Chapter 4 Environmental Consequences

Introduction

Chapter 4 provides the scientific and analytic basis for the comparison of alternatives presented in Chapter 2. It describes the probable consequences (impacts, effects) of each alternative on the physical, biological, social, and economic environments. Significant or potentially significant environmental consequences to each resource are disclosed, including the direct, indirect, and cumulative effects, both beneficial and detrimental. Combinations of effects occurring over time can produce cumulative effects. Effects are quantified where possible, although qualitative discussions are often necessary.

Environmental consequences are the effects of implementing an alternative on the physical, biological, social, and economic environment. ***Direct effects*** are defined as those occurring at the same time and place as the initial cause or action. ***Indirect effects*** are those that occur later in time or are spatially removed from activity but would be significant in the foreseeable future. ***Cumulative effects*** result from the incremental effects of actions when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertaking such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Unavoidable adverse effects are potential adverse environmental effects that cannot be avoided. They may result from managing the land for one resource at the expense of the use or condition of other resources. Many adverse effects can be reduced or mitigated by limiting the extent or duration of effects. Mitigation measures within standards and guidelines are specified for project activities to be implemented under the alternatives. These are discussed in detail in Chapter 2.

Short-term effects are those that occur annually or within 5 years. Long-term productivity refers to the capability of the land and resources to continue producing goods and services for 5 years and beyond.

Irreversible commitments are decisions affecting non-renewable resource such as soils, minerals, plant and animal species, and cultural resources. Such commitments of resources are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at great expense, or the resource has been destroyed or removed. The gradual decline in old growth habitat or significant loss of soil productivity would be considered irreversible commitments.

Irretrievable commitments represent opportunities foregone for the period during which resource use or production cannot be realized. These decisions are reversible, but the production opportunities foregone are irretrievable. For example, the use of land for a roadbed precludes its use for growing trees, at least for the time the land is used as a road.

Irreversible and irretrievable commitments resulting from this project are discussed in more detail in the Other Environmental Considerations section at the end of this chapter.

Benchmark Dates and Implementation Schedule

Benchmark dates of Years One (initiation of project implementation), Five, Ten, Fifteen (all project activities would be completed), and Thirty (when it is estimated that maintenance treatments would need to be initiated) are presented to display the implementation schedule. Implementation schedules are needed to sufficiently display the effects of proposed activities. The following discussions on environmental consequences focus on the direct, indirect and cumulative effects of the proposed activities in conjunction with ongoing and recently finalized projects, programs and uses in the Silvies Canyon Watershed.

Year One

During the first year of implementation, commercial harvesting would begin in Burnt (960 acres), Curry 1 (920 acres) and Curry 2 (2,500 acres) areas in all action alternatives except Alternatives Three and Six.

Year Five

For all action alternatives except Alternatives Three and Six, by year five, Burnt, Curry 1 and Curry 2 timber sales would be completed. Commercial harvesting would also be completed on Curry 3 (1,135 acres), which would have been offered in year two. Commercial harvesting would also be completed or near completion on Curry 4 (1,600 acres), Dry (2,300 acres) and Mud (2,800 acres) timber sales, which would have been offered in year four. Commercial harvesting would be beginning on some miscellaneous small sales (about 2000 acres) scattered throughout the project area. Post and pole sales would be ongoing depending on demand for these products.

Aspen restoration would have begun in aspen stands that are in or near areas harvested in Burnt, Curry 1, Curry 2 and Curry 3 timber sales. Precommercial thinning and fencing of aspen stands would occur the same year stands are harvested. Aspen stands that have no commercial harvest would have precommercial thinning and fencing completed by fuel block. The order of priority would be Fuel Block 7, then 9, 5, 6, 3, 8, 11 and 12.

By year five, precommercial thinning and fencing of the cottonwood stand on Sage Hen Creek would be completed in conjunction with the adjacent aspen stand.

In stands where precommercial thinning is the primary treatment, implementation of precommercial thinning and burning of piles would be ongoing in Fuel Blocks 7, 9, 5, 6, 3, 8, 11 and 12.

Implementation of precommercial thinning and pile burning would have also begun in Burnt, Curry 1, Curry 2 and Curry 3 areas.

For all action alternatives except Alternative Seven-A, by year five, precommercial thinning and burning of hand piles would be implemented in the potential eagle roost stands in Myrtle Creek.

Precommercial thinning of springs would be implemented in Fuel Blocks 7, 9, 5, 6, 3, 8, 11 and 12 and in conjunction with precommercial thinning stands whenever practical. Fencing and developing springs would occur after precommercial thinning.

Juniper reduction would be implemented in Fuel Blocks 7, 9, 5, 6, 3, 8, 11 and 12 and in conjunction with precommercial thinning stands whenever practical.

Roads would be decommissioned, closed, maintained or reconstructed at various times during the implementation phase of the project, depending on the alternative selected and the timing of the timber harvest, prescribed burning and post and pole activities in those areas. Roads used for harvest activities and identified for reconstruction or maintenance in Burnt, Curry 1, Curry 2, Curry 3, Curry 4, Dry and Mud timber sales units would be treated. Roads identified for decommissioning and used for timber harvest or prescribed fire activities would not be completed. Roads identified for treatment that are not associated with project activities would be treated. Of the twelve roads identified as contributing sediment to streams, three of them (Forest roads 3100035, 3130129 and 3700379) would be treated.

When all vegetation activities are completed, prescribed burning would have begun in fuel blocks seven, nine and eleven.

Year Ten

By year ten, all commercial harvesting would be completed. All precommercial thinning in harvest areas would also be completed. Precommercial thinning, aspen and spring restoration and juniper reduction in non harvest areas would all be completed except in fuel blocks two and three where those activities would still be ongoing.

Prescribed burning would be completed in all Fuel Blocks except 4. Fuel Blocks 4 and 1 would still have implementation activities occurring. Fuel Blocks 2 and 3 would be scheduled for implementation in years 11 and 12, respectively.

Road closures and decommissioning associated with timber harvest units would be implemented on all sale areas. Roads identified for decommissioning and used for prescribed fire activities would not be completed in Fuel Blocks 4, 1, 2 and 3. Of the twelve roads identified as contributing sediment to streams, the remaining nine (Forest roads 3100286, 3100860, 3100864, 3125244, 3125912, 3700117, 3700167, 3700275, 3700294) would be treated.

Year Fifteen

By year fifteen all activities proposed in this EIS would have been implemented.

Year Thirty

By year thirty, maintenance treatments would begin.

Environmental Consequences by Resource (Issue)

The Environmental Consequences are described by resource (issue). All affected resources are analyzed; however, the analysis focuses more detailed discussions on resources linked to the significant issues identified in Chapter 1. Complete details of environmental effects can be found in specialists' reports, located in the Silvies Canyon Watershed Restoration Project Planning Record, Burns Ranger District, Malheur National Forest. Environmental consequences will be discussed in the following sequence:

The environmental consequences of each alternative are described by resource (effects of Alternative X on resource Y). For brevity, alternatives are grouped by similar activities whenever possible. Alternative One, the No Action alternative, provides a baseline against which effects of the action alternatives could be measured and compared. Alternatives Two, Four, and Five, Seven and Seven-A, the restoration with commercial harvest alternatives, are similar in terms of proposed activities but differ in their magnitude. Correspondingly, Alternatives Three and Six, the restoration without commercial harvest alternatives, are similar in terms of proposed activities but differ in their magnitude. The effects discussion focuses on two parts, the effects of proposed activities and their magnitude.

Effects on Access and Travel Management (Issue 1)

This section describes the effects on access and travel management from activities proposed in each alternative. Road closure, decommissioning, maintenance, reconstruction, and temporary construction are the proposed activities that would potentially affect access and travel management. These activities can affect wildlife habitat, water quality and fish habitat. For more information on effects to wildlife habitat, water quality and fish habitat, see the sections titled Effects on Watershed/Fish Habitat (Issue 3), Effects on Big Game and Big Game Habitat (Issue 5), Effects on Management Indicator Species and Effects on Proposed, Endangered, Threatened and Sensitive species. Each alternative proposes varying amounts of road closure, decommissioning, maintenance, reconstruction, and temporary construction activities. The effects of each alternative are similar in terms of proposed activities but vary in the magnitude of disturbance.

Direct and Indirect Effects Common To All Action Alternatives

All action alternatives include varying amounts of planned road closures, which were designed to maintain an adequate transportation system for forest management, including wildfire suppression. Access to identified dispersed camping sites was generally not closed off unless there were identified problems with the road such as sedimentation. The distance between open roads is generally not more than one mile.

The majority of roads proposed for closure, seasonal closure, or decommissioning are currently classified at Maintenance Level (ML) 2, which provides access for high clearance vehicles. Passenger car traffic is not encouraged. Traffic on ML 2 roads is normally minimal, usually consisting of one or a combination of administrative, dispersed recreation, or other specialized uses, including commercial activities.

With increasing budget constraints, the agency cannot adequately maintain the majority of road miles at their designed maintenance level. Failure to maintain these roads may impair water quality by eroding and/or contributing sedimentation to streams. Closure of these roads would reduce animal disturbance, improve water quality, and reduce maintenance costs.

When roads are closed, they are assigned a ML 1 status. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to minimally perpetuate the road to facilitate future management activities. Emphasis is given to assuring drainage structures suitable for the runoff pattern are in place and functional prior to closure. These closed roads are inspected annually for two or three years to assure the drainage facilities are adequate and self-maintaining. Planned road deterioration, such as increased vegetation growth and bank slough to natural slope repose may occur at this level. While these roads are closed to motorized vehicles, they remain open and suitable for non-motorized travel.

Decommissioned roads are permanently closed and no longer maintained. Soil compaction may be reduced where feasible, and cut or fill slopes may be returned to natural contours.

Manufactured drainage structures (culverts) and cattle guards are removed. Where appropriate, bank cuts or ditches created by the removal of these structures may be contoured to provide a natural drainage and prevent erosion.

Permanent road closures and decommissioning could hamper initial attack of fires by increasing the response time, which can increase size of fires, cost of suppression, and the risk of having a large stand replacement fire. Seasonal closures would also affect fire suppression efficiency, but not to the same extent; severe fires typically occur during months (July – September) when these roads would be open. There is a helitack crew based in Burns, Oregon; this proximity allows for a quick response time for initial attack of fires and is not affected by road closures.

Roads that are seasonally closed are still classified as ML 2. Seasonal road closures exclude access usually during the wet season to protect the road and adjacent resources. During seasonal closures many roads could become blocked by deadfall

Road maintenance activities are proposed to correct erosion problems associated with roads used for commercial harvesting. Direct beneficial effects from this proposed activity would be improved road conditions. Removing and replacing culverts would have a negative impact on access for less than ½ day per installation. Blading road surfaces and cleaning ditches would have no negative impact on access, as roads remain open during these activities.

Figure 4-1 shows the road treatment comparisons between alternatives.

Cumulative Effects Common to All Alternatives

There are 63 miles of roads identified for closure under prior environmental documents. The decision to close these roads has been made. One hundred seventy-four roads were 1) previously identified as closed; 2) identified for closure under past environmental documents; 3) historic closures; or 4) breached closures. These roads would be treated according to the descriptions in the preceding paragraphs and closed, which would reduce the miles of open roads in the watershed to 83% of current levels.

Direct, Indirect and Cumulative Effects from Alternative One – No Action

Under the No Action Alternative, all existing roads would remain open, except for the 63 miles of roads identified and analyzed in prior environmental documents. This alternative does not allow opportunity to close or decommission any additional roads within the project area. The 33 miles of roads with riparian habitat conservation areas would continue to be chronic sediment sources and degrade water quality and fish habitat within the watershed. The agency would continue to expend limited funds for maintenance of unneeded roads.

This alternative would have the least impact on access. The road density within the watershed would remain above Forest Plan standards. Administrative use, access for fire suppression and public access would not change, and hiding cover for big game, water quality, and sedimentation would not improve over the slight changes and improvements due to road closures under previous decisions.

Direct and Indirect Effects from Alternative Two

Two hundred and sixteen roads, totaling 78 miles would be permanently closed with an earthen berm, sign, or gate; 85 roads totaling 62 miles would be seasonally closed with signs; five roads totaling three miles would be decommissioned; for a total of 306 roads and 143 miles. Road closures would reduce the miles of open roads in the watershed to 45% of current levels. This alternative also proposes 164 miles of maintenance and 3.5 miles of temporary road construction.

Road closures would reduce motorized vehicle access for gathering forest products such as edible plants, posts, poles, and firewood. In addition, seasonally closed roads that are not available for motorized vehicle travel during the hunting season would require use of non-motorized forms of travel. For some hunters, this provides solitude and a more enjoyable hunting experience. For others, it means they would not be able to access certain areas.

Seasonal closures (November 15 – May 31, annually) would eliminate motorized vehicle use from the late elk hunting seasons through the spring period when the ground is wet and road surfaces are more highly saturated. This would also reduce spring access for horn hunters, mushroom pickers, recreationists, and others.

Thirty-nine miles of seasonal and permanent closures proposed for the Forest Road 3125 system would affect access into the Burnt Mountain area. Closure of four spur roads would permanently close four miles to motorized vehicle traffic and eliminate access into a large area. Twenty-four miles of seasonal and permanent closures proposed for the Forest Road 3746 system would affect access into the Squaw Flat area.

One hundred sixty-four miles of road maintenance activities are proposed for this alternative. The 3.5 miles of temporary road construction would be utilized during harvest operations and scarified, seeded (if needed), and permanently closed at the conclusion of harvest operations.

Direct and Indirect Effect from Alternatives Three and Four

Two hundred eighty-three roads totaling 110 miles would be permanently closed with an earth berm, sign, or gate; 27 roads totaling 25 miles would be seasonally closed with signs; and 35 roads totaling 25 miles would be decommissioned; for a total of 345 roads totaling 160 miles. Road closures would reduce the miles of open roads in the watershed to 41% of current levels.

All or portions of Forest Roads 3100195, 3100860, and 3700861 are proposed for either permanent closure or decommissioning under these alternatives. Approximately six miles of road access would be eliminated by these closures.

Alternative Three has no proposed miles for maintenance or temporary construction.

Under Alternative Four, one hundred ninety-two miles of road maintenance activities are proposed. The 3.5 miles of proposed temporary road construction would be utilized during harvest operations and scarified and seeded (if needed), and permanently closed at the conclusion of harvest operations.

Direct and Indirect Effects from Alternative Five

One hundred five roads totaling 23 miles would be permanently closed with an earth berm, sign or gate; 4 roads totaling 4 miles would be seasonally closed with signs; and 16 roads totaling 9 miles would be decommissioned; for a total of 125 roads and 37 miles. Road closures would reduce the miles of open roads in the watershed to 74% of current levels.

This alternative proposes 163 miles of road maintenance and 2.8 miles of temporary road construction. The temporary road construction would be utilized during harvest operations and scarified and seeded (if needed), and permanently closed at the conclusion of harvest operations.

Direct and Indirect Effects from Alternatives Six, Seven (the Preferred Alternative), and Seven-A

Two hundred twenty-four roads totaling 70 miles would be permanently closed with an earth berm, sign, or gate; 7 roads totaling 10 miles would be seasonally closed with signs; and 16 roads totaling 7 miles would be decommissioned; for a total of 247 roads totaling 87 miles. Road closures would reduce the miles of open roads in the watershed to 61% of current levels. Ten miles of road maintenance are proposed on five of the twelve roads identified as "problem roads" contributing sediment directly to streams and to the degradation of stream habitat conditions.

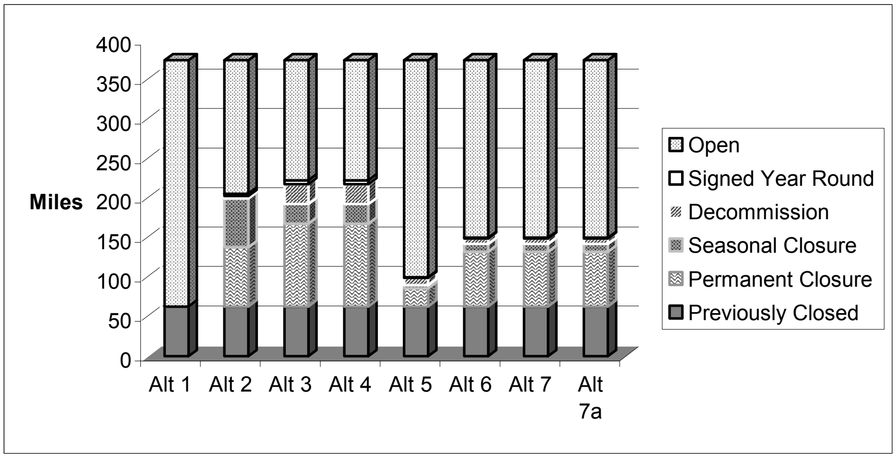
One hundred ninety-two miles of road maintenance activities and 3.5 miles of temporary road construction are proposed for Alternative Seven and Seven-A. Temporary road construction would be utilized during harvest operations and scarified and seeded (if needed), and permanently closed at the conclusion of harvest operations.

The Preferred Alternative also proposes to decommission about 4 miles of Forest Road 3100035. This is the portion of the 3100035 road that was closed under the Forest Plan, breached, and closed again in 2001. Currently this road is closed to motorized access. However the mere presence of the road encourages motorized vehicles to ford the Silvies River and travel into the Myrtle-Silvies Roadless Area. Additionally, the southwest portion of the road accesses the Myrtle-Silvies Roadless Area from private property. This alternative would decommission about 2 miles on both ends of the 3100035 road to discourage motorized vehicles from entering the Myrtle-Silvies Roadless Area.

Cumulative Effects from All Action Alternatives

The cumulative effects of these alternatives combined with the road closures approved in previous decisions and road closures that are likely in the future would be a reduction in sedimentation, fewer roads to maintain, less money spent on maintenance, reduced access for all motorized users, increased response time for fire crews, and less disturbance to wildlife.

Figure 4-1. Road Treatment Comparison.



(Also see Chapter 2, Table 2-20 for Issue Comparison)

Consistency with Direction and Regulations

Forest Plan

All action alternatives would be consistent with applicable Forest Plan road standards (standards 156-164, FP IV-42), including Forest Plan road densities standards. All action alternatives meet the 1999 Forest road density standards (as monitored on a watershed basis); Alternatives Three and Four are best at moving the watershed towards the desired future condition road densities as described in the Record of Decision for the Forest Plan (page 23). The No Action alternative does not meet Forest Plan road densities standards (as monitored on a watershed basis).

Roads Analysis

A Roads Analysis for this project was prepared in accordance to policy published in the Federal Register on March 3, 2000 (65 FR 43) and Forest Service Manual (FSM) 7700, specifically section 7712; as well as recommendations published in Miscellaneous Report FS-643, *Roads Analysis: Informing Decisions About Managing the National Forest Transportation System* (August 1999).

Effects on Roadless Areas (Issue 2)

This section discloses the effects on the Myrtle-Silvies Roadless Area from activities proposed by each alternative. Road closures and decommissions, landscape scale prescribed burning, precommercial thinning and associated fuels treatments, and riparian (spring) habitat restoration are the proposed activities within the roadless area that would potentially affect it; similar activities as well as other vegetation management have been proposed outside the roadless area but close enough to affect it. Affects to recreational aspects of the roadless area are disclosed in the section titled "Effects on Recreation."

Proposed activities under all alternatives within the Myrtle-Silvies Roadless Area are consistent with the National Roadless Area Conservation Policy. No new road construction or reconstruction is proposed within the existing Myrtle-Silvies Roadless Area. No commercial harvest treatments are proposed within the existing Myrtle-Silvies Roadless Area. Besides the

Roadless Area, there are no contiguous 1000-acre or greater blocks of unroaded area within the Project Area.

Direct, Indirect and Cumulative Effects From All Alternatives

A proposal by the Oregon Natural Resources Council (ONRC) and a coalition of 130 environmental groups would designate as wilderness the Myrtle-Silvies Roadless Area as well as adjacent areas the coalition refers to as "uninventoried roadless" which total about 15,097 acres. See their website at http://www.oregonwild.org.

Recommendations for wilderness designation by the agency are done as part of the forest plan revision process (see 36 CFR 219.17). The Malheur National Forest will start the revision process in fiscal year 2004. In the interim, activities proposed within the Silvies Canyon Watershed Restoration Project are consistent with the direction for Roadless Area Protection published in the *Federal Register* on January 12, 2001 (66 FR 3244). Specifically, this project does not propose road construction or reconstruction in unroaded portions of roadless areas. Additionally, this project does not propose commercial cutting, sale or removal of timber in roadless areas.

Implementation of activities proposed in the FEIS within the Myrtle-Silvies Roadless Area would not preclude the area's future ability to be designated wilderness. Specifically, proposed road closures (seasonal and year-long closures) and road decommissions meet and enhance roadless characteristics by closing or decommissioning unneeded roads within roadless areas.

Proposed landscape scale prescribed burning on 5,526 acres within roadless areas would enhance roadless characteristics by reducing the risk of uncharacteristic wildfire effects through restoration of ecosystem composition and structure.

Proposed precommercial thinning and associated fuels treatment (hand piling and burning) within roadless areas meets the exceptions for cutting of generally small diameter trees which maintains or improves roadless characteristics. Proposed precommercial thinning of small diameter trees, (less than 9" dbh) and hand piling and burning slash on 729 acres of potential bald eagle winter roost areas would improve habitat for the bald eagle, a threatened species, and move towards restoring ecosystem composition and structure, thus reducing the risk of uncharacteristic wildfire effects.

Proposed riparian habitat (spring) restoration on two springs (less than 5 acres) within roadless areas would enhance roadless characteristics by improving habitat for riparian associated species (see Chapter 2 for a description of spring restoration activities).

Direct, Indirect and Cumulative Effects From Alternative One - No Action and Alternative Seven-A

Under these Alternatives, no additional activities would occur in the Myrtle-Silvies Roadless Area except for road closures and decommissions under Alternative Seven-A. These activities are the same as described for the Preferred Alternative.

About 6,000 acres of prescribed burning in the Silvies River portion of the roadless area authorized under the Silvies South and Silvies River Prescribed Burning Project was accomplished between 1995 and 2002. Evidence of this past burn is still visible on the landscape. For about two years following prescribed burning brown needles in the lower tree canopies were evident. Many trees less than 5" dbh were killed. Clumps of trees (less than a quarter acre in size) 5-20" dbh occasionally were killed and occasional large dead trees are still evident. These past prescribed burns have not changed the natural integrity or the naturalness of the area since they appear natural to the average user.

Currently the Myrtle Canyon portion of the roadless area is at very high risk of a high intensity wildfire and protecting it from such a fire would be almost impossible within the steep canyon. Overstocking, shifts in species composition away from fire resistant ponderosa pine, fuels build up and the development of ladder fuels have created an area at high risk to a stand replacement fire. The No Action Alternative and Alternative Seven-A would not change these conditions, and would perpetuate the potential for a stand replacement fire to eventually occur. A stand replacement wildfire could drastically affect the natural integrity of the roadless area, and wildlife and fish habitat.

Precommercial thinning and related fuels treatment activities would not occur within the two potential bald eagle winter roost stands. A decline in suitability is underway and would continue in the Silvies River potential bald eagle winter roost stands, as reflected by shifts in tree species composition, loss of large ponderosa pine, and increased fire risk.

The closure of Forest Road 3100035, proposed and implemented previously, has been breached. This closure would be re-implemented and monitored for effectiveness. Motorized use on this portion of the road has been reduced but not eliminated. In the long term, this would reduce impacts and improve the overall naturalness and natural integrity of the area.

Direct and Indirect Effects Common to Alternatives Two, Three, Four, Five, Six and Seven

Prescribed burning and spring restoration activities would increase the disturbance level within the Myrtle-Silvies Roadless Area under these alternatives. The goals of managing for tranquility and isolation in the roadless area would be interrupted by prescribed burning activities during implementation. Public access to the Silvies River portion of the Myrtle-Silvies roadless area would be excluded during the ignition period. Fire crews would be working within the area during ignition, holding, patrol, and mop-up periods. The ignition and holding periods would last a few days and would be the most disruptive to individuals using the roadless area. The patrol and mop-up periods may last up to approximately a month but are less disruptive. The sights and sounds of the helicopter used in prescribed burning could be very disruptive to individuals seeking solitude. Smoke would be evident for many miles.

For about two years following prescribed burning brown needles in the lower tree canopies would be very evident. About 80% of the trees less than 5" dbh would be killed. Clumps of trees (less than a quarter acre in size) 5-20" dbh occasionally would be killed and occasional large dead trees would be evident. The prescribed burning should appear natural to the average user and therefore should not change the natural integrity or naturalness of the area.

Riparian habitat (spring) restoration on two springs by removal of encroaching conifers and junipers and fencing on one spring for protection is proposed under these alternatives. The goals of managing for tranquility and isolation in the roadless area would be interrupted by spring restoration activities during implementation, which would last a few days. The sights and sounds of chainsaw use could be very disruptive to individuals seeking solitude. Removal of encroaching conifers and junipers may result in some benefits to aquatic species and their habitats but the stumps may appear unnatural to some users. Fencing of one spring would improve and protect habitat for aquatic species that utilize springs such as amphibians and aquatic macroinvertebrates, but could also have a negative affect on the naturalness of the roadless area to some users.

Direct and Indirect Effects from Alternative Seven – The Preferred Alternative

This alternative would decommission the portion of Forest Road 3100035 that was previously closed and breached. Decommissioning this portion of the road would better camouflage the road, thus dramatically reducing vehicles fording the Silvies River and excluding several miles of roaded access into the Myrtle-Silvies Roadless Area. The sights and sounds of machinery used in this activity could be very disruptive to individuals seeking solitude during implementation (it is anticipated that implementation would be completed in no more than one month). In the long term, however, this activity would reduce conflicts of OHV use in a non-motorized area and improve the overall naturalness and natural integrity of the area.

Direct and Indirect Effects from the Proposed Action and Alternatives Three, Four, Five, Six, Seven and Seven-A

Under these Alternatives there would be indirect burning in the Myrtle Creek and West Myrtle Creek portion of the Myrtle-Silvies Roadless Area. The effects are similar to those described above.

Direct and Indirect Effects from Alternatives Three, Four, Five, Six and Seven

Additionally, in Alternatives Three, Four, Five, Six and Seven there would be precommercial thinning and associated fuels treatment on 471 acres in the Silvies Canyon portion and 258 acres in the Myrtle Creek portion of the Myrtle-Silvies Roadless Area to enhance and protect the potential bald eagle winter roost stands. Precommercial thinning would reduce stand densities and move stand composition towards predominately ponderosa pine. Thinning slash would be hand piled and burned. Crews working in the area on precommercial thinning would affect individuals using the roadless area for several weeks. The sights and sounds of chainsaw use could be very disruptive to individuals seeking solitude and the stumps may appear unnatural to some. However, precommercial thinning and associated fuels treatment activities are proposed on less than 10% of the roadless area and the affects would be of short duration. Precommercial thinning in these areas would significantly reduce the risk of a stand replacement fire in the potential bald eagle winter roost stands in the long term.

