used by this species during the spring and summer flight season. Loss of mistletoe infected trees in general would reduce potential foraging habitat for this species. The prescription that would be applied to proposed units incorporates both skips and gaps within the larger treated matrix within each treatment unit. Skips would account for approximately 10 to 15 percent of the proposed treatment acres within each unit; in general, these would be dense patches within the stands. Skips (untreated areas) would provide for locally high levels of mistletoe infection within the proposed treatment unit, as well as scattered large diameter and smaller dwarf mistletoe infected trees. Danger tree felling would also likely impact mistletoe infected trees to some extent; those trees with dead mistletoe brooms that have the potential to interact with traffic on roads may be felled. While potential larval forage may be reduced to some degree, dwarf mistletoe would still be available within proposed commercial thinning units following implementation. These trees, in addition to those infected trees located outside of proposed vegetative treatment units, would provide forage for this species, if present.

Non-commercial thinning may also impact dwarf mistletoe infected trees to a small degree. Generally, larger trees are used for egg deposition due to more numerous and larger mistletoe clumps (i.e., fruiting bodies), so the expected impact in non-commercial thinning would be minor.

Prescribed underburning is not expected to appreciably impact dwarf mistletoe abundance or distribution. The low intensity of these burns would make it unlikely that the abundance of overstory trees potentially used by this species for larval feeding would be appreciably impacted.

Cumulative Effects

Past activities, actions, and events in the Kahler analysis area that have impacted potential Johnson's hairstreak habitat include fire suppression, timber harvest, and wildfire (Wheeler Point). Fire suppression has likely allowed dwarf mistletoe to become more widespread and infections more severe within the analysis area and the larger landscape. Past harvest activities impacted potential Johnson's hairstreak habitat through direct removal of mistletoe infected trees of all size classes. Although mistletoe was targeted for removal in treatment units, areas outside of treatment units currently contain dwarf mistletoe infected trees. Past wildfire also impacted potential habitat by eliminating dwarf mistletoe over larger areas. These activities have combined to create the existing condition of Johnson's hairstreak habitat in the analysis area.

There are currently no ongoing or reasonably foreseeable future activities, actions, and events in the analysis area that are affecting Johnson's hairstreak habitat.

When the expected effects of these alternatives are combined with the residual and expected effects of past, present, and future actions, activities, and events in the analysis area, there would be an incremental reduction in potential larval foraging habitat in treatment units. However, mistletoe would likely continue to be more widespread than would be expected under historic conditions. Mistletoe infected trees are expected to be present in treatment units (general matrix, skips) following implementation. Impacts to mistletoe trees outside of treatment units would be considered minor due to the low level of impact expected during prescribed burning, and the fact that only those mistletoe infected trees that rate out as a danger to users of roads (using the 2008 Danger Tree Identification Guide) would be felled. For these reasons, it is not expected that there would be a shortage of potential larval foraging habitat after implementation.

Determination and Rationale (All Action Alternatives)

Under all of the action alternatives, the proposed activities may impact individuals or habitat, but are not likely to contribute to a trend towards federal listing or cause a loss of viability to the population or species. The rationale for this determination is as follows:

- The Johnson's hairstreak butterfly is not known to occur in the analysis area; it is assumed present based on the presence of suitable habitat.
- Commercial thinning, and to a much lesser degree non-commercial thinning, would impact the larval host plant (dwarf mistletoe). Potential larval foraging habitat would be available within and outside of proposed treatment units following implementation.
- Burning would have minor impacts on dwarf mistletoe infected trees; an occasional tree may be killed.
- The impacts of danger tree felling are also expected to be minor given guidelines in the 2008 Danger Tree Identification Guide.

*Other Species**Northern Goshawk**No Action**Direct and Indirect Effects*

Potential nesting and foraging habitat would remain unchanged in the short term. In the mid and long term, stands would continue to grow and develop multiple dense canopy layers. Young stands would develop large trees over time. Openings created by past harvest and wildfire would fill in over time. The availability of nesting habitat would increase slightly in the long term due to a greater abundance of large trees and dense multi-layered habitat in dry forest stands. Foraging habitat quality would change as the area grows denser and more homogeneous, resulting in fewer microhabitats for prey species. The multi-layer condition would increase the susceptibility of stands to high severity wildfires and insect or disease outbreaks. Suitable nesting and foraging habitat would be converted to an unsuitable condition by a fire of this extent and magnitude.

*Common to All Action Alternatives**Direct and Indirect Effects*

Proposed commercial harvest (with skips and gaps) would have the same effects on the northern goshawk and goshawk habitat under each of the action alternatives; the extent of these activities would vary by alternative. It is this difference in acres treated that would result in varying levels of impact to the goshawk and its habitat. Since potential habitat quality would be affected by proposed commercial thinning it stands to reason that an increase in the acres impacted by these activities would have a greater impact on potential goshawk habitat.

There are no known northern goshawk nests in the project area. In the event that a northern goshawk nest is discovered in the project area during layout or implementation, treatments would be adjusted to meet the guidelines provided in the Eastside Screens (USDA 1995). This

would include identification of a 30 acre nest stand immediately surrounding the nest, and a 400 acre post-fledging area for active nests. Harvest would not be allowed within the 30 acre nest stand.

Vegetative treatment activities (commercial thinning, shrub steppe enhancement, and non-commercial thinning) would occur in suitable goshawk habitat under all of the action alternatives. Refer to Table W-30 for acres of treatment by habitat type (nesting and foraging) and treatment type.

Table 4-58 Acres of northern goshawk habitat treated by habitat type and treatment type.

Habitat Type	Alternative	Acres Treated	Treatment Type		
			Commercial Thinning	Shrub Steppe Enhancement	Non-Comm Thinning
Nesting	Alternative 2	1,151	1,107	13	31
	Alternative 3	981	892	13	76
Foraging	Alternative 2	11,481	9,599	1,163	719
	Alternative 3	10,823	8,788	1,163	872

Under all of the action alternatives, suitable goshawk nesting and foraging habitat would be commercially thinned. Goshawk prefer to nest in larger diameter trees in stands that generally have at least 40% canopy closure. Commercial harvest (with skips and gaps) would reduce canopy closure below this level (40%) in treated stands and reduce stand complexity (multi-layered profiles). As a result, goshawk would be less likely to use commercially thinned reproductive habitat for nesting post-implementation. These impacts would persist through the mid and long term in commercially thinned nesting habitat; over this period, residual trees would continue to grow and increase canopy closure and understory vegetation would regenerate. Although small skips would be retained in treatment units, it is unlikely that these skips would be of adequate size to support nesting activities. Treatment activities would improve the health and vigor of residual stands. In dry upland forest stands, treatment would promote or move stands into a more appropriate structure and composition.

Commercial thinning in suitable foraging habitat would also reduce canopy closure; however, goshawk use a wide range of structures, stand ages, and densities while foraging (Daw and DeStefano 2001). The goshawk would likely continue to use these stands post-treatment for foraging. Retention of skips (comprising 10 to 15 % of unit acres) within these commercially thinned stands would provide for a diversity of habitat for prey. Prey densities may be reduced in the short term as a result of ground disturbance and burning in these stands, but would likely be similar to pre-treatment levels in the mid term due to the diversity of habitat that will be available. Goshawk use may be reduced to some degree in the short and early mid term due to reductions in canopy closure resulting from treatment activities designed to move these stands towards a more appropriate dry forest composition and structure and short term disturbance of potential prey habitat. In the long term, canopy closure and understory vegetation layers would increase. Without further overstory treatment, commercially thinned foraging habitat would provide suitable nesting habitat in the long term (see Silviculture Report).

Burning would not impact potential goshawk nesting or foraging habitat suitability. Although an occasional large overstory tree may be killed, this activity would not impact stand structure or composition (Harrod et al. 2009). Potential prey may be reduced in the short and early mid term as a result of consumption of small diameter downed woody material and brush. Burning and mechanical activity fuels treatments (if necessary) are not expected to measurably reduce potential prey for the goshawk because landscape underburning is expected to blacken only a portion of the acres within the burn area. While it is difficult to predict where fire will and will not occur, it is estimated that approximately 70% of the burn area would actually be blackened. Because burns would be low intensity, it is expected that Forest Plan standards for large wood would be met following burning and contribute to habitat complexity and cover required by potential prey.

Road use (open and closed) and associated danger tree felling are not expected to impact the goshawk. If a nest is discovered during layout or implementation, seasonal road use restrictions would be applied in any instance where a road used for haul has the potential to disturb nesting goshawk. New temporary road construction would occur within foraging and nesting habitat under both of the action alternatives. Because new temporary roads would generally follow existing openings (where available), impacts to overstory vegetation and goshawk habitat quality are expected to be minimal. Felling of danger trees along haul routes may impact a small number of larger diameter green trees that could potentially be used for nesting. Due to the proximity of these trees to roads and the availability of potential nesting trees elsewhere, it is unlikely that this activity would directly or indirectly impact this species.

Non-commercial thinning would not impact goshawk habitat quality. In the long term, this activity will promote the development of larger trees by stimulating growth in residual small diameter trees.

Shrub-steppe enhancement treatments would impact areas where historic shrublands and grasslands have been encroached by conifers, including juniper, ponderosa pine, and Douglas-fir. These areas would be quite open after treatment; only old, large trees would be retained in the overstory. These areas would not be used for nesting following treatment; potential foraging would likely be greatly reduced in these stands.

Cumulative Effects

Past activities, actions, and events in the Kahler analysis area that have impacted suitable goshawk habitat include commercial thinning and regeneration harvest, wildfire (Wheeler Point), fire suppression, and insect and disease outbreaks. Fire suppression has allowed for the ingrowth of shade-tolerant vegetation in upland forest stands, increasing canopy density and stand complexity (multiple layers). As a result, a larger proportion of dry forest stands provide suitable habitat conditions (canopy closure $\geq 40\%$ and multiple canopy layers) than would have been expected under historic conditions. Past harvest activities have impacted the quality, quantity, and distribution of suitable goshawk habitat in the analysis area. These activities altered stand structure, reducing the amount of late and old structure habitat, and the size of available habitat patches. Large trees were generally targeted in these stands. In general, commercially thinned and regeneration harvested stands are not currently providing suitable nesting habitat due to a lack of large diameter green trees and complex stand structure. Past high and moderate severity wildfire also reduced the amount of suitable habitat within the analysis area. Insect outbreaks (spruce budworm) have resulted in high mortality of grand fir and Douglas-fir in small, relatively isolated moist upland forest stands and some overstocked dry forest stands. These events reduced suitable nesting habitat in some locations; conversely, foraging habitat quality

may have improved to some degree in these stands. These activities have combined to create the existing condition of northern goshawk habitat in the analysis area.

Currently, there are no ongoing or reasonably foreseeable future activities proposed in the analysis area that would affect or have the potential to affect the goshawk or its habitat.

When the effects of this alternative are combined with the residual and expected effects of past, present, and future activities in the analysis area, there would be a cumulative reduction in suitable nesting habitat. This reduction would add to past losses in nesting habitat resulting from past harvest and wildfire, and reverse past increases in suitable nesting habitat resulting from fire suppression. Refer to individual alternative sections for further discussion. Foraging habitat would also be treated under all three action alternatives. Although the proposed activities may alter stand structure and composition and reduce prey in the short term, there would be no cumulative reduction in or adverse cumulative impact on suitable foraging habitat under any of the action alternatives. In the long term, treatment activities would maintain and promote development of the large tree component in affected stands, and promote the resilience of habitat to wildfire. The proposed activities are consistent with Forest Plan standards and guidelines for goshawk habitat and late and old structure habitat (USDA 1995), and would continue to be so in the event a nest is discovered within the project area.

Alternative 2

Direct and Indirect Effects

This alternative would have similar effects to those described under the *Common to All Action Alternatives* section. This alternative would commercially thin and enhance shrub-steppe habitat on the most acres of suitable nesting and foraging habitat when compared to Alternative 3. For this reason, it would also have the greatest impact on goshawk habitat in the short and long term. Commercial thinning and shrub-steppe enhancement would make 1,120 acres of nesting habitat unsuitable for nesting. These acres are located in stands where the HRV indicates that more open dry upland forest vegetation dominated by ponderosa pine or openings and shrublands would have occurred historically. This would equate to a 62% reduction in suitable nesting habitat in the short and mid-term. In the long term, without further treatment of overstory vegetation, it is expected that stands would again be encroached by fire-intolerant conifers and stand densities and canopy closure would increase. As a result, some stands would transition back to a suitable nesting habitat condition in this time frame (see Silviculture Report).

Foraging habitat quality would be impacted in the short and mid-term on the most acres (11,481 acres) under this alternative.

Cumulative Effects

The cumulative impacts of this alternative would be similar to those described under the *Common to All Action Alternatives* section. This alternative would result in the greatest incremental reduction in suitable nesting habitat when combined with reductions in habitat resulting from past harvest and wildfire. This alternative would commercially thin and enhance shrub-steppe habitat on the most acres when compared to Alternative 3. Treatment activities would reduce the amount and distribution of suitable nesting habitat and high quality foraging habitat within the analysis area to such a degree that goshawk may be less likely to use the analysis area after treatment. Available nesting habitat would largely be restricted to riparian areas and Dedicated Old Growth stands under this alternative. In the long term, this alternative would have the greatest improvement in terms of old growth (single stratum) development,

resilience to fire, and would return the most acres in the dry upland forest PVG to a more appropriate structure and composition.

Alternative 3

Direct and Indirect Effects

This alternative would have virtually the same effects as those described under the *Alternative 2* section. This alternative would have slightly less impact on nesting habitat than *Alternative 2*; it would commercially thin and enhance shrub-steppe habitat on approximately 905 acres of suitable nesting habitat. This would equate to a 50% reduction in suitable nesting habitat in the short and mid term. In the long term, without further treatment of overstory vegetation, it is expected that stands would again be encroached by fire-intolerant conifers and stand densities and canopy closure would increase. As a result, some stands would transition back to a suitable nesting habitat condition in this time frame (see *Silviculture Report*). Under this alternative, the distribution and abundance of suitable nesting habitat would be greater in the long term than would be available under *Alternative 2*.

Under this alternative, foraging habitat quality would be impacted in the short and mid term on slightly fewer acres (10,762 acres) than under *Alternative 2*.