Cumulative Effects from All Action Alternatives

The Myrtle Creek portion of the roadless area has an extremely high risk of stand replacement wildfire. The high-risk conditions are due to heavy fuel loading, overstocked stands, steep terrain and limited access. Once fuels are treated along the perimeter of the Myrtle Creek portion of the roadless area, prescribed burning could be introduced to Myrtle Creek canyon in the future.

The Silvies River portion of the roadless area is within fuel block 6. Under all action alternatives except for Alternative Seven-A it would be proposed for prescribed burning aimed at reducing overstocked stands with high fuel loads to historical conditions. One or two additional prescribed burns would be needed in the future before the area would be ready for maintenance burning.

These proposed activities, along with probable future activities aimed at reducing fuels, would help ensure the long-term capability of sustaining the desirable attributes within the Myrtle-Silvies Roadless Area. The natural integrity and naturalness of the area as well as the opportunity for solitude would be enhanced in the long term.

If the Myrtle-Silvies Roadless Area is designated Wilderness during the Forest Plan revision process, none of the current uses are expected to noticeably change.

Consistency with Direction and Regulations

All alternatives are consistent with the National Roadless Area EIS (November 2000), and final rule at 36 CFR 294 published in the *Federal Register* (66 FR 3244); other roadless area direction published as part of the final planning regulations 36 CFR 219 (65 FR 67514) on November 9, 2000, as well as interim direction for Roadless Area Protection published in the *Federal Register* on August 22, 2001 (66 FR 44111) and Forest Transportation System Analysis and Roadless Area Protection on December 20, 2001 (66 FR 65796). Specifically, this project does not propose road construction or reconstruction in unroaded portions of roadless areas. Additionally, this project does not propose commercial cutting, sale or removal of timber in roadless areas. Because of these reasons, implementation of activities proposed in this FEIS within the Myrtle-Silvies Roadless Area would not preclude the area's potential to be designated as wilderness.

Effects on Watershed/Fish Habitat (Issue 3)

This section describes the effects on uplands, riparian and fisheries habitat, and water quality from activities proposed by each alternative. Proposed activities differ between alternatives and would have varying direct, indirect and cumulative effects on watershed and aquatic resources. The magnitude and timing of these combined activities, or lack of, determine the cumulative effects.

Direct and Indirect Effects From Alternative One - No Action

Under this alternative no management activities are planned; however, there would be direct and indirect effects to water quality, riparian habitat and fisheries habitat. This alternative would maintain current conditions within the watershed, including high road densities, high fuel levels, degraded riparian areas and overstocked forest stands that have resulted from past management activities.

Transportation System

No roads would be constructed, reconstructed, decommissioned or closed. However, 63 miles of road that have been identified for closure under previous Environmental Assessments would be closed and placed into a self maintaining condition to improve drainage features and reduce sedimentation. The road system would continue to contribute fine sediment directly into stream channels and would continue to have negative direct and indirect effects on water quality and fisheries habitat. Increases in fine sediment can result in decreased reproductive success of redband trout, reductions in pool and interstitial habitat, and reductions in bank stability. Due to numerous variables affecting stream temperatures and current habitat conditions, it is difficult to predict future temperature patterns; however, they are not expected to improve under this alternative.

Upland and Riparian Vegetation

As no vegetation or fuels treatments would be done, there is a high probability that this alternative would allow additional understory fuel build-up in both uplands and RHCAs and would leave stands susceptible to mortality and insect/disease occurrences. This would augment amounts of dead ladder fuels, increasing the risk of stand-replacement wildfires. A stand-replacement wildfire could have effects on soils and hydrology of the watershed, dependent upon the intensity and severity of the fire.

Wildfires can have short-term (1-5 years) adverse affects on fish and aquatic macroinvertebrates by heating streams to lethal temperatures, changing water chemistry, removing riparian cover, increasing fine and coarse sediment, and changing LWD (Brown 1990). High intensity wildfires can cause extirpation of fish at the reach scale (Rieman et al. 1997) and may result in the complete extirpation of fish in a stream (Rinne 1996). However, fire is a natural process in the Pacific Northwest and post-wildfire studies have shown that salmonids often survive high intensity wildfires and rapidly repopulate stream reaches where they were eliminated during fires (Novak and White 1990, Rieman et al. 1997). Unaffected fish populations in areas adjacent to fires, relatively unaffected areas within the fire and multiple age classes of fish are important mechanisms for recovery of salmonid populations following high intensity wildfires (Novak and White 1990, Rieman et al. 1997). A high intensity wildfire in the Silvies Canyon watershed would probably not result in total extirpation of aquatic species due to the widespread distribution and multiple age classes of redband trout, diversity of aquatic habitat and the lack of permanent impassable fish barriers in the watershed. An irrigation diversion is present on Myrtle Creek and may be a passage barrier during the irrigation season, which would slow the recovery time associated with a high intensity fire.

Noxious Weeds

Treatments on the 12 noxious weed sites would not occur under the No Action alternative. Noxious weeds can adversely affect aquatic habitat by altering erosion processes, increasing delivery of fine sediment to streams. Increases in fine sediment can have adverse effects on reproductive success of redband trout, pool and interstitial habitat, and bank stability. Noxious weeds can also replace desirable riparian species, decreasing stream shade. Untreated noxious weed sites would allow further spread of noxious weeds in the watershed and adjoining areas.

Cumulative Effects From Alternative One - No Action

During the past 100 years timber harvesting, livestock grazing, noxious weeds, stream dewatering, fire suppression, road construction on erosive soils, road density, lack of road maintenance, and general road use on public and private lands have contributed to landscape changes in overland and stream flows affecting riparian and aquatic habitat. These changes are having negative affects on water quality and aquatic species. Fire exclusion in the 20th century resulted in dense understories that may be detrimentally affecting late season flow in streams. Extensive road construction and timber harvest activities often occurred adjacent to stream channels resulting in unstable streambanks and high amounts of sediment. The cumulative effects of riparian grazing and timber harvest contributed to a reduction of LWD, wider stream channels, and loss of stream shade, resulting in higher stream temperatures and a reduction of high quality pools due to increased sediment. Map 30 (Stream Reach), Map 31 (Road Segments Contributing to Fine Sedimentation to Stream Channels and Degrading Aquatic Habitat), Map 32 (Past Harvest Activities with Stream Category), Map 33 (Stream Segments with Large Wood Deficit and Surveyed Segments) and Map 34 (Stream Segments with Deficit Pools and Surveyed Segments) in Chapter 2 display site specific areas within the project area where these activities and subsequent habitat alteration occur. As streams became channelized, riparian floodplains lost their ability to retain ground water and floodplain vegetation changed from grasses, sedges and forbs to sagebrush and rabbitbrush. During the past 10 years successful efforts have been made to limit resource degradation in the RHCAs and conduct small-scale restoration projects. INFISH guidelines established riparian stream buffers and now exclude activities from these areas that may have negative affects on aquatic ecosystem. However, this process will require decades to restore natural drainage systems and meet INFISH/Forest RMOs, including pool frequency, water temperature, large woody debris, bank stability, lower bank angle, and width depth ratios.

Stand densities within the watershed would continue to increase influencing water yield and timing of stream flows. Low water flows would likely continue as juniper and other conifer species increase across the landscape. This is a result of increased transpiration and decreased water available for soil storage, spring recharge, and downstream water yield. As fuel levels and stand densities increase, so do the chance for stand replacement fires. An intense wildfire can adversely modify soil conditions, water quality, water quantity and fish populations in the watershed and downstream areas, leading to increased cumulative watershed effects and diminishing watershed health.

Potential large-scale wildfires, which are likely to occur in the future due to worsening watershed conditions, would temporarily increase adverse effects to water quality (sediment and temperature), aquatic species, and aquatic habitat both in the watershed and downstream areas. Considering the number of streams and distribution, diversity, abundance and age classes of fish within the Silvies Watershed, similar positive effects would be expected if riparian areas are rested from livestock grazing, following wildfire. Since there are no plans to rest riparian pastures if a large fire did occur, the riparian and streambank vegetation would require a longer time period (5-9 years) to recover. Potential effects from the No Action alternative would be cumulative with effects from non-federal activities within the project area and all activities outside the project area on federal, state and private lands but within the Silvies River drainage. Aside from this project, other activities that may contribute to cumulative effects include; timber harvest activities, wildfires, livestock grazing, road use, flood irrigation, and vegetation alteration. These activities occur on an annual basis with the exception of timber harvest and wildfire and are known contributors of stream dewatering and sediment affecting water quality and aquatic species to an unknown degree.

Other large-scale timber harvest activities and wildfires within the sub-basin (35 river miles upstream of the Silvies project area) include the 8,000-acre Flagtail wildfire, which burned in 2002. Between 3,800 and 5,000 acres would be harvested on National Forest System Lands in 2004, with no harvesting activities in RHCAs. Associated restoration projects occurring in 2003 include adding LWD to 27 miles of streams, riparian planting of hardwoods on 200 acres, coarse wood placement on 3-5 acres of sensitive soils, and decommissioning/closure of 24 miles of road.

Additionally there are state permits for timber harvesting on 8,540 acres of private land occurring within the entire upper Silvies watershed, upstream of the project area.

Both positive and negative effects from these activities are likely to be immeasurable at the Silvies Canyon project area due to distance between project areas, numerous beaver dams, and diversions for flood irrigation that filter out sediment over 35 miles of stream channel. Restoration activities associated with these projects would be designed to improve the resiliency of the watershed by reducing sedimentation, restoring base flows, improving road drainage, enhancing in-channel habitat conditions and shade, and increasing the health and vigor of stream-side vegetation. Improvements in watershed and stream channel conditions will likely improve habitat conditions for redband trout within the watershed. Improvements in water quality (water temperature and fine sediment) will also benefit downstream habitat conditions for redband trout.

Livestock grazing and its effects on water quality (temperature and sediment) and aquatic species would continue into the foreseeable future until addressed in allotment management plans. Allotment management plans for Silvies, Big Sagehen, Crooked Creek, and Scotty allotments are scheduled for completion in 2005. The West Myrtle and Scatfield allotment management plans were completed in 1996. The Myrtle allotment management plan completed in 1996 addressed negative effects of livestock grazing on several reaches of the Silvies River and Myrtle Creek systems that are in a current downward trend due to excessive riparian forage utilization and associated bank failures. Currently more than half of the reaches within the Silvies Canyon watershed are classified as functioning-at-risk (see Silvies Canyon WA 2000) and contribute to higher stream temperatures and sediment, due to lack of shade and bank failure, respectively. Shading of streams has been documented as a key component in maintaining proper stream temperatures (Beschta et al., 2003).

Direct and Indirect Effects Common to All Action Alternatives

Alternatives Two, Four, Five, Seven, and Seven-A would treat vegetation in the watershed through thinning and commercial harvest, involving ground disturbing activities. Alternatives Three and Six would treat vegetation through precommercial thinning, without the ground disturbing activities associated with commercial harvest. Commercial harvest activities, related permanent and temporary road construction, and commercial hauling are the primary activities influencing the delivery of sediment to stream channels with the potential to adversely affect aquatic habitat. The use of BMPs, design features and RHCA buffers would lessen the potential effects but may not totally eliminate them. Effects to water quality, riparian vegetation and fish habitat can generally be summarized as follows:

- Sediment levels are directly affected by erosion from harvest units, roads, skid trails, and unstable stream banks, and are indirectly affected by increased peak flows that erode stream banks. INFISH stream buffers would keep harvest units and related skid trails far enough away from streams so potential sediment from these sources would not negatively impact streams. Decommissioning roads within RHCAs would have the long-term effect of reducing sediment input into streams, and improving fish habitat and conditions for aquatic species. Reconstruction and maintenance of sections of road that are causing sedimentation would also improve water quality and fish habitat.

- Stream temperatures are not expected to increase under the action alternatives because riparian buffers following INFISH standards and guidelines would be applied. No commercial timber harvest or associated activities, including landings, stream crossings, road construction or skidding, would occur within the RHCAs. Aspen, cottonwood, and spring restoration are the only activities occurring in RHCAs. About 147 acres of conifer thinning in aspen and cottonwood stands would occur within RHCAs representing less than one percent of the linear stream distance in the project area.

- Due to seasonal browsing and the lack of fire the typical aspen or cottonwood stand within the project area now consists of a few decadent trees and recovery of these stands depends on immediate action. Most of this activity is on intermittent streams and would result in a small, short-term (one to five years) increase in solar radiation. However, effects are expected to be minor and not affect downstream temperatures (including 303(d) listed streams) since very little shade would be removed, the aspen sites are dispersed and small, and the intermittent streams have ceased flow during the warmest months (July and August). As aspen and other hardwoods grow and re-establish, stream shade should improve over current shade conditions. Caging and fencing of these aspen sites is a critical part of aspen restoration and would deter both livestock and wildlife browsing, while increasing vigor and reducing recovery time of aspen.

- Runoff from forested lands is affected by vegetation manipulation (thinning, removal, fire), soil compaction and road systems. Road systems can reroute surface runoff, intercept subsurface flows, and shorten time of concentration of flows. Generally this has resulted in higher peak flows and lower summer flows of longer duration. Reduction of juniper through prescribed fire and thinning of forest stands would decrease evapotranspiration and increase subsurface water, which could increase stream flows longer into summer months.

Transportation System

Sediment from roads is one of the main contributing factors degrading aquatic habitat and water quality. Road closures, reconstruction or decommissioning activities are the most effective means of reducing sediment input from these roads into streams. Direct beneficial effects from road closures and decommissioning would be a decrease in chronic sediment input to streams and improved spawning and rearing habitat for redband trout and other aquatic species. Indirect beneficial effects would be increases in large woody material recruitment and canopy closure (shade) along streams as closed and decommissioned road segments re-vegetate with native conifers and hardwoods. Table 2-20 describes the differences in road treatments between alternatives.

Decommissioning would remove the road from the Forest Road Transportation System and close the road at the entrances with earthen berms and/or boulders. Road surfaces would be sub-soiled to a depth of about 18" and scattered with slash to restore natural infiltration processes, allowing the reestablishment of vegetation and reducing sediment runoff. All culverts would be removed and the natural drainage channel restored. Removing culverts may result in short-term (< 1 year) sediment increases to stream channels; however, design features and BMPs would minimize these impacts. Long-term effects would include improvements to water quality, reestablishment of drainage-ways and natural vegetation, and improvements to fisheries habitat and populations of aquatic species.

Permanently and seasonally closed roads would be closed to motorized traffic, but would remain on the Forest Road Transportation System. Surface erosion from these roads can be a major source of sediment to streams (Furniss et al. 1991). Sediment from unpaved roads is correlated to traffic volume; higher traffic levels result in higher amounts of sediment reaching streams (Reid and Dunne 1984). Road closures would decrease the amount of road-related sediment into streams and improve water quality and aquatic habitat. Under these alternatives, all permanently closed roads would be treated to correct drainage problems and may require periodic maintenance to ensure they remain hydrologically stable.

Road reconstruction (Alternatives Six, Seven, and Seven-A) would improve roads through blading, realignment, new surfacing, cleaning ditches and culvert replacement to restore drainage and reduce sediment input into streams. Depending on the alternative selected, maintenance activities using BMPs would occur on approximately 8-200 miles of road, which would further reduce sediment input into streams throughout the project area. Alternatives Four, Seven, and Seven-A would have the greatest benefit to water quality and aquatic species, treating over 192 miles of road.

Alternatives Two and Five would treat about 163 miles, whereas Alternative Six would treat the least amount, only 8 miles. About fourteen temporary roads, totaling between 2.8 and 3.5 miles, would be constructed outside of RHCAs following BMPs in Alternatives Two, Four, Five, Seven, and Seven-A. No long-term negative effects (including effects to 303(d) listed streams) are expected from these roads due to the small number and short lengths. They would also be constructed and decommissioned (at the completion of harvesting activities) following BMPs, which would minimize the ground disturbing activities and potential water runoff.

Twelve roads were identified in the project area as contributing sediment directly into streams and contributing to the degraded stream habitat conditions in the Silvies Canyon watershed (Table 3-5 in Chapter 3).

Varying combinations of these twelve roads would be decommissioned, closed, maintained or reconstructed at various times during the implementation phase of the project, depending on the alternative selected and the timing of the timber harvest, prescribed burning and post and pole activities in those areas (see section titled "Benchmark Dates and Implementation Schedule" in this chapter, Table 2-21 in Chapter 2 and Table 4-1). The location of the road and possible connected use for other project activities will determine the timing for treatment. Treating roads early as possible in the project timeframe would allow for maximum benefits to water quality and fisheries habitat. Roads used for harvest activities and identified for reconstruction or maintenance would be treated just before the start of harvest activities. Roads identified for decommissioning and used for timber harvest or prescribed fire activities would be treated at the completion of those activities. Roads identified for treatment that are not associated with project activities would be treated within the first three years of implementation. Roads identified for closure would be closed at each end (following BMPs) with drainage structures along the length of the road to reduce water movement and sediment input to streams.

Table 4-1. Specific Road Treatments by Alternative.

Road Number	Timber Sale/Year of Road Treatment	Harvest Activities?	Alt. One	Alt. Two	Alt. Three and Four	Alt. Five	Alt. Six and Seven-A	Alt. Seven
3100035	2004-2006	No	Portion Closed Previously	Portion Closed Previously	Close Entire Road/ Maintenance	Portion Closed Previously	Portion Closed Previously	Decommission Roadless Portion
3100286	Dry/2004-2007	Yes	Open	Open	Decommission	Open	Maintenance	Maintenance
3100860	Curry4/2004-2007	Yes	Open	Open	Decommission	Decommission	Maintenance	Maintenance
3100864	2004-2007	No	Open	Open	Decommission	Decommission	Decommission	Decommission
3125244	2007/2009	No	Open	Seasonal Closure	Permanent Closure	Decommission	Decommission	Decommission
3125912	Mud/2004-2007	No	Open	Seasonal Closure	Decommission	Decommission/ Seasonal Closure	Reconstruct	Reconstruct
3130129	Curry3/2006	Yes	Open	Open	Signed Year Round Closure	Open	Maintenance	Maintenance
3700117	2007	No	Open	Open	Open	Open	Permanent Closure/ Maintenance	Permanent Closure/ Maintenance
3700167	2007	No	Open	Permanent Closure/ Maintenance	Permanent Closure/ Maintenance	Decommission	Decommission	Decommission
3700275	2007	No	Open	Open	Decommission	Decommission	Decommission	Decommission
3700294	Dry/2007	Yes	Open	Open	Decommission	Seasonal Closure	Seasonal Closure	Seasonal Closure
3700379	Dry/2005	Yes	Open	Permanent Closure/ Maintenance	Decommission	Open	Permanent Closure/ Decommission	Permanent Closure/ Decommission

Within the Myrtle Park sub-watershed, S.F. Myrtle Creek and Heifer Creek are two specific streams identified as receiving excessive amounts of sediment from roads. South Fork Myrtle Creek has fine sediment being contributed from roads in the vicinity of West Myrtle Spring, Brad Spring, Soup Spring, and Gribble Spring. Figure 4-2 compares the amount of road treatments to existing road densities in S.F. Myrtle Creek drainage. Heifer Creek also has high amounts of fine sediment identified from several roads. Figure 4-3 compares the amount of road treatments to existing road densities in Heifer Creek drainage.

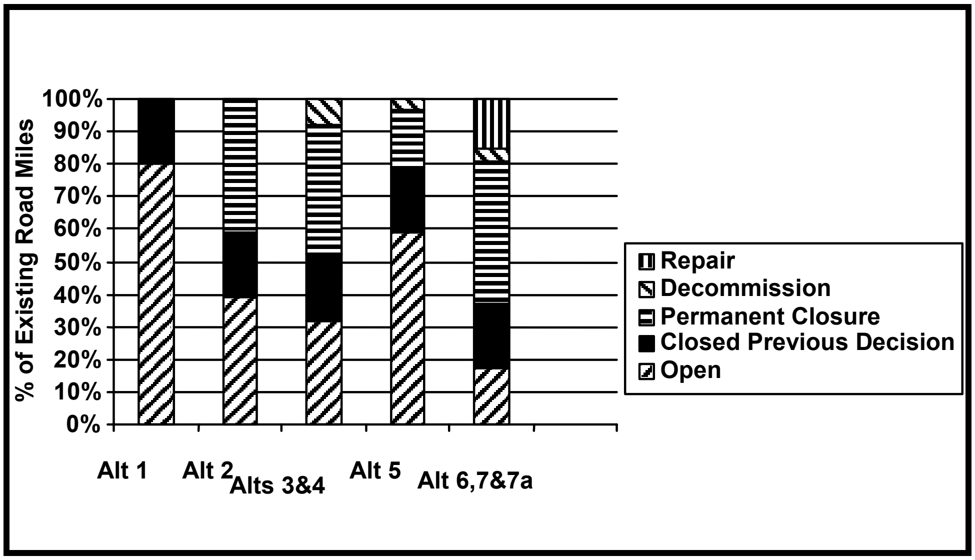


Figure 4-2. Comparison of road treatments in South Fork Myrtle Creek Drainage.

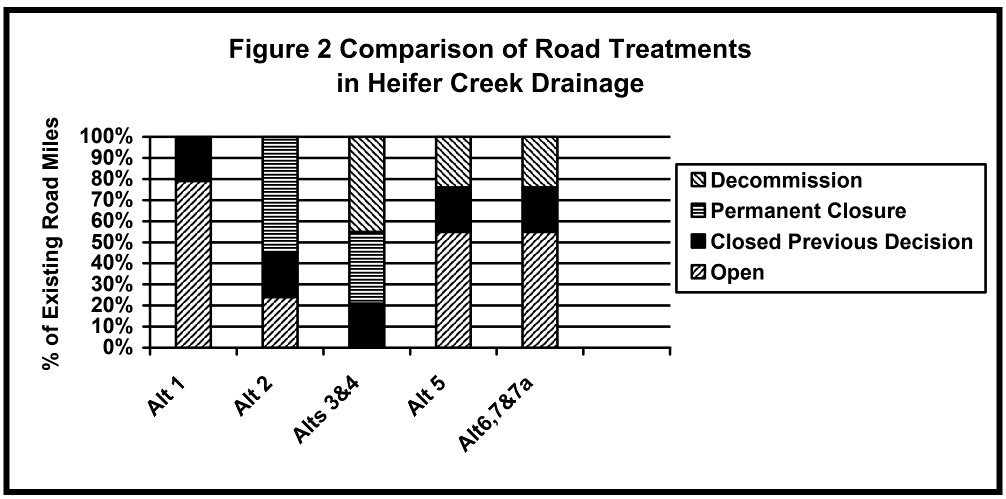


Figure 4-3. Comparison of road treatments in Heifer Creek Drainage.

The following discussion describes varying effects, by alternative, of road treatments on water quality and aquatic species and includes a discussion on the twelve specific roads identified as sediment sources as well as the reduction of roads within the S.F. Myrtle Creek and Heifer Creek drainages.

Alternative Two would correct five of the twelve specific roads identified as sediment sources, and would have less beneficial effect than the other action alternatives. This alternative would reduce the miles of open roads in the vicinity of S.F. Myrtle Creek to 39% of current conditions and Heifer Creek to 24% of current conditions. Additionally, this alternative treats the fewest miles of roads in the Silvies Canyon Watershed.

Although Alternatives Three and Four would have the second greatest benefit by correcting eleven of the twelve specific roads identified as sediment sources, they would have the greatest reduction of open roads in the S.F. Myrtle Creek and Heifer Creek drainages by reducing the miles of open road to 32% and 0%, respectively. Additionally, these alternatives treat the most miles of roads in the Silvies Canyon Watershed.

Alternative Five would be the second least effective of the action alternatives by correcting eight of the twelve specific roads identified as sediment sources. This alternative would also reduce the miles of open roads in the S.F. Myrtle Creek and Heifer Creek drainages to 59% and 55% of current conditions, respectively.

Alternatives Six, Seven, and Seven-A would have the greatest benefit by correcting all twelve of the specific roads identified as sediment sources. However, these Alternatives would be less effective than Alternatives Three and Four because they reduce the miles of open roads in the S.F. Myrtle Creek and Heifer Creek drainages to 17% and 55% of current conditions, respectively. Alternative Seven would decommission an additional 4 miles of FS road 3100035 in the Silvies-Myrtle Roadless Area.

Upland and Riparian Vegetation

Several types of riparian habitat restoration are proposed at 46 springs under all action alternatives. Removal of encroaching conifers and junipers would have a beneficial impact by increasing the abundance and diversity of understory riparian species (grasses, forbs and shrubs) and possibly increasing water flows at springs. Anecdotal reports have suggested that removal of conifers and junipers (Eddleman and Miller 1992) adjacent to springs can increase spring flows; however, little quantifiable scientific information exists to substantiate these claims (Belsky 1996). Five of these springs would be fenced to restrict livestock and protect riparian habitat for Columbia spotted frogs and other aquatic species. Four of the fenced springs would be developed and would transfer water to livestock troughs. These developments would include float valves or return lines to prevent dewatering of the riparian habitat and potential altering of the riparian vegetation. Fencing spring sites would reduce compaction, improve water quality, and limit sediment transport into the stream network. To reduce fuel loading, fire intensity and fence damage, springs located in burn blocks would be treated (conifer thinning and fencing) after prescribed burning is completed.

Aspen restoration within RHCAs would include converting encroaching conifers and junipers to standing snags or LWD, with hand tools. This would occur on 147 acres within RHCAs associated with category 1, 2, and 4 streams, in all action alternatives. Most of this activity is proposed on category 4 streams which are intermittent and do not affect downstream summer water temperatures. Ground disturbance would be limited to the felling of conifer trees, which would add to the LWD component, benefiting soil stabilization and reducing sediment input into streams. Releasing these aspens from conifer competition and protecting them from ungulate browsing by fencing or felling trees would allow the reestablishment of stream shade within 7-10 years. Due to the small size of aspen stands, the potential loss of stream shade from felled conifer trees would be minimal with no negative effects.

Aspen stands associated with harvest units would be restored the same year that commercial harvest treatments are scheduled (2004-2008). Aspen stands with no commercial treatment would be treated with precommercial thinning, prescribed burning and then fencing, in order of the burn block schedule (2006-2014). Aspen stands not associated with harvest or precommercial harvest activities would be treated in years 2003-2005.

Cottonwood restoration is proposed under all action alternatives and would reduce conifer encroachment at the remnant cottonwood stand on upper Sagehen Creek. Due to the few remaining cottonwood trees and their poor condition, immediate action is necessary to maintain and restore these unique ecosystems and would take place within the first three years of the project. Conifers would be converted to standing snags or downed LWD. Effects from these activities would benefit the stream channel by adding. Cottonwood plantings with protective cages or fencing on Sagehen Creek, Stancliffe Creek and reaches on the Silvies River below the FS Road 31 would restore a unique riparian species and benefit aquatic species and their habitat. Benefits include reduced stream temperatures, improved fisheries habitat, increased deposition of organic material (leaves), and increased bank stability.