Cumulative Effects

The cumulative impacts of this alternative would be similar to those described under the *Common to All Action Alternatives* section. This alternative would result in a 50% reduction in suitable nesting habitat. Retention of larger patches of dense dry forest habitat would increase the likelihood of the Kahler analysis area providing goshawk nesting habitat and high quality foraging habitat of appropriate quantity and distribution to maintain occupancy and successful reproduction.

Neotropical Migratory Birds

No Action

Direct and Indirect Effects

The current condition of habitat for land birds in the analysis area would not change in the short term or early mid-term. In the long term, dry forest habitats would continue to be invaded by shade tolerant tree species due to fire suppression. This would further restrict development of old forest single strata habitat; this habitat type would continue to be well below the HRV in the long term. Species requiring these habitats may be less abundant as a result. Mesic mixed conifer stands would also continue to develop multiple canopy layers and dense understories. Stress resulting from overstocking in upland forest stands would increase the susceptibility of these stands to insects and disease, which would in turn increase snags and downed fuel loadings and increase the risk of high severity fire. If a large stand-replacing event took place, old forest habitats and large green trees and snags could be lost. Fire of this type would create edges and perches that would benefit some species (olive-sided flycatcher and Lewis' woodpecker), and encourage shrub regeneration. Species requiring high canopy closure and multiple canopy layers would be negatively impacted by a fire of this type; species like the black-backed woodpecker would benefit in the short term through improved nesting and foraging habitat. Aspen habitat quality would continue to decline as conifer encroachment continues. Existing aspen clones would shrink and ultimately die out without intervention and/or protection. Continued encroachment of conifers into steppe shrubland habitats would further reduce habitat quality in

these stands by reducing vegetative diversity and altering structure and composition of shrublands. In the long term, the loss of shrubs would impact nesting and foraging habitat for a number of Neotropical migratory birds. Uncharacteristic fire may also result, causing further reduction in habitat.

Common to All Action Alternatives

Direct and Indirect Effects

Proposed commercial thinning, non-commercial thinning, steppe-shrubland improvement thinning, temporary road construction, new road construction, mechanical activity fuels treatment (if necessary) and burning would have the same effects on Neotropical migratory bird habitat under each of the action alternatives; the extent (acres affected, miles of activities, etc.) would vary by alternative. Since potential habitat quality would be affected locally in proposed treatment units, within the underburn area, and along temporary roads, an increase in the acres (or miles) affected by these activities would have a greater impact on migratory birds and their habitat.

Planned activities in the Kahler analysis area (which represents about 2% of the Umatilla National Forest) may have short, mid, and long term effects at a local scale that may favor one or several bird species over another. Depending on the timing of treatment activities, there is a potential that mechanical treatment activities (commercial thinning, steppe shrubland thinning, and mechanical fuels treatment) may directly impact nests within treatment units. If ground conditions permit, these activities may occur in the spring when migratory birds are nesting. Nests may be crushed by machinery used in these units. It is not expected that these activities would result in impacts to population levels of migratory birds at either the analysis area (subwatershed) or Forest scale. If nests are lost, birds would likely re-nest in undisturbed habitats within the analysis area or elsewhere.

Commercial thinning in dry forest habitat would reduce stand densities, favor retention of large, old trees characteristic of dry sites (ponderosa pine, larch, Douglas-fir, and grand fir), and create small-scale heterogeneity by providing skips, gaps, and variable density patches within stands. All large, old trees (>150 years old) would be retained; a portion of Douglas-fir and grand fir that are greater than 21 inches DBH, but that are young (based on visual assessment) may be removed, felled and left, girdled, or topped to meet silviculture and wildlife goals. Treatment would move these stands towards a more characteristic structure and composition in the short and long term. Proposed treatments in dry forest habitats would promote the development of single-layered stands with large trees and snags and an open understory dominated by herbaceous cover, scattered shrub cover, and pine regeneration in the short and long term. The white-headed woodpecker and the flammulated owl would benefit in the short and long term through activities that would promote the development of large trees and snags and open canopies. Hazard and danger tree felling within treatment units and along roads would reduce existing snags to an unknown degree in the short- and mid-term. It is expected that the loss of large diameter snags along roads and in treatment units would be minimal due to the fact that only snags that pose a safety hazard would be felled. While all imminent danger trees along roads would be felled, those classified as having a “likely” failure potential may be retained for future wildlife habitat. A minor reduction in snags is not expected to impact habitat suitability or limit potential nesting strata for either the white-headed woodpecker or the flammulated owl. The chipping sparrow would also benefit from activities that create open understories and promote pine regeneration. Gaps would accentuate existing openings within units; natural regeneration and targeted planting of ponderosa pine in these areas would promote this priority

habitat feature. The risk of high severity fire (and associated loss of large diameter trees and snags and old structure stands) would also be reduced, potentially reducing burned old forest habitats in dry upland forest (focal species: Lewis' woodpecker). Dense untreated stands (Skips within units, class 1, 2, and 3 riparian habitats, and other untreated areas) within and outside the analysis area would continue to be at risk to high-severity wildfire that would provide habitat for species like the Lewis' woodpecker and black-backed woodpecker. Maintenance of skips composed of dense dry forest habitat within units and larger untreated areas across the landscape would be consistent with Management Considerations (*Habitat Conservation and Restoration*) contained in the white-headed woodpecker conservation strategy (Mellen-McLean et al. 2013). Mechanical activity fuels treatment prior to burning may occur where heavy accumulations of activity fuels pose a risk to residual vegetation. This activity would generally occur where vegetative disturbance has already occurred; additional short term impacts to habitat quality occur should these activities occur in subsequent years. This activity would have the potential to impact nests if it occurs in the spring. Given the fact that only a portion of these units would be directly impacted by mechanical fuels treatment activities, it is unlikely that population levels of migratory birds would be affected.

Commercial thinning would occur in approximately 10 acres of aspen lying within proposed treatment units under Alternatives 2 and 3. Competing conifers less than 150 years old would be removed (with some retained for downed wood and girdled/topped for snags) in these stands; Conifers >150 years old would be retained, regardless of size. Conifer felling and removal would reduce shading and competition for resources, improving growing conditions for the residual aspen and stimulating regeneration. Commercial thinning would not directly affect existing overstory aspen and aspen snags. Understory aspen sprouts may be impacted by mechanical equipment use, but they would recover in the years following vegetative treatment. In the mid and long term, these activities would improve habitat quality (regeneration of younger seral stages for replacement, large mature aspen, large aspen snags, and high mean canopy density) for the red-naped sapsucker, the focal species for the aspen habitat type (Altman 2000). Outside of treatment units, other aspen stands would be treated with non-mechanical methods as deemed necessary; as much as 20 acres of aspen outside of proposed units would be non-commercially thinned under Alternatives 2 and 3. As was the case in those stands within proposed treatment units, these stands would be fenced to reduce browsing impacts associated with wild ungulates and livestock. This activity would allow for regeneration of the clone to occur, and reduce ground disturbance associated with grazing.

Under both of the action alternatives, there would be approximately 1,496 acres of ground-based mechanical thinning to improve steppe shrubland habitat; an additional 38 acres of thinning would be accomplished by hand, and would target non-commercial sized encroaching conifers less than 9 inches DBH. In the short term, the use of mechanical skidding equipment in a portion of these stands would cause disturbance to existing herbaceous vegetation and shrubs, and may impact nests if this activity occurs in the spring or early summer. The disturbance that would occur in individual units would vary greatly according the amount of encroaching conifers that are present. As larger, commercial-sized encroaching conifers are widely scattered through many of the affected acres, a relatively small proportion of unit acres would be impacted by mechanical skidding equipment. As a result, it is expected that only an occasional nest would be impacted by this activity, and that it would not impact population levels of shrub-steppe associated migratory birds. It is expected that vegetation would recover quickly; these impacts would persist for perhaps one to two growing seasons. Thinning of encroaching conifers would improve growing conditions for shrub-steppe vegetation in the mid and long term.

New system road construction (0.3 miles) and new temporary road construction (3 miles) would occur in dry upland forest habitat under both of the action alternatives. Road building would constitute a removal of habitat, be it forested, shrub, grass, or lithosol from production along narrow corridors within this habitat type. The proposed new temporary roads generally follow existing openings, so impacts to overstory vegetation structure would be minimal. Existing temporary roads would also follow existing openings or roadbeds. The miles of existing temporary road used would vary by alternative. Under both of these scenarios, clearing of understory vegetation and blading of the road surface may disturb habitat for ground and near-ground nesting birds within the road prism. Due to the narrow footprint of proposed temporary roads (approximately 15 feet wide), impacts to habitat are expected to be minor. New and existing temporary roads would be decommissioned to varying degrees following their use. At a minimum, temporary roads would be seeded, hydrologically stabilized, and blocked to eliminate non-permitted use following implementation. Temporary roads would fill in with conifers and shrubs in the long term. Road construction also creates a situation in which hazard trees adjacent to the roads and must be removed. Because impacts to snags along these temporary road segments are expected to be minor, it is unlikely that species requiring large snags (white-headed woodpecker and flammulated owl) would be measurably impacted.

Both of the Action Alternatives would burn approximately 31,000 acres within the analysis area. Landscape burning within the proposed underburn area would have short term impacts on nesting habitat for ground and near-ground nesting birds (focal species: chipping sparrow, vesper sparrow, varied thrush, and MacGillivray's warbler) in steppe-shrubland, dry forest, and mesic mixed conifer forest habitat types. The preferred time for landscape underburning would be the fall; however, spring burning may occur if weather and fuels conditions are appropriate. If spring burning occurs, attempts would be made to implement this activity prior to the peak of migratory bird breeding, approximately May 15. Spring burning may result in nest loss. The proposed underburn area would be broken into smaller burn blocks; adjacent burn blocks would not be burned in the same year to maintain well-distributed, undisturbed habitat for migratory bird species. Approximately 70% of individual burn blocks are expected to be blackened during burning; these unburned areas would include wet areas, areas with low fuel loading, and areas where grasses have not yet cured out. Grasses and shrubs would re-sprout in the year following burning due to the low intensity of burning. It is not expected that this activity would result in impacts to population levels of migratory birds at either the Forest or subwatershed scale. If nests are lost to this activity, ground and near-ground nesting Neotropical migratory birds would likely re-nest in adjacent habitat (unburned patches within burn blocks and areas outside burn blocks). This activity would also promote open understories and a more appropriate structure and composition on dry forest sites, improving habitat quality in the mid and long term for the chipping sparrow, flammulated owl, and white-headed woodpecker. Some snags potentially used for nesting and roosting by white-headed and Lewis' woodpeckers, and Vaux's swift may be lost to this activity. Losses of dead wood associated with landscape burning would be minimal due to the low intensity of these burns; impacts on habitat quality for these species would also be minimal. Burning would have a neutral or positive impact on aspen stands that are currently present in the analysis area. Because underburns would be low intensity, there would be minimal impacts to overstory and understory aspen. Aspen clones will likely respond to burning by sending up additional vegetative shoots in the spring following burning.

Noncommercial thinning within and outside of commercially harvested stands has the potential to impact potential nesting habitat through direct removal of small diameter trees by hand or mechanical methods. Because clumps of untreated small diameter trees and individual small diameter trees (with appropriate spacing) would be retained within these units, the expected

impacts to habitat for species that nest on or near the ground would be minor. Within harvest units, this activity would reduce cover and potentially nesting substrates, as described above. Mechanical non-commercial thinning (if it occurs) has the potential to directly impact ground nests. Given the fact that only a portion of these units would be directly impacted by mechanical non-commercial thinning activities, it is unlikely that population levels of migratory birds would be affected. This impact is expected to be minor and temporary; retained small diameter conifers, shrubs, and new conifer regeneration will provide cover and nesting substrate in the years following treatment.

Cumulative Effects

Past activities, actions, and events in the analysis area that may have affected Neotropical migratory bird habitat include timber harvest, road construction, wildfire (Wheeler Point), fire salvage (approx.. 2,164 acres in the Wheeler Point burn), fire suppression, and livestock grazing. Timber harvest altered the structure and composition of forested stands in the analysis area. Generally, these activities converted older stands (including late and old structure habitat) to stand initiation, stem exclusion, and young forest structure stands. Harvest stimulated growth of understory shrubs, grasses, and small diameter conifers in affected stands, improving habitat for some Neotropical migratory birds requiring these features. Openings created by regeneration harvest and overstory removal treatments are still present on the landscape today. Road building generally resulted in a loss of potential migratory bird habitat, and fragmentation of habitat. Road construction also resulted in impacts to snags by increasing access for woodcutters and creating the need to mitigate danger trees along these routes. Wildfire had variable impacts on Neotropical migratory bird habitat; these events benefitted some species and were detrimental to others. Wildfire altered stand structure and composition and reduced stand complexity where it burned at high severity, reducing potential nesting habitat for those species requiring high canopy closure, multiple canopy layers, and stand complexity. The Wheeler Point Fire created high snag density patches in upland forest habitat, providing habitat for Lewis' woodpecker, olive-sided flycatcher, black-backed woodpecker, and other species that select for burned stands. Subsequent fire salvage greatly reduced potential habitat for post-fire adapted species like the Lewis' woodpecker; there is currently little burned habitat with high snag densities on NFS lands in the fire area. Fire suppression has resulted in reduced dry forest habitat quality due to the invasion of shade-tolerant vegetation and the development of multiple canopy layers. Historic livestock grazing had negative impacts on shrub and grassland communities, altering the structure and species composition in these habitats. This activity also removed nesting cover and structure. More recent livestock grazing (approximately 1960 to present) impacted dry forest habitat by decreasing ground cover and suppressing upland shrub communities. These activities have resulted in the current condition of migratory bird habitat in the analysis area.

Ongoing and reasonably foreseeable future activities, actions, and events that affect Neotropical migratory bird habitat include cattle grazing. Grazing seasonally reduces the height of grasses and suppresses upland shrub communities in some areas. Given the current stocking levels and the fact that standards are consistently being met in the allotments that lie within the Kahler Project area (Winlock, Yellow Jacket, and Collins Butte), it is unlikely that grazing is adversely impacting habitat or populations of ground nesting birds in the analysis area.