Twelve of the identified noxious weed sites in the project area are proposed for manual treatment (hand pulling) under all action alternatives. Fewer than five sites are located near streams. Due to the control method, distance from streams, and relatively small size (each site < 25 sq. ft.), there would be no negative effects to water quality and aquatic species during the control effort. Noxious weed treatments would result in increases in native vegetation species, control of the spread of noxious weeds, stabilization of stream banks and improved stream shade, which would benefit aquatic habitat, water quality and aquatic species.

Precommercial thinning and slash treatment, post and pole removal, juniper removal, and conifer thinning in aspen stands would reduce dense stands of timber and ladder fuels, reducing the likelihood of stand replacement fires within the project area and potential negative effects on soils and water quality (McNabb and Swanson 1990). This would also increase the amount of water available for stream flows and for remaining plants. Between 10,920 and 17,577 acres would be treated depending on the alternative selected. There would be no effects on stream shade, LWD, water quality or aquatic species. All of these activities would be conducted by hand except slash treatment of thinning material, which would be accomplished by grapple piling. These activities would be limited to areas outside INFISH RHCA buffers and result in minimal impacts to soils, surface water flows, water quality and aquatic species.

Grapple piling using machinery that has a ground pressure of less than 7 psi typically makes only one pass, and operates over slash where possible. It is considered to have less impact than a feller-buncher operation. However, recent monitoring and data from areas of similar soils and conditions are only available for feller-buncher operations and so this data will have to serve as a basis for discussing impacts of grapple piling. The effects of a feller-buncher logging operation have recently been monitored on both the Fremont and Malheur National Forests. On the Fremont, six units were monitored at two different locations, both within and one meter outside of feller-buncher tracks. Monitoring results indicate that the change in soil bulk density within the feller-buncher tracks, as compared to outside the tracks, ranged from zero to an increase of 8 percent (based on an average of five measurements at each monitoring site), with the average increase in soil bulk density for all 12 locations being 4%. The overall result was no net increase in detrimental soil compaction (change in soil bulk density must be more than 15%, 20% or more for volcanic soils) due to the feller buncher operation. Similar results were found on the Emigrant Creek District of the Malheur National Forest in 1996 (McNeil 1996, unpublished). A summary of the results of this study revealed that 11% of the logging unit monitored was tracked by a feller-buncher, of which 15% showed an increase in soil bulk density (some level of compaction) – for a total of less than 2% of the unit showing an increase in compaction. The increase in soil bulk density averaged 5% with a standard deviation of 7%. The overall result was only a negligible increase in detrimental soil compaction due to the feller buncher operation.

Based on this recent monitoring information from the Malheur and Fremont National Forests, grapple piling of slash within specified units would create only a small amount of soil displacement from turning machinery and negligible detrimental compaction. Design features would limit the overall detrimental soil impacts from grapple piling machinery within the proposed units to less than 1%. It is unlikely that these limited impacts would lead to soil erosion and a reduction in water quality or aquatic habitat (sedimentation).

Effects from Burning

Alternatives Two, Three, Four and Seven would prescribe burn 12 fuel blocks for a total of 39,277 acres in each alternative. These alternatives propose the highest amount of burning and have the greatest potential for effects from prescribed burning. Alternative Seven-A would prescribed burn 11 fuel blocks for 33,751 acres, Alternative Six, 10 burn blocks for 33,374 acres, and Alternative Five, 7 burn blocks for 25,311 acres, with corresponding levels of potential effects in each alternative. Prescribed burning activities (by aerial and ground ignition) are planned over a 10-year period to allow different combinations of spring and fall burning and allow for varying stages of vegetation growth across the landscape. There would be no aerial ignition within 300 feet of category 1 riparian areas except for incidental ignitions due to steep slopes or wind gusts. All ignitions would be allowed to back burn into the RHCAs. Table 4-2 displays the relationship of burn blocks to stream categories.

Table 4-2. Stream Categories by Burn Block.

Burn Block	Category 1 Streams	Category 2 Streams	Category 4
1	None	Heifer Creek	Category 4 streams present
2	None	None	Category 4 streams present
3	Sagehen Creek	None	Category 4 streams present
4	None	None	Category 4 streams present
5	L. Sagehen Creek	None	Category 4 streams present
6	Silvies River	None	Category 4 streams present
7	Stancliffe Creek	None	Category 4 streams present
8	Stancliffe Creek	None	Category 4 streams present
9	Stancliffe Creek	None	Category 4 streams present
10	Crane Creek	Cooley Creek	Category 4 streams present
11	None	None	Category 4 streams present
12	None	None	Category 4 streams present

Landscape level prescribed burning is designed to improve watershed functions within the project area. Prescribed fire associated with the action alternatives would aid in decreasing areas of bare soil (removal of competing juniper and sagebrush) while promoting the establishment of grasses and forbs, resulting in reduced surface erosion and downstream sedimentation. This would have positive effects on site productivity, soil resources, water quality, aquatic species, and downstream beneficial uses.

Few adverse direct and indirect effects from prescribed burning are expected from these alternatives due to the gently sloping terrain of the project area, which reduces the potential for soil erosion and sedimentation. Sediment transport to stream channels may occur during the first year. There is little risk of mortality to fish and other aquatic species since these burns would be initiated outside RHCAs and would only be allowed to passively back into riparian areas as low intensity burns. Within the first 3 years, aspen stands within RHCAs would be thinned, to remove competing conifers and start the restoration process. Prescribed fire would then be used under appropriate fuel levels in order promote aspen suckering and restore the stand. The use of prescribed of fire in aspen stands is recommended to maintain the stand (Debyle et al.) Effects on water quality and fish habitat would be minimal due to the small (two acres) size of treated stands and controlled fuel levels. In the short-term (one to three years), the prescribed fires may produce small amounts of sediment into the project area tributaries. Groundcover may be consumed in small areas of moderate to high intensity burns on upslope and riparian areas during the prescribed burn. If this occurs, groundcover usually returns to or exceeds pre-burn levels three to five years in the Blue Mountains (Johnson 1998). Sediment yields, however, are expected to be insignificant for the following reasons:

(1) Low intensity burns. DeBano et al. (1998) states that low to moderate intensity fires have minimal effects on soil infiltration, citing sources that documented infiltration rates as nearly normal in areas affected by low intensity fires. Prescribed burns would be low to moderate intensity, resulting in little change to soil structure or infiltration capacity and minimal amounts of surface runoff. These types of fires only burn portions of the surface litter component resulting in minimal surface erosion.

(2) Timing. Spring burns would occur after snowmelt and before plant growth begins. As a result, burn sites would have a complete growing season to produce grasses and forbs before the next year's snowmelt and period of predictable erosion. This regrowth would be effective in preventing soil erosion and minimizing downstream sedimentation. Fall burns would permit little or no regrowth prior to snowmelt, but observations of other fall burns within the general area in the same vegetation types indicate that surface erosion is minimal when fires are of low to moderate intensity.

Fall burning conducted by ground ignition would be outside category 1, 2, and 3 RHCAs. Based on previous prescribed burns there would be a 20-50% reduction of large woody material during fall burning and 10-30% increase in new large woody material in the RHCAs. Prescribed burning of decadent riparian vegetation would be beneficial to riparian plants, fish and wildlife. Riparian vegetation would be stimulated and would regenerate following the burning.

(3) Mosaic burn patterns. Due to varying wind conditions and fuel densities, the burns are expected to spread in a mosaic pattern, burning some areas and passing others. As a result, patches of unburned ground distributed across the landscape would act as sediment capture sites until the burned patches revegetate.

(4) Moist, wet riparian conditions. Riparian zones, characterized by wet fuels, should inhibit combustion and maintain a buffer that reduces sedimentation into an associated stream channel. Fire may creep into riparian areas and be allowed to burn in order to reduce conifer densities and stimulate riparian species such as aspen and willow.

A remnant stand of cottonwood on upper Sagehen Creek in burn block 3 is the only stand of cottonwood present in the Silvies watershed adjacent to a stream, and represents a unique riparian component. This area would be protected from burning. Cottonwood can sprout from roots but are susceptible to fire due to their shallow root systems (FEIS 2000). While spring burning generally results in low intensity burns compared to fall burning, spring burning can result in high soil temperatures (Agee 1993), which may kill roots of the cottonwoods.

With the implementation of mitigation and resource protection measures, prescribed burning should not cause adverse impacts to riparian ecosystem functions, channel conditions, soil resources, water quality and aquatic species. Mitigation and Resource Protection Measures are included to minimize potential impacts from prescribed burning and protect the functioning of riparian ecosystems, without totally excluding these areas from low intensity burning. Additionally, the action alternatives are intended to enhance watershed/riparian health and aquatic habitat, moving conditions toward the Riparian Management Objectives recommended in INFISH. The enhancement of any deciduous tree and shrub species as a result of the burning will increase the preferred forage of macroinvertebrates, a major food source for redband trout.

Effects from Commercial Harvest

Alternatives Two, Four, Five, Seven, and Seven-A propose varying levels of commercial harvest activities. Alternatives Four, Seven, and Seven-A propose the most timber harvesting activities (15,701 acres) and therefore would have the highest potential for impact. Alternative Two (13,222 acres) would have a slightly lower potential for causing adverse effects than Alternatives Four, Seven, or Seven-A. Alternative Five (9,920 acres) proposes the least amount of timber harvesting activities and therefore would have the least impact of the five harvest alternatives. No harvest or harvest related activities are proposed in the RHCAs.

Timber harvesting and associated activities can increase peak and channel modifying flows, and can increase sediment supply from erosion and bank destabilization resulting in channel degradation (Chamberlin et al., 1991). Tree felling by itself is not usually a significant cause of increased sediment production. Timber yarding, on the other hand, can cause measurable increases in erosion through alteration of soil structure, gouging of slopes, disturbance to stream channels and modification of soil infiltration capacities. Road systems, skid trails, and landings can accelerate hill slope runoff by concentrating flow and altering the natural drainage system.

Significant increases in sediment yields to stream channels may exceed the stream's natural ability to carry the sediment load. This would result in sediment deposition as point and mid-channel bars, especially in lower gradient reaches of a stream, which would lead to wider, shallower, and less stable channels. This can result in bank erosion and bed-scour, which further increase the sediment load in the stream. These effects can be activated by initial direct introduction of sediment from outside the channel and/or increases in water yields that result in channel erosion. Increases in fine sediment can result in decreased reproductive success of fish. However, significant increases in sediment yields are not expected with any of the action alternatives due to the gentle terrain, design features, mitigation, and riparian protection measures (INFISH buffers).

Burning of approximately 700 large heavy slash piles outside the RHCAs can result in burned soils and create sediment sources; however, most slash pile burning would occur at sites that have been previously compromised due to compaction and slash pile burning from previous logging activities. Due to the gentle topography and distance from streams only minor impacts to site productivity are anticipated.

Aquatic habitat would be buffered from effects related to commercial harvest activities by using INFISH RHCA buffers, R6 BMPs, Malheur N.F. Forest Plan standards, and INFISH standards and guides. RHCAs help maintain the integrity of aquatic habitats by buffering stream channels from non-channelized sediment delivery, and providing for other riparian functions such as LWD inputs, shading, and bank stability (USDA Forest Service, USDI Fish and Wildlife Service, INFISH, 1995). INFISH RHCA buffers are: 300 ft each side of fish-bearing streams, 150 ft each side of non fish-bearing perennial streams, and 50 feet each side of non fish-bearing intermittent streams. Springs would be protected with 100-foot buffers as required by the Forest Plan.

R6 BMPs, Forest Plan standards, and INFISH standards and guides would reduce effects from timber harvest and associated road reconstruction and use. These measures are designed to protect stream channels and banks, reduce soil disturbance and compaction, and reduce channelized sediment delivery to streams, which would result in minimal impacts to water quality and aquatic species.

No significant impacts are expected from the five commercial harvest alternatives due to the implementation of design features, BMPs, INFISH RHCA buffers and monitoring. However, alternatives Four, Seven, and Seven-A have the highest amount of ground disturbing activities that create the potential for causing negative effects to water quality and aquatic species. These alternatives propose the highest combination of acres of commercial harvest, miles of temporary road construction, and miles of road activities related to timber harvest (i.e. truck traffic, road reconstruction, and road maintenance). Alternative Two would have a slightly lower potential for causing adverse effects based on fewer acres of timber harvest related activities. Alternative Five has the least potential for negative effects to water quality and aquatic habitat based on the fact that this alternative has the least amount of acres with timber harvest related activities.

Table 4-3. Magnitude of Commercial Harvest and Related Activities.

Alternative	Acres of Commercial Harvest	Miles of Temp Roads	Miles of Haul Route	Miles of Road Reconstruction
Two	13,222	3.5	221	164
Four, Seven and Seven-A	15,701	3.5	228	192 - 201.8
Five	9,920	2.8	200	163

Cumulative Effects Common to All Action Alternatives

Management activities and natural processes over space and time create cumulative watershed effects. These include but are not limited to: changes in timing and magnitude of flows, sediment supply to channels, sediment storage, structure in channels, and water temperature, snowmelt and freezing. Cumulative watershed effects can affect fish directly by increasing sedimentation of spawning/rearing habitat, or indirectly by changes in habitat, water quality, or impacts to macroinvertebrates/aquatic organisms.

Prescribed burning combined with juniper treatments, precommercial and commercial thinning, aspen restoration, road closures and decommissioning, spring restoration and noxious weed control would improve watershed conditions and aquatic habitat. The result would be improved channel stability with the addition of LWD from aspen restoration sites, enhanced riparian areas and riparian vegetation through thinning of conifers in aspen stands and reduction in sediment erosion-prone roads. As individual roads are closed and decommissioned, sediment input would be reduced and eventually the entire watershed and downstream area would receive less sediment, resulting in long-term positive effects for water quality and aquatic species.

The cumulative effects of precommercial thinning, commercial thinning and prescribed burning would reduce the chance of stand replacement fires and the potential negative effects to soils and water quality (McNabb and Swanson 1990, Effects of Fire on Soil 1979). The higher the number of acres thinned and prescribed burned, the greater the reduction in fuel levels across the landscape. This reduces fire danger and decreases the intensity of wildfires. Alternatives Four and Seven would reduce fuel levels on the most acres, followed by alternatives Seven-A, Two, Five, Three, and Six.

Based on the analysis of proposed activities, the action alternatives are not likely to exacerbate cumulative watershed effects; few adverse impacts from harvesting activities are expected due to design features, mitigation, and monitoring. Insignificant sediment increases are expected from soil disturbances, as RHCA buffers would filter any sediment from upslope activities.

Standard Cumulative Watershed Effects

An explanation of Cumulative Watershed Effects and how they are calculated is located in Chapter 3 in the "Watershed/Fish Habitat" section.

Table 4-4 summarizes by subwatershed existing Equivalent Roaded Areas (ERAs), Thresholds of Concern (TOCs; see Chapter 3 for definition), and changes in ERAs from implementing Alternatives Two, Four, Five, Seven, and Seven-A. Commercial harvest is a common activity among these alternatives.

Table 4-4. ERAs for Alternatives Two, Four, Five, Seven, and Seven-A.

Subwatershed	Existing ERA	Alternative Two		Alternatives Four, Seven, and Seven-A		Alternative Five		TOC
		ERA	% Change	ERA	% Change	ERA	% Change	
Myrtle Park	5.7%	9.3%	+3.6	9.3%	+3.6	8.7%	+3.0	16%
Red Hill	4.1%	6.7%	+2.6	6.8%	+2.7	6.0%	+1.9	12%
Sage Hen Creek	3.9%	9.6%	+5.7	10.0%	+6.1	8.7%	+4.8	12%
Stancliffe Creek	3.5%	10.4%	+6.9	10.9%	+7.4	9.1%	+5.6	14%
Boulder/Fawn Creeks	1.9%	4.6%	+2.7	4.7%	+2.8	4.3%	+2.4	12%
Burnt Mountain	1.4%	4.6%	+3.2	5.5%	+4.1	4.6%	+3.2	12%
Myrtle Creek	3.5%	6.3%	+2.8	6.7%	+3.2	6.4%	+2.9	14%

ERA numbers for Alternatives Two, Four, Five, Seven, and Seven-A are below the TOC for all subwatersheds. Alternatives Four, Seven, and Seven-A essentially double the ERA values for Red Hill, Sage Hen, Stancliffe, Boulder, and Burnt Mountain subwatersheds. However, all subwatersheds would still remain below the TOC. The ERA was calculated with the assumption that all timber harvest activities would occur in one year, although it is anticipated that these activities would take place over a ten-year period. Thus, ERA numbers are higher than what would actually occur. ERAs for Alternatives Seven and Seven-A would be similar to the ERA calculated for Alternative Four since decommissioning of roads was not modeled and ERA numbers do not approach TOC. The TOC would not be exceeded in any subwatershed.

Table 4-5 summarizes by subwatershed existing ERAs, Threshold of Concerns, and changes in ERAs from implementing Alternatives Three and Six.

Table 4-5. ERAs for Alternatives Three and Six.

Subwatershed	Existing ERA	Alternative Three		Alternative Six		TOC
		ERA	% Change	ERA	% Change	
Myrtle Park	5.7%	5.8%	+0.1	5.9%	+0.2	16%
Red Hill	4.1%	4.1%	+0.0	4.1%	+0.0	12%
Sage Hen Creek	3.9%	4.4%	+0.5	4.0%	+0.1	12%
Stancliffe Creek	3.5%	3.6%	+0.1	3.5%	+0.0	14%
Boulder/Fawn Creeks	1.9%	2.0%	+0.1	2.0%	+0.1	12%
Burnt Mountain	1.4%	1.6%	+0.2	1.5%	+0.1	12%
Myrtle Creek	3.5%	3.7%	+0.2	3.7%	+0.2	14%

ERA numbers for Alternatives Three and Six are below the TOC for all subwatersheds. Since ERAs are below the TOC for each subwatershed the cumulative effects of the proposed actions are not anticipated to be a concern.

Alternatives Three and Six would cause the least amount of ground disturbance in the watershed and still allow varying degrees of other restoration activities to occur, including road decommissioning, precommercial thinning, juniper reduction, and aspen, cottonwood and spring restoration. However, without commercial thinning of forest stands across the watershed, dense stand conditions and high fuel levels will remain an issue, increasing the risk of stand replacement fires.

Cumulative Effects from Reasonably Foreseeable Future Actions

Potential effects from the action alternatives would be cumulative with effects from non-federal activities within the project area and all activities outside the project area on federal, state and private lands but within the Silvies River drainage. Aside from this project, other activities that may contribute to cumulative effects include timber harvest activities, wildfires, livestock grazing, road use, flood irrigation, and vegetation alteration. These activities occur on an annual basis with the exception of timber harvest and wildfire and are known contributors of stream dewatering and sediment affecting water quality and aquatic species to an unknown degree.

Water diversions for flood irrigation occur in Myrtle Creek just above the 31 Road on USFS/private lands, and in the Silvies River in Silvies and Bear Valleys, on private lands. In both cases, small weir dams block the stream flow and divert it into the floodplain for livestock grazing or hay production. These diversions may restrict seasonal fish movement during the spring and summer and temporarily trap fish. Sediment is released downstream when the structures are opened at the end of the irrigation season, affecting fish habitat and reproductive success. These diversions also affect natural seasonal water flows.

Other large-scale timber harvest activities and wildfires within the sub-basin (35 river miles upstream of the Silvies project area) include the 8,000-acre Flagtail wildfire in 2002. Between 3,800 and 5,000 acres would be harvested on National Forest System Lands in 2004, with no harvesting activities in RHCAs. Associated restoration projects occurring in 2003 include adding LWD to 27 miles of streams, riparian planting of hardwoods on 200 acres, coarse wood placement on 3-5 acres of sensitive soils, and decommissioning/closure of 24 miles of road. Additionally there are state permits for timber harvesting on 8540 acres of private land occurring 35 miles upstream of the Silvies Canyon watershed.

Both positive and negative effects from these activities are likely to be immeasurable at the Silvies Canyon project area due to distance between project areas, numerous beaver dams, and diversions for flood irrigation that filter out sediment over 35 miles of stream channel.

Livestock grazing and its effects on water quality (temperature and sediment) and aquatic species would continue into the foreseeable future until addressed in allotment management plans. Allotment management plans for Silvies, Big Sagehen, Crooked Creek, and Scotty allotments are scheduled for completion in 2005. The West Myrtle and Scatfield allotment management plans were completed in 1996. The Myrtle allotment management plan completed in 1996 addressed negative effects of livestock grazing on several reaches of the Silvies River and Myrtle Creek systems that are in a current downward trend due to excessive riparian forage utilization and associated bank failures. Currently more than half of the reaches within the Silvies Canyon watershed are classified as functioning-at-risk (see Silvies Canyon WA 2000) and contribute to higher stream temperatures and sediment, due to lack of shade and bank failure, respectively. Shading of streams has been documented as a key component in maintaining proper stream temperatures (Beschta et al., 2003).

This cumulative component and future recovery of riparian areas depends on the level of livestock use and achievement of grazing standards within the RHCAs. The outcome would influence and may offset some of the positive benefits gained from this project. This analysis assumes that Forest Service grazing standards would be achieved in the future. Under these conditions riparian vegetation would stabilize stream banks in about 3-5 years, and produce stream shade in 5-10 years. Narrowing of stream channels requires the longest recovery period, between 10 to 50 years, but due to the high number of stream reaches currently functioning at risk, the stream channel recovery period could be longer.

Summary of Effects

Of the alternatives, Alternatives Four and then Seven allow for the most improvement within the project area with the least potential for negative impacts to soils and water quality. Alternative Four treats (closures, decommissions and reconstruction) about 345 roads and 164 miles while Alternative Seven treats about 248 roads and 93 miles. These alternatives would prevent further decline in watershed health, reduce risks affecting ecosystem sustainability, begin vegetation and watershed restoration activities, lower the risk of stand-replacement fires, protect and improve riparian, aquatic and terrestrial habitat, and address road management concerns. Environmental changes resulting from these actions include the enhancement of riparian areas and improved watershed health and ecosystem sustainability that would be consistent with the Clean Water Act, INFISH and Forest standards. Minimal watershed and aquatic impacts from harvesting activities are likely to occur due to the implementation of design features, BMPs, INFISH RHCA buffers and monitoring strategies associated with these action alternatives. Negligible direct, indirect, and cumulative effects on water quality (sediment and temperature) and quantity (magnitude, timing, and duration) are anticipated if these alternatives are implemented. Erosion control structures and stream buffers would limit sediment input into streams. Canopy reductions would allow more snow accumulation and reduce evapotranspiration, which would make more water available for stream flows. A reduction in stream sediment would improve aquatic habitat, especially pool quality, and allow redband trout and other aquatic species to increase in size. Activities associated with the action alternatives would maintain or improve water quality (temperature and sediment) in the long term on Myrtle Creek, a 303D listed stream for temperature and on other streams with documented high water temperatures.

Consistency with Direction and Regulations

Forest Plan

All action alternatives are consistent with Forest Plan direction. None of the potential combined effects are expected to adversely affect INFISH RMOs, redband trout, and Malheur mottled sculpin populations. Application of INFISH direction is expected to maintain or improve fish habitat conditions in the project area. Stream channel conditions are expected to improve with road management treatments.

Recreational fishing opportunities are limited in the project area by water quality and habitat degradation resulting from past activities. The action alternatives include closing and decommissioning roads within RHCAs, aspen and cotton restoration, and riparian (spring) habitat restoration. These aquatic conservation and restoration actions would improve the quantity, function, sustainable productivity, and distribution of recreational fisheries as directed under Executive Order 12962, Recreational Fisheries.

Clean Water Act Section 303 (d)

There is one stream within the project area, Myrtle Creek, which is currently on the 303 (d) list for temperature. Two other streams within the project area have been monitored for water temperature and have exceeded the maximum water temperature standards established by ODEQ at least once during the period of 1995-1999. Stream temperatures are not expected to increase under the action alternatives because riparian buffers following INFISH standards and guidelines will be applied. Increases in sediment yields are not expected with any of the action alternatives due to the gentle terrain, design features, mitigation, and riparian protection measures (INFISH buffers). No changes in the Section 303(d) List of Water Quality Impaired waterbodies would be made as a result of the action alternatives. Therefore, the action alternatives would not increase water temperature and would be consistent with the Clean Water Act and the Forest Plan as amended.

Effects on Soil Productivity

This section describes the effects on soil quality from activities proposed by each alternative. Soil Productivity was discussed as "Other Issues" in Chapter 1. The issue was described as "soils and soil productivity are a concern, particularly nutrient cycling, microorganisms, mycorrhizae, soil compaction, soil displacement, erosion and soil integrity." Each of these concerns is a subset of a broader and more inclusive concept called "soil quality." Maintenance or enhancement of soil quality is essential for performing vital ecosystem functions such as biological productivity and diversity, storing and cycling of nutrients and partitioning of water and energy. The evaluation of effects emphasizes overall soil quality. But specific effects to several components of soil quality are named and described. Effects to soil quality are coupled with sedimentation and effects on riparian and fish habitat and water quality. For more information about these effects see the section titled "Effects on Watershed/Fish Habitat (Issue 3)." See Table 4-6 for a sample of soil data; the complete table of data for this project is located in Appendix E.

Table 4-6. A sample of soil data from the Silvies Watershed Restoration Project Area.

Stand#	Acres	Preferred Alternative Treatment	Harvest Unit	Soil Mapping Unit (Land Type)	Subsoiling Potential	Existing Detrimental Conditions %	Detrimental Conditions % Expected After Implementation	Post Treatment Conditions Expected to Meet Standards
1.01	123	CT*	Curry I #1	71/85	Low	0	5-7	Yes
1.02	74	CT*	Curry I #1	71/74	Low	0	5-7	Yes
1.03	14	PCT		71/85	Low	0	5-7	Yes
1.04	4	JR		71	Low	0	5-7	Yes

Effects on soil quality are described in terms of physical impacts, biochemical and biological impacts, and erosion. Effects to soil productivity can generally be categorized as follows:

Soils Impacts – Compaction, Displacement, and Puddling

Soil compaction is defined as an increase in soil bulk density of 20% or more from the undisturbed level for volcanic ash soils. For all other soils, it is an increase in soil bulk density of 15% or more. Soil displacement is defined as the removal of more than 50% of the A horizon from an area greater than 100 square feet and at least five feet in width. Soil puddling is defined as ruts or imprints that are six inches deep or more. Soil deformation and loss of structure are observable and usually bulk density is increased. Each of these conditions is considered detrimental (FSM 2520, R-6 Supp. No. 2500.98-1, Forest Plan, Standards and Guides). An aerial extent of more than 20% of an activity area in these conditions and erosion, including the permanent transportation system, is detrimental (FSM 2520, R-6 Supp. No. 2500, 98-1).