When the expected effects of these alternatives are combined with the residual and expected effects of past, present, and future activities, events, and actions, there would be a short term incremental reduction in nesting and hiding cover and increased disturbance on migratory birds, potentially causing nest abandonment and loss. Proposed treatment activities would begin to reverse structural and compositional habitat changes resulting from fire suppression and past

harvest, by moving multi-strata old forest habitat toward a single-stratum structural condition in the dry upland forest PVG. Dry forest-associated birds would benefit in the mid and long term. Commercial thinning would also cumulatively reduce stand complexity and dense conifer stands used by some Neotropical migratory bird species. Understory vegetation potentially used for nesting would be impacted in the short term, but would be stimulated by these activities in the years following treatment. Landscape underburning would also have short term impacts on steppe-shrubland habitats and understory vegetation in forested habitat types; the cumulative impact would be minor due to the intensity, timing, and mosaic nature of this activity.

Alternative 2

Direct and Indirect Effects

This alternative would have similar effects to those described under the *Common to All Action Alternatives* section. Alternative 2 would commercially thin (with skips and gaps) the most acres (9,998) when compared Alternative 3. For this reason, it would have the greatest short, mid, and long term impact on habitat and individual Neotropical migratory birds when compared to the other action alternatives. Disturbance to potential nesting habitat, potential nest loss (should mechanical treatment occur in the spring), and snag reductions (through hazard/danger tree felling and burning) would be the greatest under this alternative. This alternative would also have the greatest long term benefit on open dry forest stands (see *Late and Old Structure* section); activities that restore or move stands toward an open, old forest structural condition would benefit the white-headed woodpecker, Lewis' woodpecker, and flammulated owl (focal species for this habitat type and features).

Under this alternative, the most miles of existing temporary road (6.9 miles) and closed system road (58.2 miles) would be used to implement the proposed activities. As a result, the immediate and long term impacts associated with road use and construction would be greatest under this alternative.

Cumulative Effects

The cumulative impacts of this alternative would be similar to those described under the *Common to All Action Alternatives* section. When the residual and expected effects of past, present, and reasonably foreseeable future activities are combined with the expected effects of this alternative, Alternative 2 would have the greatest incremental reduction in nesting and hiding cover and cause the most disturbance on migratory birds and their habitat in the short term. This is due to the fact that this alternative would treat vegetation (through mechanical means) on the most acres when compared to Alternative 3. This alternative would also have the greatest positive cumulative impact on dry forest late and old structure habitat (single-stratum) and associated Neotropical migratory birds by promoting its maintenance or restoration on more acres than Alternative 3.

Alternative 3

Direct and Indirect Effects

This alternative would have similar effects to those described under the *Common to All Action Alternatives* section. This alternative would commercially thin slightly fewer acres (9,166) and require the least existing temporary road use (5.4 miles) and closed road use (53.5 miles) than Alternative 2. As a result, there would be less short and mid-term impacts on Neotropical

migratory bird habitat. This alternative would non-commercially thin more acres (878 acres, +53 acres) than Alternative 2.

Cumulative Effects

The cumulative impacts of this alternative would be similar to those described under the *Common to All Action Alternatives* section. When the residual and expected effects of past, present, and reasonably foreseeable future activities are combined with the expected effects of this alternative, there would be an incremental reduction in nesting and hiding cover and increased disturbance on migratory birds and their habitat in the short term. This reduction would be less than what would occur under Alternative 2 due to a reduction in the number of acres that would be mechanically treated. This alternative would contribute to reversing past losses of open canopy old structure habitat in the dry upland forest PVG to a slightly lower degree than Alternative 2.

Recreation

No Action Alternative

Direct and Indirect Effects

Recreation conditions would only be affected by ongoing management and changes caused by natural events. The Recreation Opportunity Spectrum (ROS) identified for each management area would not be affected by this alternative.

Effects Common to All Action Alternatives

Direct and Indirect Effects

Treatment activities would occur in all management areas, although the portion of C1 that is treated would be converted to E1 through a Forest Plan Amendment in both action alternatives and the replacement C1 would not receive treatment. The results of these activities would all fall within the Roaded Natural to Roaded Modified ROS classes. Given the Forest Plan Amendment, none of the proposed activities under any of the alternatives would change the Recreation Opportunity Spectrum class as described in the Forest Plan (see Table 3-25 in the Recreation section of Chapter 3).

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

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. Highway 207 would continue to provide a diverse viewing experience for travelers.

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 11 acres of C1 around the Tamarack Lookout to E1, replacing it with 15 acres of C1 on the south end of the same stand of trees. Activity units are proposed within the A4, A6, C3, C5, and E1 management areas.

Harvest within Fairview Campground (A6-Developed Recreation) would result in a fully stocked, but very open stand. The prescribed basal area of 34 would equate to approximately 34 12" diameter trees per acre. In reality, the trees will vary in size, so there could be more or less than this amount in any given area. Trees would be unevenly spaced and a screen of untreated trees 10 to 20 feet wide would be retained around sites 2 and 5 to retain privacy. Mitigation directs that stumps would be low-cut to reduce their visibility. The timbered portion of the campground would change from a dense, mixed conifer stand to a very open, park-like stand primarily containing Ponderosa pine. This should blend with the remaining portion of the campground, which currently exhibits scattered clumps of ponderosa pine with a thick ground cover of grass. Visual quality would be reduced for up to three years following harvest until slash is treated and soil disturbance is revegetated. Where there is seeding of soil disturbance, recovery could be as quick as one year, depending on growing conditions. Once recovery is complete, the visual quality objective of Partial Retention would be achieved.

Proposed harvest along Highway 207 (A4-Viewshed 2) would again result in open, scattered trees (27-48 basal area). Treated stands would convert from multi-storied, dense, mixed conifer to single-storied, large trees (primarily Ponderosa pine). Remaining trees would be scattered unevenly across the landscape, blending with natural openings and tree clumps seen along existing portions of the highway. The emphasis on leaving late, old structure ponderosa pine would increase visual diversity along the route, which is currently dominated by middle age stands. Treatment using ground-based systems would cause soil disturbance that would be evident for 1-3 seasons, depending on seeding of disturbance and growing conditions. Treatment using helicopter systems would result in little soil disturbance, so treated units would be natural-appearing as soon as the slash is treated. There are two potential skyline units totaling less than 40 acres located downslope of the highway. Because of the angle of terrain, ground disturbance would be minimally visible and likely only viewed from two corners on the highway. Skyline corridors would not be evident on completion of the project due to the open nature of the remaining stand (prescribed basal area of 48). Mitigation directs that stumps within 300 feet of the highway would be low-cut to reduce their visibility. The thinning should allow more sunlight to reach the forest floor, which would increase the amount of cover that could hide stumps from view. Harvest debris would be piled and burned; the burned areas should blend with the surrounding areas within one year. Given these mitigations, proposed activities would appear subordinate to the natural landscape as viewed from Highway 207, meeting the visual quality objective of Partial Retention in the Foreground and Modification in the middle ground.

Harvest is proposed around the Tamarack rental cabin (E1 – Timber and Forage) to clear a viewing area for the fire lookout. Most trees would be removed from the foreground and middleground as viewed from the cabin. Trees directly adjacent to the cabin would remain, unless they pose a hazard to the cabin. Removal of the trees would likely open up distant views

as seen from area surrounding the cabin. This would create a very open site, with a visual quality of maximum modification, consistent with the objective for E1.