Soil Biochemical and Biological Impacts-Nutrient Cycling, Soil Organisms, Soil Organic Matter

Nutrient cycling is an important ecosystem process that contributes to the maintenance of forest soil fertility, soil development, and availability of nutrients for sustaining forest productivity. Excessive removal of fine organic material (litter, duff and woody material less than 3" in diameter), coarse woody material (greater than 3" in diameter) and soil organic matter by mechanical means, or fire, (prescribed or wildfire) can alter nutrient cycling and soil organisms. Mechanical removals reduce the amount of material available for decomposition and release of nutrients. Fire reduces organic materials by combustion. Nutrients can be removed by volatilization, erosion of ash and leaching. Soil organisms can increase or decrease, depending on the species and the amount and type of organic material. Soil structure changes, such as compaction and puddling, results in death of some organisms and changes the population distribution. Excessive accumulation of organic material also can alter nutrient cycling by immobilization of nutrients. The population distribution of various soil organisms can change depending on the type and amount and location of organic material.

Soils Impacts - Erosion

Soil erosion is the wearing away of the land surface by water, wind, gravity, ice or other natural or anthropogenic agents that remove soil or geologic parent material from one point on the surface to another. Common forms of erosion are sheet and rill, gully, dry ravel and mass wasting (landslides). Accelerated soil erosion can decrease soil productivity and, when material is deposited as sediment, decrease water quality and fish habitat.

Direct, and Indirect Effects from Alternative One - No Action

There would be no new direct physical impacts, such as compaction, displacement or puddling.

Where soil compaction or puddling exists, there would be no opportunity to implement subsoiling for restoring physical conditions. After several decades, natural processes, such as freeze-thaw, wetting and drying, root growth and burrowing animals, may restore soil physical conditions to near pre-managed conditions.

Continued increases in vegetation densities outside HRV, and increases in late successional species, such as Douglas-fir and white fir, on soils that historically did not support these species, would tend to increase fine roots near the soil surface in duff layers. (See the vegetation specialist report). Also, continued increases in tree densities with accompanying increased fuel accumulations in resource-limited ecosystems would likely result in significantly altered nutrient storage and recycling processes (Harvey, et. al. 1999). Thus, vegetation would become increasingly stressed because of the inability of the soils to supply adequate moisture and nutrients. If stand replacement fires occur, substantial effects to soil nutrients, mycorrhizae, organic matter, soil organisms, and erosion would be likely because of combustion of organic matter, volatilization of nutrients, and soil erosion. A study in lodgepole pine and jack pine forests in Canada, found that wildfire destabilizes the ectomychorrizal and decomposer fungi community to a greater extent than clearcutting (Visser and Parkinson 1999). Visser and Parkinson also found that recovery to pre-disturbance conditions is more rapid following clearcutting than with wildfire. Similar results would be expected in the Silvies Watershed soil-vegetation systems.

Stand replacement fires also generate enough heat to cause hydrophobicity, or water repellency, in some soils (DeBano 1991). Because of reduced infiltration, soil erosion occurs. There is a high probability that hydrophobicity would occur with stand replacement fires, especially on the soils forming in volcanic ash. The soils where hydrophobicity is most likely to occur with stand replacement fires are in Landtypes 48, 58, 65, 75, 82 and 83.

Juniper would continue to increase on soils that historically have not supported them or supported juniper in low frequencies. Those soils are mostly shallow or moderately deep and have low moisture holding capacity and low nutrient supply. Plant-available moisture would be increasingly limited so that species, other than juniper, would become excluded. The indirect effect would be reduced plant diversity. The soils where this is highly probable are in Landtypes 7, 44, 46, 47, 73, 74 and 85.

On those areas where deep ruts exist from past practices, mainly poorly maintained roads and skid trails, soil erosion is expected to continue. These conditions will continue to be sources of sediment that impair water quality and fish habitat. Since no roads would be decommissioned, some localized significant and critical sources of erosion and sediment would continue. This would be most likely to occur on the most highly erosive soils occupied by native surfaced roads. Map 35, Chapter 2, documents the existence of native surfaced roads on erosive soils. Where existing stream crossings are within areas adjacent to highly erosive soils, such as ash and loamy over clayey soils on slopes greater than 30%, there is likely to be continuing sedimentation. Map 36, Chapter 2, illustrates the relationship between stream crossings and general soil groups. No new road closures would occur so chronic road generated erosion and sediment would continue. Once a road has been built, traffic has been attributed as the major cause of sediment from a road. Traffic-induced sediment can be quite high (Elliot, and others 1996).

Cumulative Effects from Alternative One - No Action

Past management activities have changed soil physical, chemical and biological conditions in the project area. Where ground equipment has operated, soil compaction, puddling and displacement have occurred to varying degrees. About 90% of the project area remains well below detrimental soil physical conditions. About 1% of the project area exceeds soil quality standards and an additional 9% is approaching those limits (See Soils-Affected Environment). Because no new ground equipment is planned in this alternative, or is likely in the foreseeable future, some gradual improvements are probable through natural processes including freeze-thaw cycles, wet-dry cycles, root penetration and growth, and burrowing animals. Measurable changes probably would take several decades to be observable in most of the soils in this watershed because the soils don't often freeze to depths of more than a few inches, root growth is relatively slow in these droughty soils, and the soils are of relatively low productivity.

Because stand densities would remain high, the cumulative effects within the watershed would accrue to water yield and timing of flows. Seasonal low flows are likely to be low and continue to decline in the foreseeable future because of high transpiration losses and depletion of soil moisture. High levels of transpiration would leave little excess water for soil storage and runoff. Thus, recharge of springs and downstream yields would be potentially lower over the long-term than for any of the action alternatives.

Direct and Indirect Effects from Alternative Two - the Proposed Action, and Alternatives Four, Five, Seven, and Seven-A

Forest Plan soil quality standards would be met in each of these alternatives as described in the alternatives. In order to meet the soil quality standards, existing skid trails would be used, equipment would be operated over packed snow or frozen ground, operated when soils are dry, or operated over a bed of forest residues. So, there would be minimal detrimental impacts to soil physical properties and to soil erosion. Where soil compaction and puddling exist from past practices in excess of soil quality standards, and where soil compaction and puddling occur during commercial activities, subsoiling to meet standards would lead toward restoration of soil physical properties and improved habitat for soil organisms. However, all of the units that currently exceed the standards have low suitability for subsoiling and only three units that exceed 15% in detrimental conditions have moderate suitability for subsoiling. Those three units are Burnt 3, Mud 33.02 and Dry 27.15.

There would be some localized impacts to soil fauna, mycorrhizae, and nutrient cycles for up to three to five years, until needles and other small diameter organic materials fall to the forest floor, following harvest and slash removal or prescribed burning.

"Mitigation Measures, Design Features and Management Practices," described in Chapter 2, should be adequate to protect soils from measurable amounts of new detrimental compaction, displacement, puddling, and soil erosion. Also, leaving about five to 20% of the harvest-generated slash and existing fuels, according to the fire and fuels specialist report, together with the remaining standing trees, would be adequate to protect soil organisms, soil organic matter and nutrient cycling.

Grapple piling using machinery that has a ground pressure of less than 7 psi typically makes only one pass, and operates over slash where possible, is considered to have less impact than a feller-buncher operation. However, recent monitoring and data from areas of similar soils and conditions are only available for feller-buncher operations and so this data will have to serve as a basis for discussing impacts of grapple piling. The effects of a feller-buncher logging operation have recently been monitored on both the Fremont and Malheur National Forests. On the Fremont, six units were monitored at two different locations, both within and one meter outside of feller-buncher tracks. Monitoring results indicate that the change in soil bulk density within the feller-buncher tracks, as compared to outside the tracks, ranged from zero to an increase of 8 percent (based on an average of five measurements at each monitoring site), with the average increase in soil bulk density for all 12 locations being 4%. The overall result was no net increase in detrimental soil compaction (change in soil bulk density must be more than 15%, 20% or more for volcanic soils) due to the feller buncher operation. Similar results were found on the Emigrant Creek District of the Malheur National Forest in 1996 (McNeil 1996, unpublished). A summary of the results of this study revealed that 11% of the logging unit monitored was tracked by a feller-buncher, of which 15% showed an increase in soil bulk density (some level of compaction) – for a total of less than 2% of the unit showing an increase in compaction. The increase in soil bulk density averaged 5% with a standard deviation of 7%. The overall result was only a negligible increase in detrimental soil compaction (1% or less) due to the feller buncher operation.

Based on this recent monitoring information from the Malheur and Fremont National Forests, grapple piling of slash within specified units would create only a small amount of soil displacement from turning machinery and negligible detrimental compaction. Design features would limit the overall detrimental soil impacts from grapple piling machinery within the proposed units to less than 1%. It is unlikely that these limited impacts would lead to soil erosion and a reduction in water quality or aquatic habitat (sedimentation).

Skid trails for this operation would occupy less than 9% of each unit since skid trails would be spaced about 120 feet apart. It is estimated that skidtrails are usually about 50% to 80% compacted, and because existing skidtrails would be reused where they are appropriately located, skidding would increase detrimental impacts by about 4-5%. The amount of compaction that may occur depends much more on soil moisture than on soil type. If the unit happens to be harvested over deep snow or on deeply frozen soil, compaction would typically be less than 0.5%. Use of feller-bunchers on dry soil would increase detrimental impacts by about 1% (see discussion below), and detrimental soil impacts expected from grapple piling machinery would be limited to 1% or less (see discussion below), for an expected overall total increase of 5-7%. Design features requiring equipment use under dry soil or winter conditions and mitigation requiring tillage/remedial action of landings and skid trails in units expected to exceed 20% detrimental soil impacts, meets Regional direction and Forest Plan standards.

Commercial harvesting activities have the highest potential for negatively impacting soil physical properties. The proposed action (Alternative Two) and Alternatives Four, Seven, and Seven-A would have ground impacting mechanical equipment activities on the largest number of acres. The greatest potential for detrimental soil compaction and puddling would occur in these alternatives. Alternative Two would have somewhat less potential for compaction and puddling than Alternatives Four, Seven, and Seven-A because fewer acres would be mechanically treated. Alternative Five would have the least potential for compaction and puddling, of these commercial harvest alternatives, because this alternative has the least number of acres treated mechanically. Even though soil quality standards would be met by the mitigation measures in each of the alternatives, the fact that there are differences in acres treated means that the possibility exists for some differences in the amount of land that might be in detrimental soil physical conditions. The standards permit up to 20% of an activity area to be in detrimental conditions, including the permanent transportation system. Measurable soil displacement is unlikely in any of these alternatives because there would not be tractor piling of slash by blading. There are no harvest activities planned for RHCAs, so soils in RHCAs would not be impacted from harvest activities in any alternative.

Many of the soils within the project area are not suited to subsoiling because of their high stone content, shallow depths, or steep slopes. So, if soil compaction and puddling do occur in excess of standards during equipment operations, subsoiling to restore soil physical processes and conditions isn't often possible in these soils. The soils with the most suitable properties for subsoiling are in Landtypes 58, 81 and 82.

Removal of harvest generated slash, existing fuel accumulations, and prescribed burning to reduce vegetation densities would have a slight probability for negatively impacting soil fauna, micorrhizae, and nutrient cycles in localized areas. Areas such as landings and jackpot burn piles would probably be negatively impacted for about five to ten years, if slash is burned very hot (Harvey et al. 1994, Fire and Fuels Specialist Report). However, after about five to ten years, nutrient cycles, soil fauna, and mycorrhizae would probably be improved and moving toward HRV. Natural variability in soil organic matter, nutrient levels, soil organism populations, and physical properties are highly variable in these soils. Therefore, there is a very low probability of detection of measurable positive or negative effects to these soil properties from planned fuel treatments or removal of harvest generated slash among these alternatives (Meurisse et al. 1991). Underburning will release nitrogen, sulfur, phosphorus and cations, such as potassium and calcium, which can be immediately available for improving plant growth.

Low to moderate intensity underburns together with reduction of stand densities during thinning would probably stimulate growth of shrubs, grasses, and lichens, which provide protective ground cover and are hosts for bacterial symbionts that fix nitrogen from the atmosphere and make nitrogen available to higher plants. These understory plants also are important sources of organic matter that can be decomposed and incorporated into the soil by soil organisms. This organic matter is an important nutrient reservoir. These nutrient cycling processes are important for maintaining nutrient availability and for tree nutrition in forest ecosystems (Cromack 1998). Alternatives Four, Seven, and Seven-A would have the most acres of stand density reduction and would have high amounts of underburning so that there would be a high probability of stimulating growth of desirable plants that create conditions for improving and sustaining nutrient cycling for tree nutrition and tree vigor. Alternative Five would have the least amount of stand density reduction and Alternative Two would have the second lowest stand density reduction of the action alternatives.

Alternatives Two, Four, Seven, and Seven-A would have the most fuel treatment acres by prescribed burning and the most acres moved toward historic conditions. So, in the long-term, they would have the lowest probability for stand replacement wildfires that could potentially have adverse effects on soil organisms, soil organic matter, nutrient cycles and erosion. Alternative Five would have the least amount of fuels treated, so would have the highest probability for stand replacement wildfires that could adversely affect soil organisms, soil organic matter, nutrient cycles and erosion for several years (Visser and Parkinson 1999, DeBano 1991).

Road closures, maintenance and decommissioning activities are designed to correct erosion and sediment problems associated with roads. Road decommissioning probably would have some temporary, localized increases in erosion and fine sedimentation for one to three years. The magnitude of any increases would be highly variable and dependent on storm timing, intensity, and duration prior to vegetation establishment and any ground cover accumulation through needle and litter fall. After about three years, decommissioned roads would be stabilized and erosion would be minimized. Alternative Four has the highest number of miles of permanent road closures so would have the highest probability for reducing chronic road-related erosion and sediment after about three years. Alternative Two has the next highest number of miles closed followed by Alternatives Seven and Seven-A. Once a road has been built, traffic has been attributed as the major cause of sediment from a road. Traffic-induced sediment can be quite high (Elliot et al. 1996).

Alternative Four has the highest number and miles of decommissioned roads, so would have the highest probability for reducing erosion and sediment from critical areas such as stream crossings, steep gradients into drainage-ways, and roads on highly erosive soils. Alternative Seven would have the second most miles decommissioned. Decommissioned roads will have a greater effect than road closures on reducing erosion and sediment in critical areas such as existing stream crossings or steep gradients into drainage-ways and roads on highly erosive soils. Alternative Five has the least amount of permanent road closures, and an intermediate number of miles decommissioned, so would have the highest probability for road erosion and sedimentation in the long-term.

Alternatives Two, Four, Seven, and Seven-A have the highest probability for increasing road-related erosion and sediment during commercial activities, and for about three years after completion, because of the temporary road construction and re-construction. After about three years following the temporary road construction, there would be no measurable difference in road erosion and sedimentation among these alternatives. The maximum amount of temporary road construction is 3.5 miles. The probability that measurable amounts of erosion and sedimentation would occur in localized segments of the temporary roads is high. The estimated volume of soil that would be eroded would probably be less than 60 to 75 yds^3 the first year after construction. The amounts would decline slightly during the life of the project. After completion of the project, the roads would be decommissioned. Probably less than 50 to 75% of the eroded soil would reach streams. Alternative Five would have about 25% lower volumes of erosion and sedimentation.

Cumulative Effects from Alternative Two - the Proposed Action, and Alternatives Four, Five, Seven, and Seven-A

Past management activities have changed soil physical, chemical and biological conditions in the project area. Where ground equipment has operated, soil compaction, puddling and displacement have occurred to varying degrees. Among the activity areas, about 90% remains well below detrimental soil physical conditions, while about 1% does not meet soil quality standards over 20% or more of the area with an additional 9% approaching this condition (see Soils-Affected Environment in Chapter 3). Each of these action alternatives would have ground impacting equipment operations to remove trees and harvest-generated slash. Mitigation measures are prescribed to minimize additional impacts to soil physical conditions. With these measures, there is a low probability that new areas of soil compaction and puddling would develop. Because natural processes require several decades to recover soil conditions to natural functions, future entries within several decades would probably add a small amount of soil compaction and puddling. Some gradual improvements are probable through natural processes, including freeze-thaw cycles, wet-dry cycles, root penetration and growth, and burrowing animals. Cumulatively, past, present and foreseeable future activities are not likely to result in measurable changes to soil physical, chemical or biological properties. Use of existing skid trails would produce no measurable new effects to soil physical properties, erosion and sedimentation, or soil biological and chemical properties in foreseeable future entries. If new skid trails were used in future entries, there potentially would be some new and cumulative effects of soil compaction and puddling. Because most of the units that have detrimental soil conditions on 15% or more of prior activity areas have low suitability for subsoiling, there is little opportunity to improve soil physical and biochemical properties, soil organism populations and functions, and soil erosion and sedimentation by subsoiling. Natural processes will be required to restore vital functions to the soil, which will take several decades.

Past management, such as exclusion of fire and thinning, has created stands that are denser than most of the soils in the project area can sustain without undue plant stress. Severe stress can lead to insect and disease conditions that are outside HRV. Proposed actions to reduce stand densities would result in a reduction of transpiration losses and leave more water for recharge to springs and seasonal low flows. Alternatives Four, Seven and Seven-A would have the highest probability for reducing transpiration losses. However, as tree growth increases and as roots increasingly occupy the soils, there will be a gradual reduction in excess water for release to streams and springs. Alternative Five would retain and regain the highest stand densities and therefore have the lowest probable increase in water yields over the long-term. The net effect to overall soil quality for the long term should be somewhat positive. Most of the soils would be able to perform their vital functions of productivity and diversity, nutrient storage and cycling, and partitioning of water and energy. Soil and ecosystem health likely would be enhanced in each of the alternatives. Vital soil functions would be enhanced the most with Alternatives Four, Seven and Seven-A through the combined actions of reduced stand densities compatible with the soil properties, stimulation of understory plants that probably would enhance nitrogen fixation, and organic matter decomposition and incorporation into the soil.

Direct and Indirect Effects Specific to Alternatives Three and Six

Forest Plan soil quality standards are expected to be met in each of these alternatives. No new commercial harvest activities would be implemented, so no new soil compaction, displacement, or puddling would occur. Where compacted soils already exist from past practices, they would likely remain compacted for several decades until natural processes could ameliorate these conditions.

Prescribed burning and precommercial thinning would be the primary methods of treatment to reduce stand densities of small diameter trees. Some areas may be treated mechanically. If thinning slash is treated mechanically, there would be a low probability for soil compaction and puddling because of a limited amount of equipment travel, and design features that would minimize soil impacts. Alternative Three would have a higher potential for soil physical impacts than Alternative Six, if slash were treated mechanically, because more acres would be treated. Reductions in surface duff and litter by fire would help to reduce the amount of fine roots near the surface and stimulate nutrient cycling so that remaining larger trees would respond with increased vigor for about ten years after treatment. The forest floor would then become thicker with litter and duff, and fine roots would tend to re-occupy the near surface. As stand densities increase, tree vigor would again be reduced because of limited moisture and nutrients. Tree mortality, from insects and diseases, probably would increase and the risk of stand replacement fires would increase. Alternative Six would show the reduced plant vigor before Alternative Three.

The risk of stand replacement fires would be reduced for about five to ten years. After about ten years, the risk of stand replacement fires would increase because stand densities would have increased to levels at which soil moisture and nutrients would become limited. This would result in stressed sites and lead to a higher risk of insect and disease conditions that increase tree mortality. Continued increases in tree densities with accompanying increased fuel accumulations in resource-limited ecosystems, would likely result in significantly altered nutrient storage and recycling processes (Harvey et. al. 1999). If stand replacement fires occur, substantial effects to soil nutrients, mycorrhizae, organic matter, soil organisms, and erosion would be likely because of combustion of organic matter, volatilization of nutrients, and soil erosion. A study in lodgepole pine and jack pine forests in Canada found that wildfire destabilizes the ectomychorrizal and decomposer fungi community to a greater extent than clearcutting (Visser and Parkinson 1999). Visser and Parkinson also found that recovery to pre-disturbance conditions is more rapid following clearcutting than with wildfire.

Stand replacement fires also generate enough heat to cause hydrophobicity, or water repellency, in some soils (DeBano 1991). Because of reduced infiltration, soil erosion occurs. There is a high probability that hydrophobicity would occur with stand replacement fires, especially on the soils forming in volcanic ash. Alternative Six would have the highest probability of stand replacement fires because fewer acres would be treated and fuel loads would remain relatively high.

Only small diameter juniper would be reduced by prescribed fire. Large diameter juniper will continue to increase on soils that historically have not supported them in both Alternatives Three and Six. Those soils are mostly shallow or moderately deep and have low moisture holding capacity and low nutrient supply. Plant available moisture would be increasingly limited so that species other than juniper would continue to be excluded. The indirect effect would be reduced plant diversity. Soils that may have previously supported microbiotic crusts may again support them on some small, localized areas that would be exposed by burning. The probability of contiguous crusts forming is very low, however.

Road closures and decommissioning activities are designed to correct erosion and sediment problems associated with roads. Once a road has been built, traffic is thought to be the major cause of sediment from a road. Traffic-induced sediment can be quite high (Elliot et al. 1996). Road decommissioning could have some slight increases in erosion and fine sedimentation for one to three years. After three years, decommissioned roads would be stabilized and erosion would be minimized. Alternative Three would have the highest probability for reducing chronic erosion and sediment from roads because of the miles of roads closed and decommissioned. It would be similar to Alternative Four. Alternative Six would have fewer miles of road closed and decommissioned than Alternative Three, but more miles would have maintenance. Alternative Six would have a lower probability for reducing chronic erosion and sediment than Alternative Three and it would be similar to Alternatives Seven and Seven-A.

Cumulative Effects from Alternatives Three and Six

Past management activities have changed soil physical, chemical and biological conditions in the Silvies Watershed. Where ground equipment has operated, soil compaction, puddling and displacement have occurred to varying degrees. About 90% of the project area remains well below detrimental soil physical conditions. About 1% of the project area does not meet soil quality standards and an additional 9% is approaching those limits. (See section titled "Soils" in Chapter 3). Because the only new ground equipment planned in these alternatives is for removing thinning slash, the probability of adding to existing compacted, displaced, or puddled soils is very low, but is higher in Alternative Three than Alternative Six, because more acres are planned for treatment. Also, no additional physical impacts are likely in the foreseeable future. Some gradual improvements are probable through natural processes including freeze-thaw cycles, wet-dry cycles, root penetration and growth, and burrowing animals. Measurable changes probably will take several decades to be observed in most of the soils in this watershed because the soils don't often freeze to depths of more than a few inches, root growth is relatively slow in these droughty soils and the soils are of relatively low productivity.

Stand densities would be reduced from the current levels by thinning and prescribed fire. The reduction would be mostly in the small diameter classes (see the vegetation specialist report). The cumulative effects to soil nutrient cycles, soil organisms, and organic matter would result from the combined effects of thinning and prescribed fire. The net effect from past practices, present actions and foreseeable future activities would probably be only a short interval of about ten years of improved nutrient cycling. Soil organism populations would probably be minimally affected over the long term.

The combined effects of past practices with the present and foreseeable activities would result in the soils being fully occupied by roots to exploit moisture and nutrient supplies. There would be a temporary and insignificant reduction in transpiration losses from the current conditions. Because stand densities would return to relatively high levels (outside HRV) in about ten years, there probably would be no measurable increases in seasonal low flows or recharges to springs. High levels of transpiration would leave little excess water for soil storage and runoff; there would be no measurable difference between Alternative Three and Alternative Six. The cumulative effects of road closures, decommissioning, and no foreseeable temporary road construction would result in reduced erosion and sedimentation within the watershed and downstream for the foreseeable future.

Consistency with Direction and Regulations

All action alternatives would be consistent with applicable Forest Plan soil protection standards (standards 125-129, FP IV-40). Stands that currently exceed 20% detrimental conditions or stands that would exceed 20% detrimental conditions after implementation would be monitored and mitigated as described in Chapter 2.

Effects on Vegetation Condition (Issue 4)

This section evaluates the effects of the alternatives on existing and future characteristics and patterns of vegetation, including stand structure and composition, and natural processes such as wildfire, insects, and disease.

Vegetation Response to Fire

The following is a general discussion of how different vegetation types respond to fire. The vegetation in the project area is highly adapted to periodic fire in forest, shrubland, and grassland ecosystems. The adaptations that enable the vegetation to survive, increase site occupancy, and attain renewed vitality following fire include thick bark (in ponderosa pine and western larch), ability to sprout from root crowns and rhizomes (in shrubs and graminoids like willow, alder, sedges, and rushes), and protection of buds in crown foliage (in grasses like bluebunch wheatgrass and Sandberg's bluegrass).

Forested Stands

Tree species occurring in the Blues, Wallowas, and Seven Devils have been rated into categories of fire resistance (Johnson 1998). Tree species that occur within the project area and their fire resistance include:

- Very high resistance - western larch
- High resistance – ponderosa pine and Douglas-fir
- Moderate resistance – grand fir (white fir)
- Low resistance – lodgepole pine.

Thick bark enables western larch, ponderosa pine and Douglas-fir to sustain moderate and light intensity underburns (Johnson 1998). Within the high resistance category, ponderosa pine is more resistant than Douglas-fir. Resistance also varies with size of the tree; the larger the tree the better resistance to fire.

Non-Forest Vegetation

Rangeland communities where woodlands, savannas, shrublands and grasslands regularly occur are composed of species with varying responses to fire. Historically, fires have visited rangelands on frequent return intervals. The natural fire regime of these areas in the project area is one of frequent (5-23 years) low-intensity fires (Schwenke 2003). As with forest stands, there has been a decreased frequency of fires over the last century resulting primarily from effective fire suppression. As a result there has been an increase in fire-susceptible plant species in rangelands; juniper and sagebrush have increased in densities and extent in sites where high-frequency fires once kept them subordinate to fire-adapted vegetation.

MOIST AND DRY UPLAND SHRUBLANDS AND DRY UPLAND HERBLANDS

Numerous studies have shown that sagebrush (Blaisdell 1953, Blaisdell et al. 1982, Neuenschwander 1980, Young 1983), bitterbrush (Blaisdell 1950), mountain mahogany and currant species (Bradley et al. 1992, Bradley et al. 1991, Crane and Fischer 1986) are all highly susceptible to fire and would be expected to be killed by prescribed fire; however, sagebrush and bitterbrush will resprout on moist ground (Johnson 1998). Rubber rabbitbrush is often top-killed by fire (Martin and Dell 1978, Mitchell 1984); mortality after fire is variable, but is generally very low (Neuenschwander [n.d.], Plummer et al. 1955).

In general, bunchgrasses with large accumulations of dead material can generate high temperatures for long periods after fire has passed, which can reduce fire survival for older plants (Wright and Bailey 1982).

Idaho fescue is susceptible to severe damage by fire owing to perennating buds located in the dense basal tufts where fire can burn hot and linger (Johnson 1998). Sandberg's bluegrass, prairie junegrass and bluebunch wheatgrass are all tolerant and resistant to fire damage (Johnson 1998). Although bottlebrush squirreltail is generally top-killed by fire, its small size and low density of coarse fuel per unit basal area make it relatively fire tolerant (Britton et al. 1990, Volland and Dell 1981, Wright 1971). Orchardgrass is reported to increase or remain stable after burning (Cocking et al. 1978, Pase et al. 1977). Kentucky bluegrass and common timothy are moderately resistant to fire. Fires may stimulate seed production and rhizome growth. When plants are dormant, cool fires have little effect on them (Crowe and Clausnitzer 1997).

RIPARIAN HERBLANDS

Willows, alder, red-osier dogwood and common snowberry are all well-adapted to fire and have the ability to sprout from roots, root crowns, basal stems and stolons, even when fire kills the aboveground plant parts (Lyon and Stickney 1976, Crowe and Clausnitzer 1997). Sedges and rushes are primarily located in wet associations and probably do not burn frequently. Those with deep-seated rhizomes are well-suited to survive low to moderate intensity fires. They can also colonize burned areas by seeds and with the spread of rhizomes.

Direct and Indirect Effects of Alternative One – No Action

Under the No Action alternative, there would be no commercial or precommercial thinning, no fuels treatments, and no restoration activities conducted. Because there are no treatments proposed under this alternative, there would be no direct effects to vegetation resulting from implementation.

Effects to Stand Structure and Forest Health

In general, the indirect effects of this alternative in all forested areas would be that overstocked conditions would continue to exist. Stands would continue to increase in density as growth and regeneration continue. Competition for available resources, such as moisture and nutrients, would continue to increase, and vigor of the trees would continue to decrease. Scattered individual trees in the highest density areas would continue to die periodically. Number and diversity of shrubs, forbs, and grasses would decrease as stand density increases (Oliver and Larson, 1990).

Large overstory ponderosa pine would continue to decline and mortality rates would continue to increase. Naturally endemic levels of western and mountain pine beetles would likely increase, and may become epidemic due to heavy stocking and low vigor of the trees. Mortality due to these insects would probably increase, especially if a drought occurred. When bark beetle outbreaks occur on low productivity sites, higher mortality rates from beetles tend to occur in the largest trees first (Lynch 1958, Keen 1950, Eckberg et al. 1994), resulting in a natural thin from above, and may approach a clear cutting (Keen 1936). Ponderosa pine stands begin to be at risk when they become 8" dbh and are 50 to 100 years old (Gast et al. 1991), which is the approximate age of about 5,000 acres in the Hot Dry PAG. Blackstain root disease would continue to spread in small disease centers and kill pine. Stumps infected with Annosus root disease would not be treated to prevent spread, so this disease would likely continue to increase.

White fir and Douglas-fir would continue to increase in density in mixed conifer stands, while the ponderosa pine component would continue to decrease. Ground vegetation would continue to decrease in quantity and diversity. Populations of naturally occurring defoliators such as Douglas-fir tussock moth and western spruce budworm would likely reach outbreak levels. Douglas-fir mistletoe would likely increase, as the opportunity to spread throughout stands would increase with increased tree density. If trees are weakened by these factors, secondary disturbers such as fir engraver in white fir and Douglas-fir bark beetle in Douglas-fir may kill trees. Indian paint fungus may become activated in white fir if these trees are stressed by other factors.

When stand-replacing events occur, the ability of forested stands within the project area to naturally regenerate would be compromised as early seral species give way to climax species. Natural regeneration may not occur, and historically forested areas may become non-forested. The seed source for early seral species would be deficient, and if natural regeneration should occur, it would be to later seral species. If a stand-replacing event occurs, regeneration of that area would largely be dependent upon artificial reforestation.

There would be no treatment of western larch to improve the regeneration and increase the percent composition of this species.

In the absence of restoration treatments, most aspen stands would continue to decline, and small stands would continue to be lost. It is estimated that up to 20-50% of existing aspen stands may be lost within the next 20 years (Vegetation Specialist Report).

No effort would be made to protect or restore the two existing cottonwood stands. One stand may be able to regenerate naturally, but has not been able to do so effectively in the past. The other stand is made up of only one tree; regeneration is very unlikely, since this species requires pollination and seed production to propagate. The cottonwood stands would likely continue to decline and may die out. Because this species is so limited in the project area, a stand replacing wildfire could eliminate it.

Effects to Non-Forest Vegetation

Without vegetation treatments, natural processes would continue in forested stands that were previously non-forest. Tree canopies would continue to reduce the amount of sunlight and precipitation that would reach the ground. Duff layers would increase and trees would use up most of the available soil water and nutrients. The grasses, forbs and shrubs would continue to decline in abundance, vigor and density.

Without the introduction of prescribed fire to Woodlands and Non-Forested PVGs, juniper would continue to encroach into non-woodland areas causing a decrease in available moisture to other plants (grasses, forbs, and shrubs) and a corresponding decrease in the number and density of these species. As desirable plant species die out, the areas they occupied would become fire resistant due to a lack of continuous fuels. In shrub-dominated areas, shrubs would increase and forbs and grasses would decrease.

Historically, fires have visited rangelands on frequent return intervals. The natural fire regime of these areas in the Silvies Canyon Watershed Restoration Project Area is one of frequent (5-23 years) low intensity fires (Schwenke 2003). Past management actions, primarily effective fire suppression, have decreased the frequency of fires over the last century. Today the unprecedented combination of decreased low-intensity surface fires, increased stand-replacing fires, and fire-exclusion management practices has resulted in a high percentage of plant communities vulnerable to crowning fires. No Action would result in the persistence of these conditions until a large stand-replacing fire occurs.

Effects to Natural Fuels

Natural fuels would not be reduced in the project area. In all timber types, increased mortality due to a variety of factors would contribute to the risk of stand replacing wildfire. As individual trees die and eventually fall, the ground and ladder fuels components would increase. Mistletoe brooms, where they occur, would contribute to ladder fuels. Should a fire occur, it would likely be larger, of higher intensity and more difficult to contain than historically.

The northern half of the project area has higher stocking, more natural fuels and ladder fuels, and greater forest continuity than the southern half; more extreme fire behavior and conditions would be expected in the northern half of the project area. Wildfires would be more likely to spread from the project area to adjacent Federal and non-Federal lands under this alternative.

It is expected that the mortality rate associated with wildfire would be higher than found historically, due to increases in natural fuels, overstocking, and higher percentages of late-successional species. A stand replacing fire would move the structure toward stand-initiation phase, and would set back structural development approximately 100 years; diversity of ground vegetation would increase, while tree species diversity would decrease (Oliver and Larson, 1990). Fire would tend to select against white fir and Douglas-fir, and for ponderosa pine and for lodgepole pine and western larch, where they occur.

If a fire occurred in a forested stand adjacent to a non-forested site, it would likely burn into the non-forested area in a mosaic fashion, wherever ground vegetation was continuous, at a hotter intensity than would be found historically. This would probably cause more severe environmental damage than a natural, low-intensity fire. Some of the invading juniper would be killed, as would shrubs; grasses and forbs would increase in the short-term.

Cumulative Effects of Alternative One – No Action

Past disturbances and activities that have affected the vegetation condition in the project area include timber harvest, precommercial thinning, road construction, livestock grazing, fire, and fuels treatments. Reasonably foreseeable future disturbances and activities under the No Action alternative include continuation of present levels of livestock grazing and open roads. Since current levels of natural fuels and tree stocking would not be reduced, and stand conditions are such that fuels levels and stocking would continue to increase, it is reasonable to predict that stand replacing event(s) such as wildfire or insect/disease outbreak would occur in the foreseeable future. Forest structure would be moved toward stand initiation phase, and structure development would be set back 100-250 years. Following a stand-replacing event, intense salvage harvest and reforestation would likely occur.

Direct and Indirect Effects Common to All Action Alternatives

All action alternatives propose treatments that would reduce stocking from below, treat natural fuels, and move species composition toward early seral species; the level of effects to vegetation would vary between alternative depending on how many acres were treated and the intensity of treatment. In general, resulting and future stand structure and composition would be closer to what existed before the beginning of the 20th century. The action alternatives vary in the number of acres treated and the intensity of the different types of treatment. Table 2-20 summarizes the proposed commercial harvest, precommercial thin, and juniper removal in each alternative. Table 4-7 summarizes the acres of commercial harvest and PCT in fuel blocks.

Table 4-7. Acres of Commercial Harvest and PCT in Fuel Blocks.

Alternative	Acres of Commercial Harvest in fuel blocks	Acres of PCT in fuel blocks
Two	10,094	11,874
Three	0	12,116
Four	12,208	12,570
Five	4,645	6,977
Six	0	5,819
Seven	12,207	12,569
Seven-A	11,737	11,864

Effects to Stand Structure and Forest Health

Table 4-8 shows the acres of each structure being treated by alternative.

Table 4-8. Acres of Stand Structure Manually Treated by Alternative.

Alternatives	Structure*							
	Non-Forest	SI	SEO	SEC	YFMS	UR	OFSS	OFMS
Existing Condition	15,201	942	7,765	4,734	20,772	6,567	31	9,225
Two	583	127	3,612	2,473	8,925	1,046	29	2,857
Three	593	127	2,311	1,247	7,909	1,007	29	3,391
Four and Seven	664	231	3,802	2,554	9,228	1,058	29	3,624
Five	579	127	2,913	2,043	7,762	1,012	29	2,669
Six	71	12	759	894	5,807	714	29	2,512
Seven-A	664	231	3,802	2,554	9,105	1,058	29	3,021

*SI= stand initiation; SEO=stem exclusion open canopy; SEC=stem exclusion closed canopy; YFMS=young forest multi-story; UR=understory reinitiation; OFSS=old forest single story; OFMS=old forest multi-story.

All action alternatives propose precommercial thinning. This activity would move the stand density and the forest composition for trees 7" dbh and under towards historical stand conditions in this size class. Generally speaking, trees in treated stands would grow faster than trees in untreated stands. Stands classified as YFMS, SEO, SEC, and UR that are treated would move towards OFMS and OFSS at a faster rate than stands not treated. All action alternatives would treat 27-39% of OFMS stands to maintain their old forest characteristics.

All action alternatives propose treatments in pure ponderosa pine stands to improve forest health and reduce the risk of insect and disease outbreaks and stand replacing fire. Mistletoe would be reduced in ponderosa pine stands by reducing stocking, especially of trees under 21" dbh that are affected by mistletoe; after reduction in stocking, the released trees have the ability to outgrow the mistletoe infection. Risk of bark beetle outbreak and incidence of blackstain root disease would be reduced in treated stands.

All action alternatives propose treatments in mixed conifer stands for forest composition and density. Treatments would reduce white fir and Douglas-fir with the intent to move the forest towards historic forest composition. With the reduction of white fir and Douglas-fir in the mixed conifer stands, the risk of an outbreak of defoliators, mistletoe, and stand replacement fire would be lowered on the acres treated. The spread of mistletoe would be reduced in mixed conifer by removing Douglas-fir. Prescribed burning would further reduce mistletoe because mistletoe brooms are highly susceptible to fire, and trees that are highly infected with many brooms are apt to torch out and become snags.

Ponderosa pine and western larch are more fire resistant than either white fir or Douglas-fir, so it is expected that prescribed burning would increase the composition of these species. No western larch would be cut with any alternative. Following treatments, especially prescribed burning, western larch should increase in species composition.

No regeneration harvesting is proposed in any of the alternatives. Following harvesting, areas would be fully stocked. It is expected that following treatment of units some limited natural regeneration would occur in openings through time.

All action alternatives propose aspen restoration. Removing competition for a space of 60 to 70 feet around the existing aspen stems (including suckers), would allow the aspen stands to expand in acreage. With reduction of competition, suckering would be initiated resulting in a two-storied stand of aspen. These treatments would enhance and maintain aspen areas. With all of these alternatives some site disturbances would occur. This site disturbance would further stimulate the aspen to sucker, but may impact other associated vegetation; impacts would be limited due to mitigation measures. In the RHCAs snags and large woody debris would be created under all action alternatives to enhance fisheries and watershed conditions.

Cottonwood restoration is proposed in all action alternatives. The existing stands of cottonwood would be protected and precommercially thinned. To increase the opportunity for future natural propagation of this species, planting of cottonwood would be done as cuttings become available; cuttings would be protected from herbivores. Measures would be taken to restore cottonwood by reducing competing vegetation.

The Forest Plan standards amended by Regional Forester Amendment #2 set the management level for snags at 100% potential population level (PPL), or 2.39 snags per acre 21" dbh or larger. The project area does not currently meet this standard. However, this does not mean that the project area doesn't comply with the Forest Plan. While the standard is the desired level, the current condition could be called the natural level. The project area is unable to support the desired level of snags due to past management practices, past disturbances, and the fact that approximately 6,000 acres were historically non-forested and have not been forested long enough for trees to grow to 21" dbh. All alternatives propose snag creation in replacement old growth areas. Following the guidelines described in Mitigation Measures in Chapter 2 for creating snags out of codominants and intermediates with an occasional dominant tree, would be feasible and sustainable in the long term.

Effects to Non-Forest Vegetation

In forested areas that were historically non-forest, when the canopy is opened up by vegetation activities (harvest, thinning, and burning) and duff levels are reduced, the amount of sunlight and precipitation (snow and rain) reaching the forest floor increases. Because whole tree yarding is proposed and 80% of created slash would be removed to landings, there should be little increase in slash in commercial harvest units. Precommercial thinning units would have an increase of slash for about two years until the slash is fully treated. Once the slash is treated, more sunlight and moisture would reach the forest floor and more water and nutrients would be available to the grasses, forbs and shrubs. These species would therefore increase in composition and density.

All action alternatives propose landscape scale prescribed burning (25,311-39,277 acres) that would affect shrublands and herblands. Table 4-9 lists fuel blocks and the amount of shrublands and herblands in each. Amounts of shrublands and herblands are listed by percentage and acres to show the magnitude of effects.

Direct lighting from prescribed burning would not occur in non-forest PVGs; however, there would be some indirect burning by allowing fire to back into or creep into these PVGs. Spring burning generally would be of low intensity due to the wet conditions. Fall burning would have more potential for higher intensity fire due to dryer conditions. Because of this, fall burning would be accomplished by ground ignition to maintain better control of fire intensity (Mackey 2003).

Because moist upland and dry upland shrublands and dry upland herblands PVGs within the project area have less vegetation than forested areas, these areas are expected to burn in a mosaic pattern at low intensities (Mackey 2003). The sparse herbaceous condition of these areas makes them practically immune to fire. Riparian herbland PVGs within the project area can be densely vegetated but because of the high moisture content and often cool temperatures of these sites they too are expected to burn in a mosaic pattern at low intensities (Mackey 2003). In non-forested areas similar to scab flats, less than 5% of the area would burn and this would mainly be along the timberline. Non-forested areas that contain meadows, grasses, or shrubs would be 10-40% burned depending on the density and continuity fuels. Prescribed fire would therefore create small openings in shrublands and herblands in which fire tolerant species would begin to become re-established. This would enhance biological diversity by providing for varied structure and species composition.

Table 4-9. Acres and Percent of Herblands and Shrublands by Fuel Block.

Fuel Block		Dry Upland and Riparian Herblands		Moist Upland and Dry Upland Shrublands	
#	Acres	%	Acres	%	Acres
1	2,484	1%	25	0%	0
2	5,298	< 1%	3	3%	173
3	5,023	4%	163	10%	525
4	2,100	< 1%	4	<1%	15
5	7,798	1%	89	12%	936
6	5,526	1%	39	35%	1913
7	3,988	< 1%	35	20%	798
8	940	3%	25	45%	422
9	895	< 1%	8	27%	242
10	3,419	2%	58	2%	68
11	696	3%	21	1%	8
12	1,110	0%	0	22%	243
Total	**39,277**	**1%**	**470**	**14%**	**5343**

Because prescribed fire intensities are expected to be low, areas of total vegetation consumption by fire are expected to be low. In the moist and dry upland shrublands and dry upland herblands PVGs, prescribed fire is expected to creep into these areas and occasionally kill or top kill the vegetation that occupies the burned areas. Sagebrush and bitterbrush would resprout after burning if the ground is moist (Johnson, 1998). Rubber rabbitbrush, Sandberg's bluegrass, prairie junegrass, bluebunch wheatgrass, bottlebrush squirrel tail, orchardgrass, Kentucky bluegrass and common timothy are all relatively fire resistant and would be expected to be reduced slightly, remain stable, or increase after burning. Idaho fescue would be reduced after burning.

In the riparian herbland PVGs, prescribed fire is expected to creep in and occasionally kill or top kill the vegetation that occupies the burned areas. Willows, alder, red-osier dogwood and common snowberry would be expected to sprout from roots, root crowns, basal stems and stolons. Sedges and rushes would most likely not burn or burn at very low intensities. Species with deep-seated rhizomes are expected to survive low to moderate intensity fires. They would also colonize burned areas by seeds and with the spread of rhizomes.

Burning forested areas surrounding shrubland habitat would result in decreased use of shrubland habitat by big game for about 3 to 5 years. With the removal of overstory cover, woody vegetation previously suppressed would prosper under conditions that are more open.

Effects to Natural Fuels

The planned treatments that would affect fuels are timber harvesting, precommercial thinning, and prescribed burning. The timber harvesting would have little effect, as the trees would be whole tree yarded to the landings. Some minor breakage of limbs would take place but should not change the overall fuel loading on the landscape scale.

Precommercial thinning to at least 15 x 15' spacing at 8" dbh would normally eliminate the first stage of reintroducing fire as long as the created slash is piled and burned. Pruning of the lower limbs on the remaining trees would still need to be done. This pruning can be accomplished with a higher intensity fire than of the normal first stage prescribed burn. This higher intensity fire would also reduce more of the duff layer.

In precommercially thinned stands, controlling fire with a wider window of opportunity is more feasible than in unthinned stands. The possibility of manipulating fire height and rate of spread increases as tree spacing increases. A thinned stand would start losing this burning opportunity within five to seven years following treatment, as new shrubs and trees grow.

Precommercial thinning would have a short-term effect of two to five years. An estimated 30 to 50 tons per acre of slash would be created from a thinning treatment. This slash would either be hand piled or grapple piled during the same field season or the following field season. Burning of the piles would take place no later than the second field season after thinning. Piling of the slash would also remove some of the natural fuels that are currently there.

Prescribed burning on the landscape scale would be mosaic. In non-forested areas similar to scab flats, less than 5% of the area would burn and this would be along the timberline. Non-forested areas that contain meadows, grasses, or shrubs would be 10 to 40% burned depending on the density and continuity fuels. Forested areas would be 40 to 70% burned.

Prescribed fire would have the largest effect on reducing the current fuel loading. With moderate burning it is estimated that 40% to 70% of the fuel loading would be reduced after the first stage burn. This would include the litter and duff layers. Within five to seven years following the prescribed fire, approximately 75% of the fuels would return. These new fuels would be in the form of needles and limbs created both naturally and caused from the effects of the prescribed burn.

As fire burns through the timbered stands, it would consume mostly grass, shrubs, and litter. Most of the litter consumption would be near the base of the trees. Shrubs would return in a few years (one to five years) as new growth. Grass would start returning after sufficient rains and would come back vigorously the following spring.

The forest floor and mineral soil contain most of a forest's nutrient reserves (Downer and Harter 1979). With high intensity prescribed fire and wildfires, many nutrients in the forest floor are vulcanized. However, low intensity fire does not have this effect and generally has a positive reaction on nutrient cycling.

Treated slash would be a combination of activity-created slash and natural fuels. The activity-created slash would either be from logging or precommercial thinning. Underburning, jackpot burning, hand piling or grapple piling, and pile burning are the proposed fuels treatments.

Of the different fuels treatments, underburning has the least impact on the soils resource. Burn severities are minimized through prescriptions that are designed to burn at low intensities and the potential for impacts is generally dispersed across a larger area. These types of burns most closely emulate natural process as to nutrient volatilization and nutrient dispersal and are not expected to have an adverse effect on soil productivity. Revegetation would begin immediately after burning.

Jackpot burning can produce high severity effects on a small area (burn pile size), depending on fuel concentrations. This type of fire may be similar to stand-replacement type fire intensities leading to hydrophobic soils conditions. Normally jackpot burning is conducted under wetter condition with low intensity fire effects. Less area is affected than with underburning, since only concentrations of fuels are burned; the area isn't a continuous fuel treatment.

Grapple piling from existing trails and landings allows the net ground disturbance to be kept to a minimum. Hand piles are placed away from boles of trees and are at least one forth the size of a grapple pile. Horizontal fuel continuity would be interrupted so that potential rate of wildfire spread and overall severity is reduced. Burning usually takes place with snow pack conditions. Fire intensities would be higher under piles; however, grapple piles would be concentrated near or on already disturbed areas and hand piles would be smaller, resulting in fewer fire effects. After burning, piled areas would take the longest to revegetate. Table 4-10 compares the acres of hand and grapple piling following precommercial thin for each alternative.

Table 4-10. Comparison of hand and grapple piling following precommercial thin for each alternative.

Alternative	Total PCT Acres	Hand Pile	Grapple Pile
Two	15,109	661	14,835
Three	16,060	1,129	14,890
Four	16,186	1,135	15,590
Five	13,733	1,086	13,015
Six	10,799	992	9,746
Seven	16,186	1,135	15,588
Seven-A	16,186	4,86	15,561

The general effect of fuels treatments would be that fuel loading and risk of stand replacement wildfire would be reduced from current levels. Fuel concentrations would be broken up so that when unplanned ignition occurs, the fires would be smaller and suppression efforts more effective. Crown fires would be less likely, and fires would burn with less intensity. Likelihood of wildfires spreading from the project area to adjacent Federal or non-Federal lands, or vice-versa, would be reduced.

Fuels treatments are expected to have the following effects in treated areas:

- Reduction of surface fuel loading to 2 to 10 tons/acre with light to moderate intensity prescribed burning;
- Reduction of seedling and sapling size trees by 60 to 80%;
- Reduction of western juniper < 18" in diameter by 70 to 90%;
- Entrance of low intensity fire (< 2' flame length) into RHCAs;
- Increase in the amount of surface area covered by grass and forbs by 10 to 50%;
- Creation of a mosaic of burned (60 to 80% of any one block) and unburned areas;
- Retention of stocking on a variable spacing, depending upon the size of the residual trees, to produce an average of 50 basal area (range 30 to 70) for hot-dry and 60 basal area (range 40 to 80) for warm-dry sites;

- Limiting stand-replacement fire to < 1% of the size of any block, and to pockets <1 acre in size;
- Maintenance or creation of snag habitat at 100% of potential population levels of primary excavator species (2.39 snags per acres, 15" diameter small end);
- Maintenance or creation of large down woody material to meet appropriate standards (in ponderosa pine, 3-6 logs per ac greater than 12" diameter small end and 6' in length, in mixed conifer, 15-30 logs per ac greater than 12" diameter small end and 6' in length).

Cumulative Effects Common to All Action Alternatives

Effects to Non-Forest Vegetation

In forested areas, due to the implementation of vegetation treatments that would open up tree canopies and reduce duff layers, grasses, forbs and shrubs would be expected to increase. Prescribed burning proposed under this EIS would re-incorporate fire into the ecosystem. In non-forested areas such as shrublands and herblands the re-incorporating of fire would be minimal and in a mosaic pattern. In the future, additional prescribed burning is likely and would aid in re-establishing more fire tolerant species. This would enhance biological diversity by providing for varied structure and species composition.

Effects to Natural Fuels

Foreseeable future actions related to management of natural fuels are mechanical stocking reductions, periodic prescribed burning, continued unplanned ignitions, and the instigation of fuels treatments within Myrtle Canyon.

The effects of these futures actions would be to continue to move stocking and species composition towards historic levels. This would result in historical fuel loading and fuel distribution. When unplanned ignitions occur, the fire(s) would burn in a low intensity mosaic manner. The risk of crown fires and/or large stand replacement fires would be reduced.

With treatment of fuels within Myrtle Canyon, the risk to firefighter safety would be reduced. Following treatment of fuels, if fire(s) should occur, the effects to vegetation would be similar to those of a low-intensity, low-severity historic fire.

Direct and Indirect Effects Common to Alternatives Two, Four, Five, Seven and Seven-A

The effects of these five alternatives vary only in the acres that are being treated (see Chapter 2, Table 2-20).

Effects to Stand Structure and Forest Health

With commercial treatment, most stands currently classified as stem exclusion closed canopy (SEC) would move to the stem exclusion open canopy (SEO) category. Table 4-11 lists the number of acres by alternative that would change from SEC to SEO. The rest of the acreage would remain in the same structure as currently classified.

Table 4-11. Acres changed from SEC to SEO by Alternative.

Structural Stage (PAG)	Alternative Two	Alternatives Four, Seven, and Seven-A	Alternative Five
Hot Dry	541	546	318
Warm Dry	1,629	1,797	1,323

These alternatives reduce the risk of a major disturbance (stand replacement fire, and/or disease and insect outbreaks) considerably more than the No Action alternative or Alternative Six. Alternatives Four and Seven, closely followed by Seven-A and then Two, would reduce the risk of a major disturbance the most.

With these alternatives, large trees in treated stands would be released from competition with smaller surrounding trees, which would improve their overall health and vigor. This would preserve the seed source, and these stands would be more sustainable than at present. However, corridors between late structure stands (OFMS and OFSS) would be left at a higher density, and thus would be under higher stress than the trees in the surrounding stands. Due to this stress, the trees in the corridors would actively attract bark beetles from the surrounding lower density stands and provide an opportunity for bark beetles to use in moving between old structure stands. The mortality in these corridors would be higher than in the adjoining stands. These corridors would increase the mortality of the large trees in the old forest structure that they connect in the next 5 to 20 years.

As pine stands are treated to reduce stand density, more moisture would be available for the residual trees. With this increased moisture, the residual trees would increase in growth rates and vigor. As the growth rates and vigor of the trees increase, their susceptibility to western and mountain pine beetles decreases. Risk of an outbreak of bark beetles would be reduced on 13,249 acres in Alternatives Four, Seven and Seven-A, 11,328 acres in Alternative Two, and 8,614 acres in Alternative Five.

These alternatives would harvest trees that have characteristics of small disease centers of blackstain root disease. Once the trees are harvested and the roots die, the disease dies and does not persist in the dead roots. These alternatives would result in a reduction of blackstain root disease in treated stands.

With these alternatives, stumps would be created that could potentially be infected by spores of Annosus root disease. Due to the slow spread of this disease, the stumps of small trees (under 12" diameter) decompose too quickly to become disease centers. The stumps of trees over 12" diameter would be treated with borax, which inhibits the colonization of the Annosus spores. There would be no spread of Annosus root disease as a result of these alternatives.

Treatments in mixed conifer sites would reduce the density of trees under 21" dbh, reduce the composition of late seral species (white fir and Douglas-fir) and move the forest towards historical stand stocking and composition, which would increase the vigor and the growth rates of the residual trees. With a reduction in white fir and Douglas-fir, the risk of large wide-spread mortality due to either Douglas-fir tussock moth or western spruce budworm would be reduced. This would also reduce the incidence of Douglas-fir dwarf mistletoe, and decrease mortality due to secondary disturbers such as Douglas-fir bark beetles and fir engraver. Risk of Douglas-fir tussock moth and western spruce budworm would be reduced on 6,869 acres in Alternatives Four, Seven and Seven-A, 5,961 acres in Alternative Two, and 4,342 acres in Alternative Five. Risk of insect-related mortality would be reduced for 20 to 50 years and possibly up to 100 years. While reducing the white fir component would reduce the incidence of Indian paint fungus, this fungus could be activated in residual white fir that are damaged during treatment of the units, and many of the remaining trees may become hollow. This would decrease their chances of growing into large trees and predispose them to early mortality.