The Forest Plan also directs that dispersed occupancy sites be managed to at least a partial retention visual quality level. There are seven inventoried dispersed sites that occur inside or within 300 feet of proposed units (Table 4-60). The treatment for most of these units would be commercial thinning, with one unit receiving juniper removal treatment. As a result, stands would remain fully stocked. None of the inventoried dispersed campsites would be used as log landings. Stumps and soil disturbance could be visibly evident in the foreground of affected campsites, although overall views should be minimally affected. The length of time that visual quality is affected would be shortened where seeding is used to treat areas of soil disturbance. As a result of prescriptions and associated design criteria, harvest would meet the Visual Quality Objective of Partial Retention adjacent to all affected dispersed sites.

Table 4-59 Dispersed campsites within 300 feet of a proposed unit

		Alternatives	
		2	3
Unit #	Unit Prescription	# Sites	# Sites
65	Commercial thin	1	1
57a	Commercial thin	1*	1*
89	Commercial thin	2*	2*
88	Commercial thin	1*	1*
52	Commercial thin	1*	1*
202	Shrub/steppe	1*	1*
28a	Commercial thin	1	1
19	Commercial thin	1	1
17	Commercial thin	1	1

*** indicates that site is affected by more than 1 harvest unit**

Both C3 and C5 management areas allow for a range of visual quality, including Modification in C5 – Riparian and Maximum Modification in C3 – Big Game Winter Range. The proposed treatments together with the mitigation and design criteria described in Chapter 2 would meet the visual quality objectives for these two management areas.

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 100 percent. A portion of the campground lies in open forest, while the remainder is densely stocked with trees. This campground lies within the A6 – Developed Recreation management area (see Tables 3-25 and 3-26)

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 3-25 and 3-26).

Dispersed camping has traditionally been a popular activity in the area, with sites used intermittently during the three-month big game hunting seasons in the fall. A generic description of a dispersed campsite consists of a user-made area that is generally adjacent to a developed road. The site often has a meat pole hanging in the trees, a rock fire ring and a hardened parking/camping surface for one to three families. There are 16 inventoried dispersed campsites within the Kahler planning area. Sites are predominantly located along Forest Roads 2142, 2400, and 2500.

Table 4-60 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

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 defensible should a wildfire occur in this area. Treatment of Unit LO1 would reduce fuels along the egress route from the cabin, which would make for safer evacuation in a fire situation.

The four inventoried dispersed camps located along Road 2142 should not be affected by the proposed thinning activities. These four camps do, however, lie on the boundary of proposed burning, so campers could be affected by smoke and increased traffic. All dispersed campsites would be affected to some degree by smoke from prescribed burning. This would generally occur on the fringes of the camping season because conditions during the main camping season are too hot and dry to allow adequate control of fire. Late fall campers (primarily hunters) would be the most likely affected. Dense smoke could cause campers to relocate to another area, but the duration that this impact could occur would be short (1-2 weeks). Burning would also improve elk forage for several years, which could improve the quality of the hunting experience during that period.

Twelve dispersed camps lie on proposed haul routes and would experience increased traffic, dust, and noise in addition to smoke related to prescribed burning. Harvest could improve camper safety by removing weakened or dead trees that could otherwise fall and cause injury. For several years after harvest, campers would also benefit from an increased availability of firewood in the treatment units. Noise and dust would likely cause campers to use another site during treatment activities, but the effects would be limited to a small number of sites at one time and would cease as soon as treatment of the adjacent unit is complete (generally 1-2 weeks as work is occurring). Also, the early hunting season occurs during the driest part of the year, when there are often limitations on industrial operation in the forest due to fire concerns so the highest use period would not likely be affected.

Effects Unique to Alternative 2

Direct and Indirect Effects: Alternative 2 would close 19.3 miles of road to mitigate effects of harvest on wildlife. One known, but uninventoried, dispersed campsite would be affected by closing Road 2500063. However, this campsite has been unused for some time due to a conflict

with an adjacent private landowner. As a result, dispersed camping would not be affected by the road closures.

Effects Unique to Alternative 3

Direct and Indirect Effects

Alternative 3 would close 17.3 miles of road to mitigate effects of harvest on wildlife. Access to two un-inventoried, dispersed campsites would be lost: the campsite discussed under alternative 2 as well as an un-inventoried campsite on 2500063. As a result, dispersed camping opportunities within the Kahler planning area would experience a slight decline. This could be offset by new opportunities being created by log landings adjacent to open roads.

Cumulative Effects of All Action Alternatives

Past harvest has occurred throughout the Kahler area; in a number of places old, recovered log landings have become dispersed campsites due to their proximity to roads and relatively flat topography. Proposed activities under both alternatives could increase the number of dispersed campsite options in the long-term where new landings are created. Even with the road closures proposed under Alternatives 2 and 3, dispersed camping opportunities would likely increase.

There would be no other cumulative effects on camping with any of the alternatives based on a review of the Past, Present and Future projects listed in the project analysis file.

Trails and Dispersed Recreation

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

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 Biologist) which could affect the big game hunting experience.

There would be an increase in traffic during log hauling, which could pose hazards to ATV riders, but once hauling is complete there would be no lasting effects. Closure of 0.4 miles of ATV trail O-2400140 would reduce ATV riding opportunities by 3 percent in the Kahler planning area. However, it would also remove a stream crossing which would eliminate the expense of installing and maintaining a bridge. Use of the 24 Bypass trail as a temporary road

during harvest would improve the trail condition by clearing rocks from the trail that make riding extremely rough. The route would revert back to use as a trail after harvest is complete.

Most sightseeing is associated with Highway 207 in the central part of the Kahler project area and the Tamarack Lookout site. Mitigations described in Chapter 2 of this EIS should minimize effects on visuals along the highway. Removal of trees from around Tamarack Lookout will open up views of distant landscapes. Firewood gathering could diminish slightly after harvest and prescribed burning, as dead material is either removed or consumed by fire. Fire could enhance opportunities for mushroom picking, with the best results occurring under a broadscale underburn.

Effects Unique to Alternative 2

Alternative 2 would close three roads seasonally and 10 roads permanently, totaling 19.3 miles of road to mitigate effects of harvest on big game. This would reduce motorized access for hunting, gathering, and sightseeing, but other modes of travel would still be permitted. At the same time, these road closures would reduce disturbance to wildlife, particularly big game, during the spring, increasing wildlife viewing opportunities. However, the amount and configuration of cover removed would not be offset by road closures during the fall hunting season and big game would likely leave the Kahler area due to increased disturbance and a lack of hiding cover, reducing the opportunity for a successful hunt.

Effects Unique to Alternative 3

Alternative 3 would close two roads seasonally and 11 roads permanently, totaling 17.3 miles of road to mitigate effects of harvest on big game. This would reduce motorized access for hunting, gathering, and sightseeing, but increase wildlife viewing opportunities in the spring. Under this alternative, blocks of big game cover would be retained, and coupled with the road closures big game would be less likely leave the Kahler area during the hunting seasons, maintaining a quality hunting experience.

Cumulative Effects of All Action Alternatives

In the long-term, the proposed harvest and thinning together with past harvest and prescribed burning would benefit recreationists by creating a more open forest environment. An open forest setting is important for many recreation activities and provides greater cross-country access. Proposed road closures would combine with past road closures associated with the District Access and Travel Management Plan to reduce disturbance of big game, improving the opportunity for hunting success. Even with extensive past management in the analysis area, outdoor recreation use, in general, has steadily increased over the years. Other past, present, or foreseeable future projects identified in the Appendix to the EIS would not result in cumulative effects on the recreational experience.