Western larch, which is found in the northern 1/3 of the project area, would be stimulated by activities proposed in these alternatives to reproduce and increase in frequency. Reintroduction of fire would favor western larch by killing advance regeneration and larger trees of Douglas-fir and white fir and exposing mineral soil. Given an equal start, western larch can usually outgrow competing conifers, since western larch was historically regenerated by fire.

Aspen should respond to all five of these alternatives and increase in area coverage and regeneration of a young stand component. In aspen outside the RHCAs, coniferous trees in excess of historic levels and those not needed for snags and large woody material would be commercially harvested. Harvest would be limited to trees under 21" dbh, except under Alternative Four. There would be no harvesting within RHCAs, so there would be little site disturbance.

Juniper would be reduced throughout the areas by mechanical treatments and with the use of prescribed fire. This should increase the moisture available to other plants such as riparian vegetation, grasses, forbs, and shrubs. As these other species respond to the decrease in juniper, ground cover should increase, reducing erosion and the space that is available to invasion of non-native plant species.

Effects to Natural Fuels

With reduction in stocking and the subsequent treatment of the existing fuels, the risk of a stand replacement fire would be reduced in treated stands due to breakup of continuity of the fuels and the reduction in ladder fuels.

The increase in ground cover resulting from juniper removal could cause an increase in light fuels and the spread of range fires. These conditions would more closely resemble historic conditions where the rangeland burned at low intensities but at frequent fire intervals.

Cumulative Effects Common to Alternatives Two, Four, Five, Seven and Seven-A

It is reasonable to predict that if Alternative Two, Four, Five, Seven or Seven-A is implemented, future actions would follow the same guidelines; that is, commercial harvest and precommercial thinning as well as prescribed burning would be used to treat stand density, stand composition and natural fuels and maintain desired conditions. Within 20-30 years, stands treated under these alternatives would need to be treated again. Stands that would not be treated under these alternatives would likely need treatment within 10-15 years. Fuel blocks treated under these alternatives would be revisited on a rotation of 5-15 years. It is assumed that livestock grazing would continue at current levels.

Effects to Stand Structure and Forest Health

Future treatments would reduce competition in the vicinity of the large old tree structure. Mortality rates would be reduced and growth would be encouraged in smaller size structure so that it develops into large old structure. In the long term, OFMS and OFSS would be maintained.

Future actions in ponderosa pine and mixed conifer stands would maintain the densities and stand structures resulting from implementation of this project and treat density and structure in stands not treated in this project. These actions would reduce stocking toward historical stocking levels; vigor of individual trees and overall resistance of stands to insect and disease outbreaks would be improved.

Future treatments of the area, including additional commercial thinning, other intermediate thinning, pre-commercial thinning, and prescribed burning, would move species composition toward historical early seral species, decrease stocking, and treat fuels, ultimately increasing fire resistance and reducing fuel continuity across the landscape.

Percent composition of western larch and aspen should increase over time as proposed and future treatments reduce competition and encourage the regeneration of these species.

Effects to Non-Forest Vegetation

Future management would continue to reduce the amount of juniper that is competing with other vegetation, which would increase the amount of ground vegetation.

Effects to Natural Fuels

Due to the lower density of residual trees, the fuels that are treated would be replaced with fine flashy fuels that have a low intensity burning. With periodic prescribed burning these fuels would be reduced.

The fuel blocks proposed for treatment in these alternatives completely surround Myrtle Canyon. In the future, if fire should occur in Myrtle Canyon, due to planned or unplanned ignition, the ability to contain it would be greater than with the other alternatives.

Direct and Indirect Effects Common to Alternatives Three and Six

These two alternatives propose no commercial harvest and no post and pole sales.

Effects to Stand Structure and Forest Health

The large old growth component in stands throughout this watershed would continue to decline and mortality levels would be higher than the other action alternatives, but lower than the No Action Alternative. Although precommercial thinning and prescribed fire would reduce some of the stress on the old growth ponderosa pine, the resultant stocking would be higher, and the percent stand composition made up of ponderosa pine would be lower, than the other action alternatives. The "pure" ponderosa pine stands would still be at a higher risk to either mountain pine beetle or western pine beetle attack than the other action alternatives, but would be lower risk than the No Action alternative.

Treatment of the species composition and stand density for trees over 9” dbh would totally be accomplished by prescribed fire. Stand densities would remain at higher level than the other action alternatives, but at lower levels than the No Action alternative. This first introduction of prescribed fire would be at low intensities. Some mortality is expected in the diameter classes over 9” dbh. In the hot dry PAG and ponderosa pine-dominated warm dry PAG, this mortality would probably be low. Mortality would be higher in the late seral species in the mixed conifer-dominated warm dry PAG sites, but would still not be sufficient to lower competition and reduce the stress of the residual trees for any significant time (longer than 5 years). In most of these stands, the trees over 9” dbh are causing the greatest competition and stress to the remaining large trees.

Since these alternatives would treat few trees over 9” dbh, the bark beetle risk would be only slightly reduced from the current condition and would remain high. These alternatives would precommercially thin small trees that may have blackstain root disease, but would do nothing to reduce larger trees that are infected with it. These alternatives would do little to control or reduce the incidence of blackstain root disease in the project area. Some stumps may be created that could become disease centers for Annosus root disease and could cause mortality of surrounding trees in the future.

Since this alternative treats few trees over 9” dbh in the mixed conifer sites, the risk of an outbreak of Douglas-fir tussock moth and/or western spruce budworm also remains higher than the other action alternatives, but would be lower risk than the No Action alternative.

Cutting trees less than 9” dbh and prescribed burning could directly affect residual trees by causing damage to their boles. The indirect effect is that this damage could activate Indian paint fungus, and many of the remaining white fir would become hollow. This would decrease their chances of growing until they are large, and predispose them to early mortality, creating snags and down woody material, and adding to fuel loads.

Although the fuels treatment would favor western larch regeneration over the regeneration of Douglas-fir and white fir, regeneration of western larch would still remain substantially lower than the other action alternatives due to the competition from trees over 9” dbh. Western larch would not substantially increase in area or percent composition.

Aspen should respond to these alternatives and increase in area coverage and regeneration of a young stand component although not as well as the other action alternatives. Due to the higher levels of snags and large woody debris, the risk of a large fire(s) burning through these aspen stands is much higher than with the other action alternatives or the No Action alternative.

Effects to Natural Fuels

The risk of a prescribed burn getting out of control and killing the larger trees would be much higher with these two alternatives than with the other action alternatives, because there would be no manual treatment of trees larger than 9” dbh.

Treated stands would remain at a higher risk of a stand replacement fire due to higher fuel loads and more ladder fuels than Alternatives Two, Four, Seven and Seven-A but at a lower risk than the no action alternative.

Cumulative Effects Common to Alternatives Three and Six

It is reasonable to predict that if Alternative Three or Six is implemented, future actions would follow the same guidelines; that is, only precommercial thinning and prescribed burning would be used to treat stand density, stand composition and natural fuels and maintain desired conditions. Within 10-15 years, stands treated under these alternatives would be treated again with prescribed fire. Stands that would not be treated under these alternatives would likely need treatment within 10-15 years. It is assumed that livestock grazing would continue at current levels.

Effects to Stand Structure and Forest Health

Units being treated with this project would continue to be treated with prescribed burning in the future. Due to greater competition from other trees, mortality of large old component in the stands would continue at a higher level than the other action alternatives.

Within 15 years densities in treated stands are expected be equal to or greater than present densities. Growth and vigor would again be reduced and these stands would be susceptible to insect and disease outbreak. Future treatments of prescribed burning would eventually move the stands toward historical stocking and composition, but this would happen more slowly than in alternatives with combinations of harvest, thinning, and burning treatments. Future treatments in stands not being treated with this project would improve health and vigor of those stands, but effects would likely last 5-10 years. The risk of losing stands to high intensity burns would be higher than with the other action alternatives due to higher levels of fuel and fuel ladders.

After 5 years stocking in treated stands would be at or above present levels and risk of pine beetle outbreaks would return to present levels. Future treatments of the area being treated now would do little to reduce these risks since only periodic prescribed burning would be done. Treatment of areas not being treated at the present may reduce the risk for a limited time (5 to 10 years).

Current and future treatments would be unlikely to benefit western larch, and this species would likely continue to decline.

Current and future treatments would increase the percent composition and vigor of aspen. However, risk of stand replacing fire and the associated risk of losing entire stands of aspen to fire would remain higher than with the other alternatives.

Annosus root disease may be perpetuated or increased over the long term, as infected stumps would not be treated in this or future projects.

Effects to Natural Fuels

Due to the densities of residual trees, the fuels that are treated would be replaced at the present levels within 5 years following currently proposed treatments. Periodic future burning would maintain these fuels at lower levels that currently, but the risk of a large stand replacement fire would remain higher than the other action alternatives because of more ladder fuels and greater fuel continuity (tree density) in the 9” dbh class.

Direct and Indirect Effects of Alternative Two, Proposed Action

Approximately 43,880 acres (67% of the project area) would be treated. Some acres would have two or more treatments. For example, a stand may first be treated with a commercial thin, followed by a precommercial thin, followed by prescribed burning. Twelve fuels blocks totaling 39,277 acres (60% of the project area) would be treated, primarily by prescribed burning. Within these acres, 15,070 acres (38%) would be pretreated to reduce stand density and to treat forest composition. Pretreatment would include commercial harvesting, precommercial thinning, juniper reduction, or post and pole removal. Another 4,584 acres (7% of the project area) outside of fuel blocks would also be pretreated for a total of 19,654 acres (30% of the project area) of pretreatment.

Effects to Stand Structure and Forest Health

Of the action alternatives, Alternative Two is the medium alternative in treating forest stocking and species composition; it would take a more aggressive approach than Alternatives Three, Five, and Six but would be less aggressive than Alternatives Four, Seven, and Seven-A. With this alternative, the risk of a bark beetle outbreak in the stands composed primarily of ponderosa pine would be substantially reduced. In the mixed conifer stands the risk of an outbreak of spruce budworm or Douglas-fir tussock moth would also substantially be reduced.

Effects to Non-Forest Vegetation

About 15% (5,813 acres) of the 12 fuel blocks proposed for prescribed burning are composed of moist upland and dry upland shrublands, dry upland herblands and riparian herblands. Effects on these acres would be as described in the section "Direct and Indirect Effects Common to All Alternatives."

Effects to Natural Fuels

Fuels treatments proposed under this alternative would result in the control of prescribed burning being greatly enhanced and the risk of a prescribed burn getting out of control greatly reduced.

Prescribed burning would create fuel breaks to reduce the risk of stand-replacement fires. Old growth conditions would be improved in a designated old growth stand; habitat would be improved in a bald eagle nest area.

Along with the treatments, approximately four miles of hand line or plow line would be constructed. There would be 34 miles of blackline, primarily along the Myrtle-Silvies Roadless Area border.

Direct and Indirect Effects of Alternative Three

Approximately 43,212 acres (66% of the project area) would be treated. Some acres would have two or more treatments. Twelve fuels blocks, totaling approximately 39,277 acres (60% of the project area) would be treated, primarily with prescribed burning. Within these acres, approximately 12,683 acres (32%) would be pretreated to reduce stand density and to treat forest composition. This pretreatment would consist of thinning trees under 9" dbh and juniper reduction. Approximately 3,934 acres (6% of the project area) outside of fuel blocks would also be pretreated for a total of approximately 16,617 acres (25% of the project area) of pretreatment.

Effects to Stand Structure and Forest Health

Of the action alternatives, this alternative would take the second least aggressive approach to treating forest stocking and species composition, since only precommercial thinning of trees under 9" dbh and prescribed fire would be used. Of the action alternatives, only Alternative Six would take a less aggressive approach. Although the total number of acres treated would be greater than with Alternatives Five or Seven-A, reduction in stocking and increase in vigor would be lower. In the stands composed primarily of ponderosa pine, the risk of a bark beetle outbreak would be much higher than with the other action alternatives, except for Alternative Six. This alternative would result in the risk or probability of an outbreak of spruce budworm or Douglas-fir tussock moth in mixed conifer stands being much higher than the other action alternatives, except for Alternative Six. Although prescribed burning would reduce late seral species more than early seral species, the control of this reduction would be less and the risk of unacceptable results would be greater than with the other action alternatives. With the limited types of treatment, the risk of prescribed fire getting out of control would be much higher than for the other action alternatives, except for Alternative Six.

Juniper would be reduced throughout the area in units designated as juniper reduction units and in units that would precommercially thinned and prescribed burned. Reduction of juniper should result in increased groundwater becoming available to other plants such as grasses, forbs and shrubs. As these other species respond to the decrease in juniper, ground cover should increase, reducing erosion and the space that is available to invasion of non-native plant species. This increase in ground cover could also cause an increase in light fuels and the spread of range fires. These conditions would be more similar to historic conditions in which the rangeland burned at low intensities but with frequent fire intervals.

Effects to Non-Forest Vegetation

Effects would be the same as under Alternatives Two, Four, and Seven.

Effects to Natural Fuels

Effects would be the same as under Alternatives Two, Four, and Seven.

Direct and Indirect Effects of Alternatives Four & Seven

These two alternatives propose the same vegetation treatment; the difference between them is in the proposed treatment of roads. Approximately 44,450 acres (68% of the project area) would be treated. Some acres would have two or more treatments. Twelve fuels blocks, totaling approximately 39,277 acres (60% of the project area) would be treated to reduce fuels, primarily by prescribed burning. Within these acres, approximately 16,008 acres (40% of the project area) would be pretreated to reduce stand density and to treat forest composition. This pretreatment would include commercial harvesting, precommercial thinning, juniper reduction, post and pole removal, and aspen treatment. Approximately 5,166 acres (7% of the project area) outside of fuel blocks would also be pretreated for a total of approximately 21,174 acres of pretreatment.

Effects to Stand Structure and Forest Health

Alternatives Four and Seven take the most aggressive approach of the action alternatives to treating forest stocking and species composition. These alternatives would result in the greatest reduction of the risk of a bark beetle outbreak in the stands composed primarily of ponderosa pine and an outbreak of spruce budworm or Douglas-fir tussock moth in mixed conifer.

Proposed reductions in stocking and late seral species would result in the control of prescribed burning being enhanced and the risk of a prescribed burn getting out of control being reduced more than any other alternative.

Effects to Non-Forest Vegetation
Effects would be the same as under Alternatives Two and Three.

Effects to Natural Fuels
Fuel loading would be reduced in treated stands by approximately 50% to 75%. Reducing the fuel load would reduce flashy fuels and disrupt fuel continuity, thus reducing the spread rate, size, and intensity of wildfires, as well as reduce the risk of a large stand-replacement fire. If wildfires occur after treatment, they would be expected to burn in a low-intensity, mosaic fashion. Units that are not mechanically treated with this project may require additional entries with prescribed burning to prepare for maintenance burning.

These two alternatives proposed more treatments than the other action alternatives. By treating more stands with harvest or PCT, they would result in a greater reduction of risk of stand replacing wildfire and greater manageability of prescribed fire operations.

Direct and Indirect Effects of Alternative Five
Approximately 35,248 acres (54% of the project area) would be treated. Some acres would have two or more treatments. Fuel Blocks 2, 5-7, 9, 11, and 12, totaling approximately 25,311 acres (38% of the project area) would be treated to reduce fuels, primarily with prescribed burning. Within these acres, approximately 9,444 acres would be pretreated to reduce stand density and to treat forest composition. This pretreatment would include commercial harvesting, precommercial thinning, juniper reduction, or post and pole removal. Approximately 7,690 acres outside of fuel blocks would also be pretreated for a total of approximately 17,134 acres of pretreatment.

Effects to Stand Structure and Forest Health
This alternative takes an approach between Alternative Three and Alternative Two in aggressiveness to treating forest stocking and species composition. Although the total number of acres being treated is lower than Alternative Three, Six, and Seven-A, it would more greatly reduce the risk and probability of insect outbreaks in treated stands than would alternatives Three or Six. Although Alternative Seven-A would treat fewer acres than this alternative, the acres that would be treated would be treated more intensely. This alternative would not reduce the risk and probability of insect outbreak as much as Alternative Two. The risks associated with prescribed burning would be greatly reduced with this alternative, much more so than with Alternative Three because fewer acres would be prescribed burned, and the acres that would be prescribed burned would have lower stocking due to the treatments involved in this alternative.

Effects to Non-Forest Vegetation
About 18% (4,508 acres) of the fuel blocks proposed for burning are composed of moist upland and dry upland shrublands, dry upland herblands and riparian herblands. Effects to these acres would be as described on page 47 of the section "Direct and Indirect Effects Common to All Action Alternatives."

Effects to Natural Fuels

In this alternative, less acreage would be prescribed burned, which could keep the risk of stand-replacement fire high in some areas. In the fuel blocks treated under this alternative, prescribed fire would be used as one of the tools to return overstocked stands to historically healthy conditions. About three miles of hand line or plow line would need to be constructed. There would be 31 miles of blackline, mostly where the fuel blocks border the Myrtle-Silvies roadless area. There would be about two miles of blackline in the southern portion of block 7.

Prescribed fire would be introduced in three major areas:

1. Squaw Flat from West Myrtle Creek south and between the western side of the project boundary and Myrtle Creek;
2. East of Myrtle Creek, along the southern boundary of the project area, north along the western boundary to Silvies River, south to the 31 road, and then north to northern boundary of the project area;
3. The designated old growth unit along Gold Creek on the northern boundary of the project area.

Fuel loading would be reduced in treated stands by approximately 50% to 75%. Reducing the fuel load would reduce flashy fuels and disrupt fuel continuity, thus reducing the spread rate, size, and intensity of wildfires, as well as reduce the risk of a large stand-replacement fire. If wildfires occur after treatment, they would be expected to burn in a low-intensity, mosaic fashion. Units that are not mechanically treated with this project may require additional entries with prescribed burning to prepare for maintenance burning.

Because fewer acres would be commercially or precommercially treated with this alternative, the reduction in fuels would be less, and the risk of a stand replacement fire remains higher than under other action alternatives.

Cumulative Effects of Alternative Five

Effects to Natural Fuels

This alternative does not treat fuel blocks on the North and Northeast portions of Myrtle Canyon. If fire(s) should occur, under peak fire conditions, the likelihood of containing a fire to Myrtle Canyon is the lowest of the action alternatives.

Direct and Indirect Effects of Alternative Six

Approximately 38,300 acres (58% of the project area) would be treated. Some acres may have two or more treatments. Fuel Blocks 2-9, 11 and 12, totaling approximately 33,374 acres (51% of the project area) would be treated to reduce fuels, primarily with prescribed burning. Within these acres, approximately 5,876 acres (17% of the project area) would be pretreated to reduce stand density and to treat forest composition. Pretreatment would be by precommercial thinning. Approximately 4,920 acres (7% of the project area) outside of fuel blocks would also be pretreated for a total of approximately 10,796 acres of pretreatment.

Effects to Stand Structure and Forest HEalth

Alternative Six would take the least aggressive approach of the action alternatives to treating forest stocking and species composition. Although this alternative treats more acres than Alternative

Five, the acres treated would not be treated as intensively. Risk of a bark beetle outbreak in the stands composed primarily of ponderosa pine and risk of an outbreak of Spruce budworm or Douglas-fir tussock moth in mixed conniver would be reduced the least. With the limited reduction in stocking and the limited reduction in late seral species with this alternative, the control of prescribed burning would be the least of the action alternatives and the risk of a prescribed burn getting out of control would be the greatest.

Effects to Non-Forest Vegetation

About 17% (5,662 acres) of the fuel blocks proposed for burning are composed of moist upland and dry upland shrublands, dry upland herblands and riparian herblands. Effects to these acres would be as described in the section "Direct and Indirect Effects Common to All Action Alternatives" under "Effects on Vegetation Condition."

Effects to Natural Fuels

This alternative is similar to Alternative Three but without fuel blocks 1 and 10. It proposes to use prescribed fire as one of the tools to return overstocked stands to historically healthy conditions. To conduct these burns, approximately four miles of hand line or plow line would need to be constructed. There would be 31 miles of blackline, mostly where the fuel blocks border the Myrtle-Silvies roadless area. There would be approximately two miles of blackline in the southern portion of block 7.

Prescribed fire would be introduced in two major areas:

1. Squaw Flat from West Myrtle Creek south and between the western side of the project boundary and Myrtle Creek.
2. East of Myrtle Creek, along the southern boundary of the project area, north along the western boundary to Silvies River, south to the 31 road, and then north to northern boundary of the project area.

Fuel loading would be reduced by 50% to 75% in pine stands, and by 10% to 30% in stands dominated by juniper. Reducing the fuel load would reduce flashy fuels and disrupt fuel continuity, thus reducing the spread rate, size, and intensity of wildfires, as well as reduce the risk of a large stand-replacement fire. If wildfires occur after treatment, they would be expected to burn in a low-intensity, mosaic fashion.

Similar to Alternative 3, this alternative proposes no harvest activities. This alternative would treat the fuels created by precommercial thinning on fewer acres. Of the action alternatives, this alternative would do the least fuels treatment. This would leave more area susceptible to risk of stand replacing fire and manageability of prescribed burning operations would be reduced.

Cumulative Effects of Alternative Six

Effects to Natural Fuels

This alternative does not treat the fuel block on the North side of Myrtle Canyon. If fire(s) should occur, under peak fire conditions, the likelihood of containing a fire to Myrtle Canyon is slightly greater than Alternative 5 but less than the other action alternatives.

Direct and Indirect Effects of Alternative Seven-A

Approximately 39,144 acres (60% of the project area) would be treated. Some acres would have two or more treatments. All fuel blocks except 6, totaling approximately 33,751 acres (51% of the project area) would be treated to reduce fuels, primarily with prescribed burning. Within these acres, approximately 15,282 acres (45% of the project area) would be pretreated to reduce stand density and to treat forest composition. Pretreatment would include commercial harvesting, precommercial thinning, juniper reduction, post and pole removal, and aspen treatment. Approximately 5,166 acres (7% of the project area) outside of fuel blocks would also be pretreated for a total of approximately 20,448 acres of pretreatment.

The effects of this alternative would be almost identical to Alternatives Four and Seven except there would be no treatment of vegetation in the Silvies-Myrtle roadless area. In other words, there would be approximately 730 acres in the Warm Dry PAG that would not be treated with a precommercial thin, and there would not be approximately 5,526 acres of prescribed burning of fuels.

Effects to Stand Structure and Forest Health

The greatest difference from Alternatives Four and Seven-A would be in the effects on the area that is not being precommercially thinned. The intent of this proposed activity was to create better roosting habitat for bald eagles, which would not happen under Alternative Seven-A. The direct effects of not prescribed burning the area would be minimal in the short term (next five years), since the area has been prescribed burned within the last five years. The indirect effects would be that the benefits from reintroducing fire into this habitat might be less effective than intended, since we would not be doing the follow up treatment that was described in the original NEPA document.

Effects to Non-Forest Vegetation

About 11% (3,861 acres) of the fuel blocks proposed for burning are composed of moist upland and dry upland shrublands, dry upland herblands and riparian herblands. Effects to these acres would be as described in "Direct and Indirect Effects Common to All Action Alternatives" under "Effects on Vegetation Condition."

Effects to Natural Fuels

This alternative is similar to Alternative Four but without fuel block 6. It proposes to use prescribed fire as one of the tools to return overstocked stands to historically healthy conditions. To conduct these burns, approximately 29 miles of hand line or plow line would need to be constructed. There would be approximately two miles of blackline in the southern portion of block 7.

Fuel loading would be reduced in treated stands by approximately 50% to 75%. Reducing the fuel load would reduce flashy fuels and disrupt fuel continuity, thus reducing the spread rate, size, and intensity of wildfires, as well as reduce the risk of a large stand-replacement fire. If wildfires occur after treatment, they would be expected to burn in a low-intensity, mosaic fashion. Units that are not mechanically treated with this project may require additional entries with prescribed burning to prepare for maintenance burning.

Although the total acres being treated would be much lower than under Alternatives Four and Seven, the effects would be similar because approximately 4,000 acres in the roadless area were treated recently (1998 – 2002). Commercial harvest would be the same, but there would be 1% less precommercial thinning that in Alternatives Four and Seven; Alternative Seven-A would be slightly less effective in fuels reduction than Four and Seven.

Cumulative Effects of Alternative Seven-A

Effects to Natural Fuels

An additional cumulative effect, particular to this alternative, is that these fuel blocks completely surround Myrtle Canyon. If large fire(s) should occur within Myrtle Canyon, the ability to contain it would approximately be equal to Alternatives Two, Three, Four and Seven. Risk would be slightly higher because the eagle roost stand would not be precommercially thinned, which would allow fire to gain higher intensity as it moves through the canyon.

Effects on HRV

The following summarizes the effects of the alternatives on the development of old forest structure 25 and 50 years in the future.

Direct and Indirect Effects in 25 and 50 years

Table 4-11 summarizes the predicted effects of the alternatives on the development of old forest structure. The following assumptions were used in the development of these effects.

- In acres not being treated there will be no stand replacement disturbance(s) in the next 50 years. This may be a valid assumption for the action alternatives, but would be highly unlikely for the No Action alternative.
- Present old forest structure (OF) will remain in an old forest structure. This assumes that no snags would be created in existing OF stands that would move this structure to an earlier structure.
- Prescribed burning would occur on some acres on a regular basis throughout the next 50 years.
- Stand acres that are in the medium age structure stages (SEO, SEC, YFMS, and UR) have the ability to move into old forest structure (OFMS, OFSS).
- In approximately 25 years, stocking will have increased to the point that growth and vigor will begin to slow down. Without treatment between 25 and 50 years the rate that stands will move into old forest structure will be half the rate of the first 25 years.
- Stand acres that are not being treated in the medium age structure stages will move into old forest structure at the rate of approximately 5% in 25 years and 7.5% in 50 years.
- Stands in the medium age structure that are being treated with a fuels treatment only will move into old forest structure at the rate of approximately 10% in 25 years and 15% in 50 years.
- Stands in the medium age structure that are being treated with a pre-commercial thin followed by a fuels treatment will move into old forest structure at the rate of approximately 15% in 25 years and 22.5% in 50 years.
- Stands acres in the medium age structure that are being treated with a commercial harvest followed by a fuels treatment or a pre-commercial thin and fuels treatment will move into old forest structure at the rate of approximately 30% in 25 years and 45% in 50 years.

Cumulative Effects

It is reasonable to predict, based upon average growth rates, that a second treatment would be done 20-30 years following the treatments proposed in this project. If this should occur the rate at which stands would move into old growth structure should remain the same as during the first 25 years. Table 4-12 summarizes the predicted levels of OF following anticipated second treatments.