Potential Wilderness Areas and Other Undeveloped Lands

Environmental Consequences

No PWAs were identified within the project planning area during the PWA inventory process. Therefore, there are no direct, indirect or cumulative effects to inventoried PWA resulting from the proposed project or alternatives to the proposed action. All of the acres within the undeveloped polygons are considered other undeveloped lands and are displayed in Map A-5.

Other Undeveloped Lands

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. Biological and ecosystem functions would continue. The landscape would likely continue developing complex fuel loads. A wildfire would have potential result in extensive mortality within denser forest stands which would result in larger acreages of blackened landscapes compared to prescribed fires. Some forest visitors could avoid blackened landscapes until green vegetation returns after 3 to 5 years. Fire is a natural occurrence and expected disturbance process in this landscape. All polygons of other undeveloped lands would continue to not meet inventory criteria as potential wilderness areas and would continue to not be an inventoried roadless area or a designated wilderness area.

For the No Action alternative, the Kahler project would not be authorizing any actions; therefore it would not be adding anything to the effects of past, present, and reasonably foreseeable future actions. Based on the definition provided in the CEQ regulations there would be no cumulative effects for the No Action Alternative.

Effects Common to All Action Alternatives

Direct and Indirect Effects

Effects to the intrinsic physical and biological resources of other undeveloped lands within the Kahler planning area (soils, water, wildlife, recreation, fisheries, etc.) are disclosed in the applicable resource sections of the EIS and are not reiterated here. Environmental effects to resources in other undeveloped lands due to the implementation of proposed project activities would be consistent with applicable laws, regulations, and Forest Plan management area standards and guidelines (see applicable sections of the EIS for Findings of Consistency for each resource).

Both alternatives proposed some level of activity within other undeveloped lands, varying only by the number of acres or miles treated. Timber harvest and associated activities in Alternative 2 would occur on approximately 2,332 acres of other undeveloped lands. Alternative 2 would also include 3.6 miles of temporary road constructed in other undeveloped lands to facilitate haul and 9,390 acres of prescribed burning. Timber harvest and associated activities in Alternative 3 would occur on approximately 2,166 acres of other undeveloped lands. There would be 3.0 miles of temporary road constructed in other undeveloped lands under Alternative 3 and 9,390 acres of prescribed burning. See the Appendix and associated maps to see the location of activity units and other undeveloped lands and the EIS Chapter 2 for a listing of harvest activity units and logging method. Table 4-62 shows the number of acres of activities proposed under each action alternative that would occur within other undeveloped lands.

Table 4-61 Activities proposed in Other Undeveloped Lands in Kahler

Activity	Alternative 2	Alternative 3
Commercial Thinning and	2332 acres	2,166 acres

Non-commercial Thinning		
Temporary Road Constructed	3.6 miles	3.0 miles
Prescribed Fire	9,390 acres	9,390 acres

On acres treated by commercial thinning, noncommercial thinning, or juniper removal, apparent naturalness and a sense of remoteness would be reduced for up to 50 years, depending on the rate of stump decay and recovery of disturbed soils. However, most areas of other undeveloped lands are less than 1,000 acres, so the sense of solitude would likely be nonexistent due to intruding sights and sounds from the surrounding managed areas. Areas of other undeveloped lands greater than 1,000 acres (four areas totaling 6,626 acres) were field checked to determine whether there were signs of past management that were not captured in existing records (see various field notes in Kahler analysis file). In one such area (polygon 57 totaling 1,548.3 acres), aerial photo and field evidence indicate a number of old roads or skid trails bisect the area. In polygons 11 (2,111.6 acres) and 27 (1,451.5 acres), stumps, stock ponds, and evidence of old skid trails/roads were found in the vicinity of the proposed harvest units. While there is little evidence of past management in polygon 21 (1,514.6 acres), an existing road almost entirely bisects the polygon; resulting noise intrusion would reduce the sense of solitude and remoteness.

Other undeveloped lands with no proposed treatments (7,599 acres in Alternative 2 and 7,765 acres in Alternative 3) would remain the same as described in the affected environment. They would remain free of developments such as forest roads or timber harvest units. All 9,931 acres of other undeveloped lands within the project planning area would still not be considered PWAs, roadless areas, inventoried roadless areas, or a designated wilderness area.

Table 4-63 is a summary showing the changes in acres for other undeveloped lands by alternative.

Table 4-62 Undeveloped Lands in Kahler Planning Area by Alternative

Alternative	Acres Prior to Activity	Acres Remaining After Implementation	Acres changed	Percent of Area* After Implementation	Percent Change
Alternative 1	9,931	9,931	No change	30%	No change
Alternative 2	9,931	7599	(-2,332)	23%	(-7%)
Alternative 3	9,931	7,765	(-2,166)	24%	(-6%)

*32,840 acres within the project planning area.

Cumulative Effects Common to All Action Alternatives

For undeveloped lands in which project activities would occur the cumulative effects to soil, water quality, air quality; plant and animal communities; habitat for threatened, endangered, and

sensitive species; recreation; noxious weeds; and cultural resources are disclosed in the applicable resource sections of the EIS and are not reiterated here.

The cumulative effects geographic boundary is the 32,840 acre Kahler planning area. This boundary is appropriate because it can reasonably be expected that the types of direct/indirect effects expected to occur as a result of the Kahler project (intrinsic physical and biological resources and intrinsic social values) are not expected to interact with any similar effects that might occur elsewhere outside of the project area.

The temporal boundary for this cumulative effects analysis is 10 years. This timeframe is appropriate, because the effects to a sense of solitude and remoteness would be limited to the times when Kahler activities would be occurring since the sights, smells and sounds of mechanical activities will only occur during this project's implementation.

In the planning area the increased numbers of stumps and the open nature of the forest stand would likely be the most apparent visual change resulting from implementation. In the long term (about 50+ years), the project would result in the development of historic open, park-like conditions, characterized by larger diameter trees, though more stumps would be present than currently exist.

Prescribed burning and future wildfires would cumulatively change composition and structure of vegetation which could affect some forest visitor's sense of naturalness and remoteness. Prescribed burning would change composition and structure of vegetation (EIS, Chapter 3). Burned areas would display a blackened color for about one year. Outside the burned areas, the conditions described in the affected environment would remain unchanged except by natural processes and ongoing management activities such as grazing and hunting.

Apparent naturalness and solitude and remoteness would be cumulatively impacted by grazing, dispersed camping, and motorized ATV and vehicle use on roads. Effects associated with recreational use, including noxious weed spread, erosion, litter, and evidence of fire rings, are expected to remain cumulatively minor. Ongoing removal of danger trees along forest roads changes the vegetation but does not change the overall sense of naturalness or sense of solitude along an existing developed transportation corridor. Overall, cumulative impacts from these activities on apparent naturalness, solitude and remoteness of the other undeveloped polygons are very small (not measurable/indistinguishable).

Finding of Consistency

None of the proposed activities, as designed and mitigated, would change the Recreation Opportunity Spectrum class in any of the management areas (Forest Plan 4-49).

Activities proposed under any of the action alternatives, as mitigated, would meet the visual quality objectives for the A-4, A-6, C-3, C-5, and E-1 management areas. Harvest prescriptions in the A4 area are for commercial thinning, so there would be no created openings greater than 2 acres. Trees would be irregularly spaced and a diversity of tree species would remain. This would be consistent with Forest Plan standards pertaining to visual quality (Forest Plan 4-106 through 4-109 and 4-183). Harvest in A-6 has been designed to meet recreation objectives of reducing fuels so the campground could survive wildfire while retaining a sense of privacy in the immediate vicinity of campsites.