Table 4-12. Projected Acres of Late/Old Structure (OF) in 25 and 50 yrs Following Proposed Treatments.

Treatments	Alternatives						
	One-No Action	Two	Three	Four and Seven	Five	Six	Seven-A
Present Acres of OF	8,607	8,607	8,607	8,607	8,607	8,607	8,607
Acres of OF in 25 years Resulting from No Treatment	2,502	1,184	1,363	1,154	1,300	1,578	1,161
Acres of OF in 25 years Resulting from Fuels Treatment Only	0	1,747	1,984	1,659	1,156	2,039	1,390
Acres of OF in 25 years Resulting from Fuels Treatment with PCT	0	816	2,403	663	945	1,611	554
Acres of OF in 25 years Resulting from Commercial Harvest with Fuels Treatment and PCT	0	3,947	0	4,681	2,921	0	4681
Total OF in 25 Years[1]	11,109	16,301	14,357	16,764	14,929	13,835	16,393
Total OF in 50 Years (if no additional treatments)[2]	12,360	20,148	17,232	20,839	18,090	16,449	20,286
Total OF in 50 Years (with additional treatments)[3]	13,611	23,996	20,106	24,923	21,250	19,062	24,177

[1]Total acres of OF resulting from treatments, added to 8,607 acres of existing OF.
[2]This assumes that no additional treatments would be done in 25 years following completion of the treatments proposed by this project.
[3]Total acres of OF resulting from a second treatment that would be done 20-30 years following treatments proposed in this project.

Consistency with Direction and Regulations

NFMA

All alternatives are consistent with NFMA in terms of vegetation.

Forest Plan

All action alternatives would be consistent with applicable Forest Plan timber standards (standards 89-129, FP IV-40) and Forest Plan fire management and residue management standards (standards 178-184, FP IV-44).

Regional Forester's Forest PLan Amendment #2 (Eastside Screens)
All alternatives meet the direction to not decrease old forest structural stages. Treatments are planned in old forest structural stages; however, they are designed to enhance large tree health and percent composition. The action alternatives meet the objective to shorten the time to grow additional old forest structure stages; of the action alternatives, Alternatives Four and Seven best meet this objective.

All action alternatives meet the objective to manage vegetation on a sustainable basis (HRV); of the action alternatives, Alternatives Four and Seven best meet this objective.

National Fire Plan
All action alternatives are consistent with the National Fire Plan.

Effects on Air Quality

A strategy for long-term air quality improvement has been approved by the Oregon Department of Environmental Quality (Memorandum of Understanding [MOU] Between Oregon Department of Environmental Quality, Oregon Department of Forestry, USDI Bureau of Land Management, and USDA Forest Service, 1994). This strategy is based on the assumption that light intensity prescribed burning in the spring and late fall create lower total smoke emissions than high intensity stand-replacement wildfires of summer and early fall. The purpose of this long-term strategy is to reintroduce fire into the ecosystem on a landscape scale during spring and late fall. As more large areas are treated, air quality would increase during the summer months because fewer wildfires would occur. Maintaining these areas with maintenance burning would create lower smoke levels because the fuel loading would be reduced and burning would be less intense.

Along with implementing the MOU, there are seven items the Forest Service addresses in an environmental document when proposing alternatives that may affect air quality. These seven items are:

1: Describe alternative fuel treatments considered and reasons why they were not selected over prescribed fire.

No Treatment:

Not selected because it would not move the area to the desired future condition.

Mechanical Treatment:

Throughout most of the planning area, the fuel loading is high. To lower this fuel loading, there were several different fuel treatments proposed. One fuel treatment would not be enough to prepare the area to meet the desired future risk and protection. Most fuel treatments would connect to the final treatment, which is prescribed burning.

The fuel treatment proposed for timber sale units is to yard whole trees, with tops attached, to landing sites. This treatment would gather most of the newly created slash to the landing areas where it would be piled and later burned, or sold as a commercial product such as firewood. This treatment would dispose of 80% of the newly created logging slash.

Much of the planning area is overstocked. PCT would need to be completed prior to prescribed burning those areas. Created slash and litter would be piled and burned.

Hand piling would be done on slopes of 35% and higher, rocky areas where equipment cannot operate, sensitive areas, and within the roadless area. Grapple piling would be used on the rest of the areas. Lop and scatter and mastication were not considered because of the present high fuel loading.

Pile burning is done during late fall or early winter. When piles are ignited, heavy smoke begins to displace PMs into the atmosphere. After the pile is fully involved (six to ten hours for landing piles, one to two hours for grapple piles and ½ to one hour for hand piles) the smoke decreases because the pile is burning intensely and the PMs are being consumed. After the pile is consumed, the pile area will continue to smolder for two to three days.

Prescribed burning the fuel blocks would be less intense following the previous fuel treatments. The main effects would be putting high levels of PMs into the air during the ignition stages. After ignition, smoke will be heavy for one to two days then decrease while the fire smolders for one to two weeks.

Treating the fuels with these different fuel treatments would displace the PMs from smoke over several years instead of treating with prescribed fire in a one-entry treatment.

2. Quantity of fuels to be burned (acres, tons, type):

Alternative One proposes no prescribed fire use.

All action alternatives would be completed over an approximately 10-year period.

Alternative Two would burn approximately: 39,277 acres of natural fuels (consume twelve tons per acre) represented by fuel model 9; 409 acres of hand piles (consume three tons per acre) and 12,151 acres of grapple piles (consume 14 tons per acre) represented by fuel models 11 and 12 (activity generated slash).

Alternative Three would burn approximately: 39,277 acres of natural fuels (consume 12 tons per acre) represented by fuel model 9; 834 acres of hand piles (consume three tons per acre) and 12,109 acres of grapple piles (consume 14 tons per acre) represented by fuel models 11 and 12 (activity generated slash).

Alternative Four would burn approximately: 39,277 acres of natural fuels (consume 12 tons per acre) represented by fuel models 9; 840 acres of hand piles (consume three tons per acre) and 12,524 acres of grapple piles (consume 14 tons per acre) represented by fuel models 11 and 12 (activity generated slash).

Alternative Five would burn approximately: 25,311 acres of natural fuels (consume 12 tons per acre) represented by fuel models 9; 794 acres of hand piles (consume three tons per acre) and

10,701 acres of grapple piles (consume 14 tons per acre) represented by fuel models 11 and 12 (activity generated slash).

Alternative Six would burn approximately: 33,374 acres of natural fuels (consume 12 tons per acre) represented by fuel model 9; 697 acres of hand piles (consume three tons per acre) and 7,179 acres of grapple piles (consume 14 tons per acre) represented by fuel models 11 and 12 (activity generated slash).

Alternative Seven would burn approximately: 39,277 acres of natural fuels (consume 12 tons per acre) represented by fuel model 9; 840 acres of hand piles (consume three tons per acre) and 12,524 acres of grapple piles (consume 14 tons per acre) represented by fuel models 11 and 12 (activity generated slash).

Alternative Seven-A would burn approximately: 33,751 acres of natural fuels (consume 12 tons per acre) represented by fuel model 9; 658 acres of hand piles (consume three tons per acre) and 11,977 acres of grapple piles (consume 14 tons per acre) represented by fuel models 11 and 12 (activity generated slash).

3. Describe the type of burns (broadcast, pile understory etc.)

Done in Step 2 above.

4. Describe measures taken to reduce emissions (fuel moisture content, site preparation, removal of debris-YUM/PUM whole tree yarding etc).

- Whole tree yarding to landings on all commercial units.
- Skidding of slash created by post harvest activities where ground skidding equipment is allowed.
- Underburning to be done with 10-hour fuels at a moisture content of 12% or less.
- Spring burning with high moisture content in large woody material to prevent it from burning.

5. Quantify the amount of emissions to be released.

Alternative One: Emissions would come from wildland fire. Estimates from CONSUME model show higher emission release of both PM 10 and PM 2.5 than in spring or fall prescribed fire due to lower fuel moisture content.

Action Alternatives: See Table 4-13 for amount of emissions released by treatments in each Alteranitve. All action alternatives would be completed over an approximately ten-year period.

Table 4-13. Amount of emissions to be released by burning slash and natural fuels in each Action Alternative.

Alternative	PM 10 Emissions (tons)	PM 2.5 Emissions (tons)
Two	3,471	3,224
Three	3,484	3,241
Four	3,540	3,279
Five	1,974	850
Six	2,591	2,438
Seven	3,540	3,279
Seven-A	3,238	2,992

6. Describe the regulatory/permits requirements for burning; i.e., the applicable parts of the smoke management plan.

Alternative One: None

Alternatives Two through Seven-A: Action alternatives need to meet the Oregon State Smoke Management Plan as amended by the Operational Guidance for the Oregon Smoke Management Program, criteria for the National Forest and Bureau of Land Management in the Blue Mountains of Northeast Oregon (directive 1-4-1-601).

Prescribed fire emissions limits have been established for forested lands administered by USDA-FS and the BLM in NE Oregon. When the emissions limit is reached (15,000 tons of PM 10/year), no more burning is allowed for the year. In years with severe summer fire events fall burning may be curtailed because of this factor. The Malheur, Umatilla, and Wallowa-Whittman National Forests along with Burns and Vale BLM will have daily conference calls during prescribed fire season to discuss smoke impacts and ways to reduce those impacts.

FASTRACKS is a fuels analysis, smoke tracking, and report access computer system used by the Forest Service and BLM to predict and calculate emissions from prescribed fires and report to the Oregon Department of Forestry.

The Oregon Smoke Management Program requires a smoke management forecast be used to:

- Assess smoke impacts
- Determine if the unit is in prescription to burn or not
- Effects of the transport winds and mixing height
- Potential for inversions

7. Provide a quantitative description of air quality impacts of burning activities, focusing on new or increased impacts on down wind communities, visibility in Class I Wildernesses, etc.

Alternative One: No impact would occur from management-ignited fire. However, wildfires, as seen in recent years, have significant impacts on local communities. Studies have indicated that smoke (quantity of PM-10 emissions) from wildfires is greater than from prescribed fires.

Alternatives Two through Seven-A: There are three areas of concern for health standards. The Harney Basin, containing the towns of Riley, Hines, Burns, Buchanan, and Crane, is the area that is least likely to be affected due to normal prevailing wind patterns from the southwest. If wind patterns were from the northwest, which is uncommon, the duration of smoke would be limited to a day or two. Night inversion may also reach some of these areas in the early morning hours. The normal pattern of the inversion lifting is at the latest from 8 A.M. to 10 A.M.

The Drewsey area is likely to experience the same effects as the Harney Basin area.

Due to the proximity to the communities of Silvies and Seneca area, adequate smoke dispersal conditions would need to be in place prior to ignition. These conditions include adequate air mixing at the lower levels of the atmosphere and adequate transport winds. Normally, the duration of smoke would be limited to a few days up to a week at the most. Even with good daytime air mixing, inversions at night are common in the watershed. Prescribed burns are to be timed to minimize smoke production during periods of night inversions. Highway 395 is most likely to be affected by smoke and pilot cars may be needed when burning.

The nearest Class I Area for air quality that can be affected by burning in the watershed is the Strawberry Mountain Wilderness area. Air quality standards are to be met from July 1 through September 15 in Class I Areas. Predominately southwest winds tend to carry Forest smoke towards the Strawberry Mountain Wilderness Area. Heavily populated areas, including Boise, Idaho (200 miles to the east), are far enough away that dispersal occurs before smoke can arrive to those locations. Air quality effects are also generally dispersed by the time they reach other Class I areas including the Eagle Cap Wilderness in Oregon or the Selway-Bitteroot Wilderness in Idaho.

Burning seasons are spring and fall. There are usually more days meeting prescription for burning during the spring. Prescribed burning and associated smoke production would need to be coordinated with adjacent Ranger Districts along with adjacent national forests (Wallow-Whitman and Umatilla NF) in order to minimize smoke impacts to local communities. There may be a need to post signs along the highway to inform the public of the burning activity.

Consistency with Direction and Regulations

All action alternatives would be consistent with applicable Forest Plan air quality standards (standards 130-135, FP IV-40).

Effects on Sensitive Plants

This section summarizes the effects of the alternatives on existing and future characteristics of sensitive plants, as well as the effects of the different types of vegetation treatments proposed in each alternative. Refer to the project Biological Evaluation (Appendix C) for a detailed analysis of effects to sensitive plants

The three possible types of effects to TEPS (Threatened, Endangered, Proposed, or Sensitive) species that a Biological Evaluation or Biological Assessment can identify, and the corresponding "determinations of effect" to use, are given for TEP species in the 1986 Endangered Species Act regulations (50 CFR Part 402) and the March 1998 FWS/NMFS Endangered Species

Consultation Handbook; and for sensitive species in FSM 2670 and in the May 15 and June 11, 1992 Associate Chief/RF 2670 letters on this topic.

Crenulate Moonwort (*Botrychium crenulatum*) Wagner

Under the No Action Alternative and the action alternatives, there would be **NO IMPACT (NI)** to the *Botrychium crenulatum* (BOCR) population.

Deschutes Milkvetch (*Astragalus tegetarioides*) Jones

Under the No Action Alternative, there would be **NO IMPACT (NI)** to the *Astragalus tegetarioides* populations.

Under the action alternatives, activities **may impact individuals and their habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population of this species (MIIH)**. Potential impacts to *Astragalus tegetarioides* would be essentially avoided with implementation of recommended project design criteria.

Raven's Lomatium (*Lomatium ravenii*) Mathias and Constance

Under the No Action Alternative and the action alternatives, there would be **NO IMPACT (NI)** to the *Lomatium ravenii* population.

Consistency with Direction and Regulations

All action alternatives would be consistent with applicable Forest Plan Threatened, Endangered and Sensitive species standards (standards 62-68, FP IV-32).

Effects on Range Resources

Cumulative Effects Common to All Alternatives

Allotment management plan revision and associated NEPA analysis are tentatively scheduled for Silvies, Big Sagehen, Crooked Creek and Scotty allotments in 2005. Environmental Analyses were completed on Myrtle, West Myrtle and Scatfield allotments in 1996 and on Rainbow allotment in 1991.

Direct, Indirect and Cumulative Effects From Alternative One - No Action

Natural processes would continue to occur as well as activities from other decisions. In the long term, tree canopy cover and duff levels would increase causing a reduction in the vigor, extent, and density of understory vegetation. The forage base for grazing animals would be reduced. With less available upland forage vegetation, ungulate use in riparian zones would increase.

In the long term, conditions for a stand replacing fire would increase. A large stand replacement fire would severely disrupt grazing systems and indirectly cause economic impacts to permittees by reducing or eliminating feed, destroying or damaging range improvements and causing direct mortality of livestock. New recommendations for burned areas suggest that there be no livestock grazing on a burned area for at least two years following wildfire. A disruption in the availability of grazing resources could be devastating to the affected permittee as well as to the grazing program.

Cumulative effects of the No Action alternative would include continued reduction of the forage base due to tree and nonnative plant encroachment, competition between grazing species, and overuse of forage as the decline in forage availability focuses livestock use into smaller areas. Risk of wildfire would increase until stand-replacing fire(s) occurred. These factors could combine to reduce the grazing program in the Project Area to the point where it is no longer economically feasible for local family ranches to utilize this resource.

Direct and Indirect Effects Common to All Action Alternatives

The following is a general discussion of the effects of proposed activities. Alternative-specific effects are summarized in Table 4-14.

There would be no change to existing permitted livestock use from any Action alternative.

The prescriptions for the vegetation activities including prescribed burning would keep ground disturbance to a minimum, produce no more than 12 tons/ac of activity slash and reduce the duff layer, which would increase forage production.

Harvest, thinning and fuels treatment activities would open the canopy, encouraging the increase of ground vegetation for up to 25 years. Juniper removal would slow the encroachment of this species onto rangeland, which would also improve the availability of forage species. Manual treatment of noxious weeds would reduce their rate of spread. Increases in availability and palatability of forage species would improve the range's ability to support current levels of livestock and big game use. Road closures would reduce sedimentation and directed runoff into creeks and improve riparian condition. This would have a positive affect on range forage resources.

Prescribed burn blocks and timing of burns were designed with pasture and allotment boundaries in mind to prevent non-use of an entire allotment and the subsequent effects to the permittees.

In the short term (one to five years), vegetation treatment activities could disrupt livestock grazing, reduce ground vegetation and create slash, which may prevent livestock's access to areas of forage. These affects may cause grazing animals to focus in undisturbed areas, leading to localized overuse of resources. There is the potential for harvest and fuels treatment activities to damage range improvements. Road closures could reduce access to rangelands, making maintenance/reconstruction of range improvements and administration of permits more time consuming and costly. Activity-related soil disturbance increases the risk of introduction/establishment of noxious weeds and annual grasses.

Aspen restoration activities include fencing to protect regeneration from browsing. Fencing aspen stands removes forage from the forage base. Fences can also change/disrupt livestock and other ungulate movement, depending on where the fences are in relation to other features on the landscape. Fenced aspen stands can potentially remove livestock watering areas causing distribution problems. Identifying available alternate watering sources would mitigate this impact. Caging aspen sprouts would have less impact on range resources than fencing aspen stands, but would not be as effective for long-term protection of aspen.

Table 4-14. Summary of Affected Range Resources.

	Alt. Two	Alt. Three	Alt. Four	Alt. Five	Alt. Six	Alt. Seven	Alt. Seven-A
Fence Affected by Veg. Treatment	31 miles	29 miles	36 miles	36 miles	19 miles	36 miles	36 miles
Fence Affected by Fuels Treatment	46 miles	46 miles	46 miles	30 miles	35 miles	46 miles	38 miles
Range Improvement Access Affected by Road Closures	17 sites	8 sites	8 sites	0 sites	7 sites	7 sites	7 sites
Spring Improvement Access Affected by Road Closures	0 sites	0 sites	7 sites	0 sites	4 sites	4 sites	4 sites
Riparian Monitoring Site Access Affected by Road Closures	3 sites	4 sites	4 sites	2 sites	4 sites	4 sites	4 sites
Juniper Reduction	537 ac	515 ac	715 ac	535 ac	Incidental by fire	715 ac	715 ac

Cumulative Effects from All Action Alternatives

Foreseeable future actions include more decreases in open roads, which could reduce access to rangelands. Maintenance/reconstruction of range improvements and administration of permits would be more difficult and costly. Road closures would reduce sedimentation and directed runoff into creeks and improve riparian condition. This would have a positive affect on range forage resources.

Potential effects from the proposed alternatives would be cumulative with effects from treating noxious weeds and expected future maintenance treatments such as prescribed burns. Beneficial effects on forage production would be expected. There would be beneficial indirect effects as well, since noxious weed spread would be prevented or minimized. In the long term, vegetation treatment activities could increase forage production and improve availability.

Consistency with Direction and Regulations

All action alternatives would be consistent with applicable Forest Plan range standards (standards 78-88, FP IV-34).

Effects on Noxious Weeds

Noxious weeds may alter ecosystems by negatively affecting native plants and animals and the communities they compose. They invade ecosystems, causing changes in structure and function. Noxious weeds can spread quickly, modifying the resident community and often usurping many of the resources. Changes in the native plant community can result in the loss of recreational opportunities, forage production for livestock and wildlife, and soil stability on slopes, roadsides, springs, and streams. Weeds often do not stabilize soils as well as native grasses, which can lead to erosion in riparian areas and loss of stream channels (USDA Malheur NF, Summit fire Recovery

Project FEIS). Public use restrictions on activities such as hunting, fishing, camping, firewood gathering, horseback riding, hiking, and off road vehicle travel could become necessary if weeds become more prevalent in the area.

State law requires landowners to keep weeds from infesting other lands from their land. More weed sites would increase the cost of following state law.

Noxious Weed Response to Ground Disturbance

Weed seeds carried on equipment to a landing site where the ground is churned up during skidding activities will grow and expand. Experience on the Emigrant Creek Ranger District shows that bull thistle and Canada thistle can be the major vegetation component on landings after use. In eastern Washington, it has been found that bull thistle invaded post-harvest, spring and fall burn treatments and cover was twice that of native species (Invasive Species Workshop Proceedings 2001). In some areas, houndstongue will also take over these areas. Noxious weeds will infiltrate areas along roads. Gelbard and Belnap (2003) found that the more improved a road was the more apt it was to have invasive plants alongside.

Noxious Weed Response to Fire

The effects of fire differ by weed species and fire intensity and may include the following:

- Burning may not increase the rate of spread, but makes the seedbed more habitable.
- Burning may increase competitiveness of the weeds by improving rhizomatous growth and seed germination.
- Seed banks in soil may survive fire and re-establish populations following a fire.
- Aboveground vegetation may burn. Extensive underground root structures are likely to survive and retain a large reservoir of carbohydrates to quickly fuel new plant growth.
- Removal of top growth may stimulate vegetative shoot production.
- Removal of overstory vegetation by fire may increase success of some existing weed populations.
- Removal of vegetation competing for water and nutrients will have a similar effect.
- Plants lacking a deep root system will generally be killed by high intensity fire.
- Several species can often re-sprout, flower and set seed six weeks after a fire, while most other vegetation is waiting for another season to produce seed (Invasive Species Workshop Proceedings 2001).

Direct and Indirect Effects of Alternative One – No Action

Under the No Action alternative, there would be no treatment to the 12 noxious weed sites identified in this EIS. New weed sites would continue to occur. Weeds would continue to spread. Spread of weed seed from the existing sites would be by wind, water, and normal activities of people in the forest. There may be some transport of the known types of weeds by wildlife and livestock (Galley and Wilson 2001). Current noxious weed treatment activities would continue, including inventory, monitoring, and manual control by pulling/digging and cutting down noxious weed plants. Closure of roads from other environmental documents would limit spread of weeds from vehicles, but could make access to existing sites difficult for treatment. The treatment of five known Canada thistle sites would be affected by road closures from previous decisions. Non-activity can also allow the spread of weeds; no treatment of existing sites would lead to expansion of the sites and occurrence of new sites.

Cumulative Effects of Alternative One

Past treatments of noxious weeds in the project area have included chemical and manual methods, and have reduced the number and size of weed sites. Sites that were chemically treated for two consecutive years have been eradicated.

The 65 noxious weed sites in the project area that were identified in the Forest Noxious Weed EA will be manually treated as planned. Because manual treatments are not completely effective in eradicating weeds, it is likely that the sites would persist and spread. Satellite sites (new weed sites that are close but not attached to existing sites) would likely develop around many treated sites as well as around the 12 untreated sites.

Region Six of the Forest Service is working on a Region-wide Noxious Weed Environmental Document. After the Regional document is completed, there will be forest-specific documents completed with options for using and Integrated Weed Management strategy to treat noxious weeds. This includes mechanical, biological and chemical treatments. Using integrated weed management, whereby the most effective eradication methods can be applied as appropriate to each situation, would result in more efficient and effective noxious weed management in the foreseeable future.

Direct and Indirect Effects of the Action Alternatives

The same treatment is proposed in all action alternatives. Noxious weeds would be manually treated (hand-pulled) on twelve sites within the project area.

Direct and Indirect Effects Common to All Action Alternatives

Manual treatment of weed sites would be moderately effective in removing weeds, but would not be completely effective. Treatments would control the size of existing weed sites, but the sites would persist.

Vehicles associated with proposed activities in the project area could transport weed seeds from other locations. Activities could create seedbeds for weed seeds and propagules. Any increase in the number of noxious weed sites, density of existing sites or introduction of new noxious weed species to the project area would have a negative effect upon rangeland vegetation, soil stability, biological diversity, and watershed condition. If additional noxious weeds sites were created, weeds could spread across acres of pastureland as they have in other parts of the country. Most weeds are not highly palatable to wild or domestic animals and can reduce the carrying capacity of the range.

With project design criteria/prevention measures in place (see Mitigation Measures, Chapter 2), the spread of weeds from the action alternatives would be kept to a minimum.

Alternative Two – Proposed Action

Fourteen known weed sites are within proposed activity units, and more sites are on roads adjacent to units. This alternative would create disturbed ground from harvest and fuels reduction activities, which could create a seedbed and possibly spread roots. Closing and ripping of roads would add acres of potential seedbed. Access for treatment of four existing Canada thistle weed sites would be limited by road closures. Increased vehicle activity on haul routes could increase the opportunity for weed seeds to spread along the roads.

Alternative Three
Eight known weeds sites are in proposed activity units. Thinning and burning activities would create disturbed ground, which could create a seedbed and possibly spread roots. Access for treatment of four existing Canada thistle weed sites would be limited by road closures. Increased vehicle activity on haul routes could increase the opportunity for weed seeds to spread along the roads.

Alternative Four
Twenty-four known weeds sites are in proposed activity units. Restoration, harvest and burning activities would create disturbed ground, which could create a seedbed and possibly spread roots. Access for treatment of four existing Canada thistle weed sites would be limited by road closures. Increased vehicle activity on haul routes could increase the opportunity for weed seeds to spread along the roads.

Alternative Five
Seventeen known weeds sites are in proposed activity units. Activities associated with fuels reduction, tree harvest, and roadwork would create disturbed ground, which could create a seedbed and possibly spread roots. No road closures would affect treatment of existing weed sites under this alternative. Increased vehicle activity on haul routes could increase the opportunity for weed seeds to spread along the roads.

Alternative Six
Fuels reduction activities and roadwork would create disturbed ground, which could create a seedbed and possibly spread roots. Access for treatment of three existing Canada thistle weed sites would be limited by road closures. Increased vehicle activity on haul routes could increase the opportunity for weed seeds to spread along the roads.

Alternatives Seven (Preferred Alternative) and Seven-A
Twenty-three known weeds sites are in proposed activity units. Fuels reduction and harvest activities and roadwork would create disturbed ground, which could create a seedbed and possibly spread roots. Access for treatment of four existing Canada thistle weed sites would be limited by road closures. Increased vehicle activity on haul routes could increase the opportunity for weed seeds to spread along the roads.

Cumulative Effects of the Action Alternatives
Cumulative effects of the action alternatives would be identical to those of the No Action Alternative, except that the 12 weed sites identified in this EIS would have been treated. Continued monitoring and treatment of noxious weed sites would limit the size and number of sites in the project area.

Consistency with Direction and Regulations
All action alternatives would be consistent with applicable Forest Plan noxious weed standard 188, FP IV-45.

Effects on Socio-Economics

Introduction

A social and economic analysis entitled *Silvies Canyon Watershed Restoration Project Final Environmental Impact Statement –Social and Economic Conditions and Effects* has been completed for this project (Kohrman 2003). This document is incorporated by reference under 40 CFR § 1502.21. The following is a brief discussion of the effects of the proposed alternatives on social and economic concerns. Tables 4-15, 4-16 and 4-17, at the end of this section, summarize effects.