As a result of prescriptions, irregular unit shapes, and seeding of soil disturbance, dispersed camps would retain a Visual Quality Objective of Partial Retention in the foreground. (Forest Plan 4-49)

The Kahler project area would continue to provide for a spectrum of recreational activities (Forest Plan 4-49).

All 9,931 acres of other undeveloped lands identified within the planning area would not qualify as a potential wilderness area, inventoried roadless area, or a designated wilderness area. This outcome is consistent with the intent of the land allocation decisions made in the Forest Plan.

Economics

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.

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.

Table 4-63 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			7.1	miles	25,000	Cost		177,500	

Oblit						per Mile			
Total Project									12,982,896

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.

Table 4-64 Financial Summary Alternative 3

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

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.

Short-term Uses and Long-term Productivity

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general

welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

When planning timber harvest projects, the need for long-term forest health and vigor achievable through density management treatments should take precedence over a short-term need for horizontal diversity. By restoring a forest to a more natural state, we can create better wildlife habitat, visual quality, recreation, and other benefits.

Unavoidable Adverse Effects

No unavoidable adverse effects over and above those addressed in the Forest Plan FEIS (Chapter 4, pages IV-231 to 233) have been identified.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

Removal of the identified vegetation from the Kahler project area would be an irreversible and irretrievable commitment of resources. However this is determined that by removing this vegetation, the project area would benefit from action by returning to an historical condition similar to pre-management.

Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs “to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with ...other environmental review laws and executive orders.”

This section describes how the action alternatives comply with applicable state and Federal laws, and Forest Service policies and regulations.

National Historic Preservation Act –Heritage surveys have been completed. State Historic Preservation Office consultation was conducted under the Programmatic Agreement among the United States Department of Agriculture, Forest Service, Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and Oregon State Historic Preservation Officer regarding Cultural Resource Management on National Forests dated April 1997. Identified sites and any newly recorded sites are protected from all project activities associated with Kahler Dry Forest Restoration Project. Because heritage resources would not be affected by proposed activities under any action alternative, there would be no effect to any historic property listed in or eligible to the National Register of Historic Places.

Endangered Species Act and Regional Forester's Sensitive Species - The Endangered Species Act requires protection of all species listed as "Threatened" or "Endangered" by Federal regulating agencies (Fish and Wildlife Service and National Marine Fisheries Service). The Forest Service also maintains through the Federal Register a list of species which are proposed for classification and official listing under the Endangered Species Act, species which appear on an official State lists, or that are recognized by the Regional Forester as needing special management to prevent their being placed on Federal or State lists.

Biological Evaluations have been completed for all TE&S plant, aquatic and terrestrial wildlife. Details are found in the Fisheries, Plants, and Wildlife sections of this chapter, and Appendices A and C.

Treaty Trust Responsibilities - In this analysis, the primary focus of the federal government trust responsibility is the protection of the treaty rights and interests that tribes reserve on land included in this project.

For this project, we have consulted with the Confederated Tribes of the Warm Springs Indian Reservation and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) at our annual program of work meetings and also had additional meeting with the separate staffs from CTUIR. No specific comments or concerns for the Kahler project were presented by tribal staff members after the government to government consultation scoping letter or Program of Work meetings. Tribal staff members have identified for similar past projects the rights they believed most at risk. Of major concern are potential effects on Treaty rights, fish habitat and populations, water quality, and protection of archaeological sites, traditional cultural properties, and first foods resources.

Cultural resource surveys are currently on-going, and all protocols for reporting to the State Historic Preservation Office and tribes will be followed.

Timber harvest has the potential to negatively affect water quality and thus indirectly aquatic habitat. The effects of harvest and associated activities on water quality are discussed in the Hydrology section in this chapter. It was found that effects of the action alternatives would not adversely or measurably affect water quality. The action alternatives were designed to prevent damage to RHCAs. Riparian and channel components that protect water quality would be maintained. Other design criteria and BMPs would control disturbance that could lead to erosion and sedimentation.

The effects of harvest and associated activities on aquatic species and habitats are found in the Fisheries section. It was determined that action alternatives may effect – not likely to adversely affect threatened species and may impact some sensitive species.

Based on the information summarized above, it is reasonable to assume that treaty rights would be protected during implementation of the proposal.

Environmental Justice - No local minority or low income populations were identified during scoping or environmental effects assessment. No minority or low-income populations are expected to be affected by implementation of any of the alternatives, in accordance with Executive Order 12898.

Wild and Scenic River Act – There are no Wild and Scenic Rivers within the project area. No designated or potential wild and scenic river sections would be affected by implementation of any alternative.

Prime Farmland, Range Land, and Forest Land - No adverse effects on any prime farmland, range land, and forest land not already identified in the Final FEIS for the Forest Plan would be expected to result from implementation of any alternative.

Civil Rights, Women, and Minorities - No adverse effects on civil rights, women, and minorities not already identified in the FEIS for the Forest Plan would be expected to result from implementation of any alternative. Alternatives 2 and 3 would be governed by Forest Service contracts, which are awarded to qualified contractors and/or purchasers regardless of race, color, sex, religion, etc. Such contracts also contain nondiscrimination requirements.

National Forest Management Act Compliance – The National Forest Management Act of 1976 (P.L. 94-588), including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378), states that when trees are cut to achieve timber production objectives, the cuttings shall be made in such a way that “there is assurance that such lands can be adequately restocked within 5 years after harvest” (P.L. 93-378, Sec. 6, (g), (3), (E), (ii)).

This reforestation policy is based specifically on language from the National Forest Management Act of 1976 (P.L. 94-588), including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378): “Sec. 3 (d) (1) It is the policy of the Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans.”

Roads Analysis - A Forest-wide Roads Analysis was completed in March 2004 on the Umatilla National Forest. The forest scale analysis addressed only those National Forest System Roads maintained for passenger car traffic, arterial, and collector roads. The Kahler project planning area has arterial, collector, and local roads. These roads are seasonally opened or are closed system roads. A site-specific project Roads Analysis containing a road risk value for each road was completed for this project and is located in the project file. This project analysis also includes maps showing the risk value for each road and the operational maintenance level of each road in the project planning area (also see Appendix G). A summary list of miles of roads used as haul routes for each alternative and other proposed road activity such as temporary road construction, and proposed decommissioning of roads in Alternative C is found in Table 2-11 and Appendix G. No new system road construction is proposed for this project.

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 proposed alternatives would avoid all floodplains and affects to floodplains and 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 proposed alternatives would avoid all wetlands and affects to wetlands and is consistent with this EO.

Municipal Watersheds - There is no de-facto or designated municipal watershed in the Kahler project planning area.

Energy Requirements - No adverse effects on energy requirements would be expected to result from implementation of any alternative.

Public Health and Safety - Public health and safety would be improved with Alternatives 2 and 3 removing danger trees along open forest routes, haul routes, developed recreation sites, and administrative sites within the Kahler project planning area.

Incomplete or Unavailable Information

There is no known incomplete or unavailable information in the preparation of this document. The interdisciplinary team used the best science available to complete the reports that the analysis in this document is based on.