Effects on Tribal Use

None of the alternatives would prevent continuation of traditional tribal practices. The anticipated direct and indirect social effects to the Burns Paiute Tribe are primarily due to change of motorized access from road closures and decommissioning proposed in the action alternatives. This change from road to non-road access would have its greatest effect on the young, elderly, and disabled tribal members. Those with other forms of non-motorized transportation, such as horses or mountain bicycles, would be less affected than those without these opportunities. The action alternatives change access on approximately 37 miles of road (Alternative Five), 87 miles of road (Alternatives Six, Seven and Seven-A), 143 miles of road (Alternative Two), and 160 miles of road (Alternatives Three and Four). Because there are still areas in and next to the project area where road access is not changed and because tribal members and others can request a permit to use a closed road, the social effects are not anticipated to be disproportionately high or adverse to these populations.

Effects on Recreation Use

Effects on recreation access and use are described in the section titled "Effects on Recreation" on page 174 of this FEIS.

No social effects to roadless and wilderness values are anticipated (USDA 2000)[1]. The proposed fuels treatment activities in the Myrtle-Silvies Roadless Area are within the permitted activities of the January 12, 2001 Roadless Area Conservation Final Rule. There effects over time are anticipated to improve the vegetation and thus maintain these social values. None of these activities will prevent the area from being considered for wilderness nomination during the upcoming Malheur National Forest Plan revision.

Effects on Small Ranchers

There would be little impact from prescribed fire due to ability to coordinate grazing systems and burning. The biggest potential impact would occur from a short-term loss of forest forage and infrastructure through wildfire and threat to adjacent or intermingled private property.

Since the Myrtle-Silvies Roadless Area directly abuts private lands, alternatives having hazardous fuels reductions within the roadless area would have fewer potential negative impacts than those that do not. The No Action alternative and Alternative Seven-A would have the greatest potential

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[1] Detailed information on social values and effects of roadless areas can be found in the USDA Forest Service, Roadless Area Conservation Final Environmental Impact Statement, November 2000.

to adversely impact the wildfire risk to those lands because they propose no activities in the Myrtle-Silvies Roadless Area. The Proposed Action would be next because it does not propose precommercial thinning in the potential bald eagle roost areas. The other alternatives would be equal in providing reduced risk (roughly 47% reduction) to those private lands abutting the roadless area.

Availability of post and poles for corrals and fencing is important to small ranchers due to the high purchase cost and continual need for a source of posts and poles. The ability to obtain post and poles from NFS lands reduces operating costs. Since the most posts and poles (452 acres) would be available in Alternatives Two (Proposed Action), Four, Five, Seven-A and the Preferred Alternative, these alternatives would be best at satisfying this need. The No Action Alternative, Alternatives Three and Six would not provide additional post and pole opportunities.

Alternative Four and the Preferred would be most effective to meet the needs of small ranchers and the No Action would be the least. Alternative Two would be next, followed by Alternatives Five, Seven-A, Three, and Six. Alternatives Seven-A and the No Action would not treat hazardous fuels within the roadless area that is adjacent to private ranches.

Effects on Forest Products and Subsistence Use

Economic effects on wood products are discussed later in this section, in subsection "Effects on the Viability of Timber Harvest" on page 79.

Effects on nontimber forest product uses from changes in roaded access would be as discussed in the subsection "Effects on Tribal Use" on page 76. Users of forest products can request a permit to use a closed road if necessary.

Effects on the availability of posts and poles would be as discussed in the subsection "Effects on Small Ranchers" on page 76.

Alternatives Four, Seven, and Seven-A would provide the most acres of available firewood (5,389 acres); the No Action alternative and Alternatives Three and Six would provide no additional firewood.

Effects on Residential and Water Use

Effects to water quality are discussed in detail the section "Effects on Watershed/Fish Habitat (Issue 3)"on page 4-13 of this FEIS.

The No Action alternative would result in no improvements to the health of the watershed. All action alternatives could potentially improve watershed conditions; The Preferred Alternative would restore the most acres in the watershed, followed by Alternatives Four, Seven-A, Two, Three, Six and Five.

Environmental Justice

Executive Order 12898 on environmental justice requires federal agencies to identify and address any disproportionately high and adverse human health or environmental effects on minority and low-income populations. In this assessment, elderly people, especially those on low-incomes that are fixed, were also identified with potential to be impacted by various alternatives. There is no quantifiable information on how much use the area receives from these populations other than the information shared by the Burns Paiute Tribe. None of the alternatives would prevent continuation of these traditional practices. The anticipated direct and indirect social effects to these populations are primarily due to change of motorized access from road closures and decommissionings proposed in the action alternatives. This change from road to non-road access would have its greatest effect on the young, elderly, and disabled. Those with other forms of non-motorized transportation – horses, off-highway vehicles, mountain bicycles, et cetera – would be less affected than those without these opportunities. The action alternatives change access on approximately 37 miles of road (Alternative 5), 87 miles of road (Alternatives 6, 7 & 7a), 143 miles of road (Alternative 2), and 160 miles of road (Alternatives 3 & 4). Because there are still areas in and next to the project area where road access is not changed and because tribal members and others can request a permit to use a closed road, the social effects are not anticipated to be disproportionately high or adverse to these populations.

Effects on Income and Employment for Local Economies

Based on the effects of the various alternatives, the No Action alternative would have the least positive impact on local economies. This alternative would not support federal contract work or timber harvesting-related employment. It would continue to support less than 1 federal work force job, 10 livestock grazing-related jobs, and fewer than 5 recreation-related jobs. Cumulatively, the No Action Alternative does little to maintain or improve the current economic conditions in Grant and Harney counties. Unemployment rates would remain high under the No Action alternative. Continued declines in Forest Service work force and budgets as well as lack of related employment would have significant effects on the economy.

All action alternatives would support ten livestock-grazing related jobs, and fewer than five recreation-related jobs.

The Preferred Alternative Seven and Alternative Four would contribute the most positive impact on local economies, supporting nearly 55 contract related jobs, 40 federal work force related-jobs, and 355 timber harvesting-related jobs.

Alternative Seven-A would support the next highest level with 55 contract-related jobs, 30 federal work force-related jobs, and 355 timber harvesting-related jobs.

Alternative Two would support around 45 contract related jobs, 35 federal work force-related jobs, and 300 timber harvesting-related jobs.

Alternative Five would support about 45 contract related jobs, 30 federal work force-related jobs, and 235 timber harvesting-related jobs.

Alternative Three would support 20 contract related jobs, 15 federal work force-related jobs, and no timber harvesting-related jobs.

Alternative Six would support 15 contract related jobs, 15 federal work force-related jobs, and no timber harvesting-related jobs.

The alternatives with the highest jobs would support the highest potential incomes. Overall, the alternatives supporting the most employment and income would occur under the Preferred Alternative (Seven), Four, Seven-A, Two, Five, Three, Six, and No Action (One), respectively.

Effects on the Viability of Timber Harvest

The area proposed for commercial thinning within the project area was analyzed to determine the economic viability of harvesting timber by determining the tentative advertised bid rates per hundred cubic feet ($/ccf). This estimate was based on estimates of volume, species, amount of sawtimber and non-saw material, logging systems costs, haul costs, road maintenance costs, contractual costs, erosion control and other developmental costs, temporary road costs, and specified road construction costs, and the value of timber proposed for removal. The preliminary value of the timber was based on the prices for the same species and material of all sales actually sold within Appraisal Zone 3 (primarily Blue Mountain forests) within the last 12 months.

The tentative advertised bid rates estimated for the project reflect the most current volume, price, and cost estimates for this analysis. An initial bid rate was determined by subtracting the costs associated with logging from the base period prices adjusted for the quality of the material and current market conditions. This rate was further reduced per current appraisal methods (Transaction Evidence Appraisal) to allow for competition between bidders to determine the tentative advertised bid rate. The computer software program TEA_ECON was used for this analysis.

Direct, Indirect and Cumulative Effects from the Action Alternatives

All alternatives that harvest timber were analyzed in four areas (Burnt, Curry, Dry, and Mud) that account for primary transportation routes to the areas. Burnt and Curry areas would produce positive tentative advertised bid rates and the Dry and Mud areas would produce negative tentative advertised bid rates. Positive bid rates indicate the costs associated with the harvest activities would be covered by the revenue produced while negative rates indicate the revenue would not be sufficient to cover the costs. At this time, negative tentative advertised bid rates occur on Dry and Mud because data on harvest levels by tree species mix and size of trees is not available. This information is determined during layout, marking and cruising of proposed timber sales.

Based on this analysis, Alternative Five produces the highest risk of receiving no bids on sales from the Dry and Mud portions of the project due to the greatest negative tentative advertised rates ($-18.84/ccf and $-12.47/ccf), followed by Alternatives Two ($-14.26/ccf and $-8.13/ccf), Four, Seven and Seven-A ($-12.08/ccf and $-6.07/ccf). These portions of the project would remove the least timber resulting in negative bid rates.

Alternatives Four, Seven and Seven-A have the highest likelihood of receiving the highest bids on sales from the Burnt and Curry portions of the project due to the highest positive tentative advertised rates ($21.04/ccf and $6.73/ccf). Alternatives Two and Five would produce the same tentative advertised bid rates as Alternatives Four, Seven and Seven-A for the Burnt area and would result in a slightly lower rate ($4.56/ccf and $1.87/ccf, respectively) for the Curry area. These portions of the project would remove the most timber resulting in positive bid rates.

All sale proposals would not be sold unless they received the minimum base rates. The base rates are the same for all alternatives ranging from a high of $17.43/ccf for the Burnt and Curry areas to $12.51/ccf for the Dry, and Mud areas. Tentative advertised bid rates exceed the minimum bid rates only in the Burnt area (Alternatives Two, Four, Five, Seven and Seven-A). The Curry, Dry, and Mud areas would not result in viable harvest proposals that would cover the minimum required costs in any of the alternatives. Alternatives One, Three and Six would not harvest any timber and therefore would not produce any revenue or benefits to wood products industries.

Estimates for tentative advertised bid rates are within the range of rates experienced by the three Blue Mountain forests (Malheur, Umatilla, and Wallowa-Whitman) within the last few years and have fluctuated reflecting the volatility of the market for timber. Changes to tentative advertised bid rates would likely occur in the future at the time of the appraisal depending on actual market conditions.

The viability of the timber harvesting portions of the project would influence the ability of any one county or community in the analysis area to experience the largest extent of the harvest-related employment and income effects. The financial viability of the timber sale proposals demonstrated by the tentative advertised bid rates would influence whether potential purchasers closest to the project area could be competitive with other purchasers to acquire the majority of the supply of wood. New road construction and reconstruction proposed under the alternatives would increase access and increase the quality of access to sale units and increase financial viability of harvesting units with ground-based logging systems. Employment projections would depend on other factors such as market conditions, quality and quantity of the volume offered for sale, timing of the offerings, and financial conditions of local firms.

Economic Efficiency

Forest Service Handbook 2409.18 provides direction to analyze financial efficiency and, if needed, economic efficiency to identify the alternative that most efficiently achieves the desired objectives of the project. Consideration of the proposal that maximizes net public benefits is important to the decision-making process.

An economic efficiency analysis was completed that focused on identifiable and quantifiable ecosystem benefits and costs for each alternative in terms of the present net value (benefits minus costs) to assess which alternative comes nearest to maximizing net public benefits (36 CFR 219.3).

Ecosystem functions provide a broad set of services such as clean water or native forest stands that are valuable to both human and non-human components of the ecosystem. Changes in ecosystem services must be measurable and quantifiable in like terms, preferably monetary measures, in order to assess a relevant change in economic value (Bergstrom and Loomis 1999).

This analysis is based on identifiable and quantifiable economic benefits and costs and is more typically a financial comparison between revenues and costs. The objective of the economic efficiency analysis is to show a relative measure of difference between alternatives based on direct costs and values used. All dollar values have been discounted in terms of the present net value (2003 dollars).

Present net value is defined as the present (discounted) net value of project benefits minus the present (discounted) net value of project costs. A benefit-cost ratio is the ratio of present net benefits to present net costs. Present net value is a more appropriate measure for comparison between alternatives when land and productive activities are limiting such as in an environmental analysis of alternatives. A benefit-cost ratio comparison is more appropriate when investment capital is limited, for example when considering budget allocation among a number of different activities.

Measurable and quantifiable economic market benefits identified for the project include discounted revenue from timber volume proposed for harvest. Revenue is derived from the tentative advertised bid rate for the timber multiplied by the total cubic-feet proposed for harvest and discounted to the present. Refer to the section above on Viability of Timber Harvest. Other non-market benefits that may occur as a result of the proposed activities include changes in recreational fishing through reductions in sediment and improvements to fisheries habitat, improvements in the quality of the recreation experience, and increases in forage to wildlife species.

In addition to use values, existence values otherwise referred to as passive, non-use or preservation values may capture important economic value to the public (Swanson and Loomis 1996). Although these benefits are important components of the ecosystem services provided to humans, the production relationship between ecosystem functions and ecosystem services (such as changes in recreation visitor days, fishing days, animal unit months, or fish population) is not well defined or measurable at the project level in terms that provide meaningful comparisons of commensurate dollar values.

Measurable and quantifiable costs at the project level include direct costs to the Forest Service for preparing and administering the commercial timber sale and implementing other restoration activities including fuels reduction treatments and precommercial thinning. Refer to Chapter 2 – Alternative Comparison, for a complete list of activities.

Direct, Indirect and Cumulative Effects from the Action Alternatives

All action alternatives illustrate a negative present net value based on discounted revenue received from the project compared to the discounted total dollar-quantified costs for the project. The No Action alternative and Alternatives Three and Six would not harvest timber and would not produce quantified benefits due to the data limitations described for quantifying economic benefits and costs beyond those identified at the project level. The No Action alternative would have no costs associated with harvesting although ongoing costs associated with management of the area would continue. Planning costs associated with the project are treated as "sunk costs" which have already been incurred regardless of the alternative and are not included in the present net value.

Because present net values are negative, the comparison of alternatives is an illustration of the figures considering that the lowest figure for present net value demonstrates the greatest contribution to present net value. Alternative Six would produce the greatest present net value ($-2.4 million), followed by Alternatives Three ($-2.9 million), Five ($-3.3 million), Two ($-4.1 million), Seven-A ($-4.4 million), Four and Seven ($-4.5 million). Figure 4-4 illustrates the present net value by alternative.

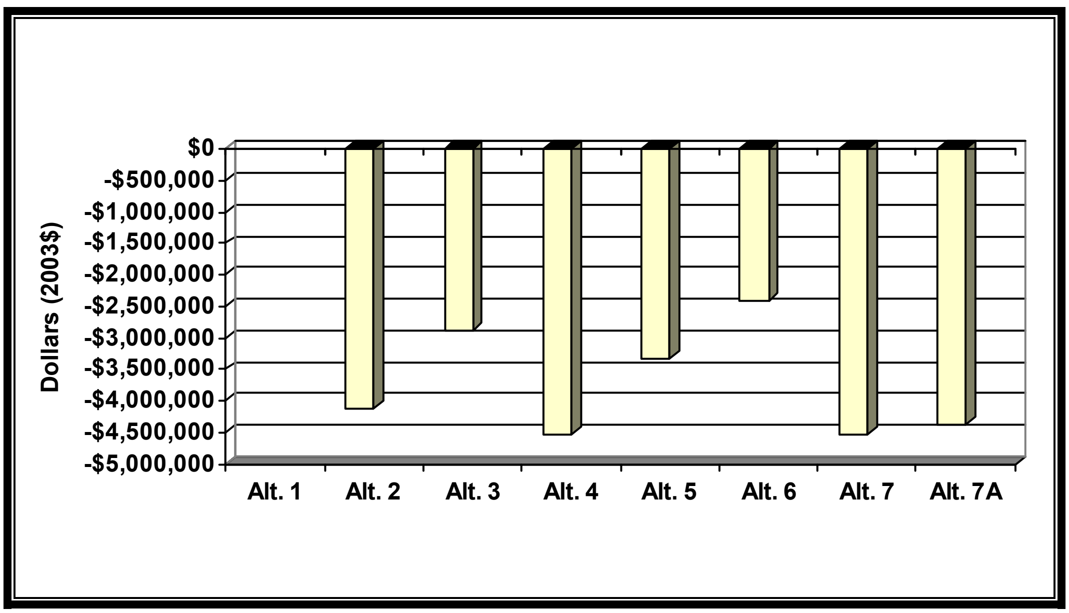

Figure 4-4. Present Net Value.

The costs associated with the fuels reduction and thinning projects account for all or the majority of the discounted costs in all alternatives. Alternatives Six and Three would have the greatest present net values of the action alternatives due primarily to the lowest costs associated with the fuels reduction and thinning activities and no costs associated with timber harvesting activities. Alternatives Two, Five and Seven-A would have slightly higher costs associated with fuel reduction, thinning and timber harvesting activities. Alternatives Four and Seven propose the most fuel reduction and thinning actions and the highest amount of timber harvest resulting in the highest costs and the least present net value of all alternatives.

Potential benefits that were not quantified in economic terms due to the limitations of measuring the production relationship between ecosystem functions and ecosystem services at the project level, including improvements to soil productivity, reduced erosion, water temperature improvements, terrestrial and aquatic habitat improvement. Potential improvements in fish habitat would subsequently increase smolt survival rates, overall fish population levels and increase commercial and recreational fishing opportunities. Two measures of potential economic effects would be changes in the value of commercial and sport fishing harvests.

Sport values quantified for fish range from an average net value per fish (the economic trade-offs an angler would make for access to a given fishing experience) of $58 for salmon and $164 (2003$) for steelhead in the Columbia River Basin depending on the location and size of the catch (Olsen et al 1991). Depending on the level of change from the restoration activities in the project area, the net economic value of fish, for example, would or would not be affected. Changes in sport fishing would also have an effect on recreation expenditures and potential economic impacts. Refer to the Effects on Watershed/Fish Habitat section of this EIS for further discussion of effects to fish habitat.

Other potential qualitative economic benefits or costs from the alternatives include changes to the diversity, quality, and quantity of wildlife habitat for both game and non-game terrestrial species. With respect to big-game populations, the economic value of hunting would depend on how changes in population levels and spatial distribution of game animals affect either the quality or intensity of the hunting experience. Consequently, the overall level of hunting would change with corresponding economic impacts from hunting-related expenditures. Changes in non-game population levels and diversity would affect wildlife viewing, photography, and other non-consumptive uses of the area. Refer to the Recreation and Wildlife sections of this EIS for further discussion of effects to these resources.

Other opportunities or externalized costs that would potentially occur include damage to soils from harvest operations resulting in long-term losses in soil productivity and potential timber harvest, losses in wildlife habitat as a result of reduced large snags or increases in wildfire risk, or increases in sedimentation to downstream fish habitat and public drinking water from erosion in the fire area. These costs are not well defined or measurable at the project level in terms that provide comparison of commensurate dollar values. Refer to the other environmental consequences sections in this EIS for a discussion of effects to ecological and human use for a relative comparison between alternatives. Refer to Tables 4-16, 4-17, and 4-18 for a summary of the effects to Grant, Harney, and other counties.

Table 4-15. Summary of the Effects to Grant County.

Affected Item	Alt. One – No Action	Alt. Two- The Proposed Action	Alt. Three	Alt. Four	Alt. Five	Alt. Six	Alt. Seven – The Preferred Alternative	Alt. Seven-A
Estimated Total Potential Income[1]								
Federal Contracts	$0	$736,080	$483,250	$827,620	$692,410	$328,290	$822,610	$799,700
Federal Salary, Support	$1,440	$1,266,840	$1,051,430	$1,392,900	$1,010,370	$757,700	$1,420,100	$1,399,360
Forage	$102,940	$102,940	$102,940	$102,940	$102,940	$102,940	$102,940	$102,940
Wood Products - Sawtimber	$0	$4,753,330	$0	$5,517,493	$3,663,705	$0	$5,517,493	$5,517,493
Recreation	$11,500	$10,020	$6,280	$6,280	$11,500	$11,160	$11,160	$11,160
Estimated Total Potential Jobs[2]								
Federal contracts	0	5	<5	10	5	<5	10	10
Federal Salary, support	0	10	5	10	10	<5	10	10
Forage	5	5	5	5	5	5	5	5
Wood Products - Sawtimber	0	165	0	195	130	0	195	195
Recreation	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Table 4-16. Summary of the Effects to Harney County.

Affected Item	Alt. One – No Action	Alt. Two- The Proposed Action	Alt. Three	Alt. Four	Alt. Five	Alt. Six	Alt. Seven – The Preferred Alternative	Alt. Seven-A
Estimated Total Potential Income[1]								
Federal Contracts	$0	$2,358,400	$1,548,325	$2,651,710	$2,218,470	$1,051,830	$2,635,640	$2,628,640
Federal Salary, Support	$3,925	$4,076,140	$3,606,390	$4,466,050	$3,168,970	$2,646,520	$4,647,780	$4,479,310
Forage	$119,640	$119,640	$119,640	$119,640	$119,640	$119,640	$119,640	$119,640
Wood Products - sawtimber	$0	$2,592,725	$0	$3,009,542	$1,998,385	$0	$3,009,542	$3,009,542
Recreation	$41,580	$36,210	$22,680	$22,680	$41,580	$40,320	$40,320	$40,320
Estimated Total Potential Jobs[2]								
Federal contracts	0	20	10	25	20	5	25	25
Federal Salary, support	0	25	10	30	20	10	30	20
Forage	5	5	5	5	5	5	5	5
Wood Products - sawtimber	0	90	0	105	70	0	105	105
Recreation	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5

Table 4-17. Summary of the Effects to Other Counties.

Affected Item	Alternative One – No Action	Alternative Two- The Proposed Action	Alternative Three	Alternative Four	Alternative Five	Alternative Six	Alternative Seven – The Preferred Alternative	Alternative Seven-A
Estimated Total Potential Income[1]								
Federal Contracts	$0	$2,395,200	$1,572,500	$2,693,090	$2,253,090	$1,068,250	$2,676,770	$2,634,370
Federal Salary, Support	$0	$0	$0	$0	$0	$0	$0	$0
Forage	$0	$0	$0	$0	$0	$0	$0	$0
Wood Products - sawtimber	$0	$1,296,363	$0	$1,504,771	$999,192	$0	$1,504,771	$1,504,771
Recreation	$0	$0	$0	$0	$0	$0	$0	$0
Estimated Total Potential Jobs[2]								
Federal contracts	0	20	5	20	20	5	20	20
Federal Salary, support	0	0	0	0	0	0	0	0
Forage	0	0	0	0	0	0	0	0
Wood Products - sawtimber	0	45	0	55	35	0	55	55
Recreation	0	0	0	0	0	0	0	0

[1]Potential income (rounded to the nearest 10) and employment (rounded to the nearest 5) is based on proposed management actions. Discounting at 4%/year has been applied to result in 2002 dollars. This analysis tracks base and secondary activity for a number of actions, as well as estimates of potential returns to various counties.

[2]Federal Contracts: The value of potential contracts was derived from proposed restoration work (acres and structures) and average costs per unit. The results were discounted at 4% to the present from the year the activity would occur and disaggregated by county based on past contracts from the Malheur National Forest. While there is no guarantee that these proportions would be the same in the future, the analysis provides a relative comparison of potential effects by county. Direct jobs were determined by dividing the value of contracts by average county income. Indirect and induced jobs were determined by multiplying the values by adjustment factors supplied by Oregon Department of Employment economists for each county.

Consistency with Direction and Regulations

This socio-economic analysis is consistent with NEPA and the Forest Plan. The Forest Plan contains direction under social-related headings such as recreation, visual quality, etc. The discussions of how the alternatives analyzed in this EIS meet that direction is included in those sections of this document. The Forest Plan also contains several goal statements under social-related headings such as timber and human and community resources. This socio-economic analysis is consistent with these goal statements.

Executive Order 12898 – The anticipated direct and indirect social effects to the Burns Paiute Tribe, minority, low-income populations, elderly people, or civil rights are primarily due to change of motorized access from road closures and decommissioning proposed in the action alternatives. This change from road to non-road access would have its greatest effect on the young, elderly, and disabled. The action alternatives change access on approximately 37 miles of road (Alternative Five), 87 miles of road (Alternatives Six, Seven and Seven-A), 143 miles of road (Alternative Two), and 160 miles of road (Alternatives Three and Four). Because there are still areas in and next to the project area where road access is not changed and because tribal members and others can request a permit to use a closed road, the social effects are not anticipated to be disproportionately high or adverse to these populations.

Other Issues

Besides the significant issues, other concerns were identified as non-significant issues and were resolved without developing separate alternatives. The sources for each of these issues are located in the planning record.

Effects on Wildlife

Effects on Big Game and Big Game Habitat

This section discloses the effects on big game habitat from activities proposed by each alternative. All proposed activities could potentially affect big game habitat. Each alternative proposes varying amounts and types of proposed activities. The effects of each alternative are similar in terms of proposed activities but vary in the magnitude of disturbance. Disclosing the effects to cover, road densities, habitat effectiveness index (HEI), and migration and travel corridors arrives at the effects to big game habitat.

Effects on Cover

Satisfactory [thermal] cover (stands with a canopy closure of at least 60%) as prescribed in the Forest Plan, is likely not sustainable in the Silvies Canyon watershed. Marginal cover, defined as trees greater than or equal to 10' tall with a canopy closure of at least 40%, is likely closer to historical values in terms of percent canopy cover for this area (Historical Crown Closure data, Wildlife Project Record). The majority of the forested stands in the northern 2/3 of the watershed are Warm Dry stands capable of providing sustainable canopy closure at or above 30%. It is likely that at any given time, some stands can produce a canopy closure capable of providing satisfactory thermal cover but stress on these stands and low site potential would likely keep the majority of these stands at or near the lower limit of marginal [thermal] cover (Vegetation Specialist Report).

Most forest stands in the southern end are Hot Dry stands capable of providing sustainable canopy closures up to 30%. These stands generally are not capable of providing satisfactory or marginal thermal cover (Vegetation Specialist Report).

Direct, Indirect and Cumulative Effects of Alternative One – No Action

With ongoing fire suppression, only one outcome of the No Action alternative is expected within the foreseeable future: removal of some or all old-forest characteristics, such as canopy cover. Removal of canopy cover is expected to occur through a combination of stress, insects, and disease and through stand-replacing fires or other stand-replacing events. See the section titled "Effects on Vegetation Condition" for a discussion of the effects of the No Action alternative on forested stands.

Over the next 50 years, canopy cover is expected to oscillate from 40-60% in warm-dry forest and from 25-45% in hot-dry forest (percent canopy based on all tree layers, not just overstory and midstory layers). Cover values would change from those displayed in Table 3-14 and be dependent on insect outbreaks.

As mortality increases in cover areas, accumulating ground material would inhibit animal movement through cover stands. This buildup of residue would also reduce the production and availability of forage in these stands by covering the ground with coarse material that would interfere with understory growth. As this occurs, animals seeking forage and thermal cover would have to use adjacent areas, use available topographic features for thermal relief, adjust physical activities and metabolic rates to compensate for reduced thermal cover values of available cover, or a combination of all of the above to survive thermal stresses.

In the short-term, the availability of hiding cover would be limited to areas where the affects of insects and disease are light. Areas more heavily affected by insects and disease would experience a gradual loss in most of the remaining cover over the next three to five years. This condition would reduce big game security and possibly increase hunter success because of the loss of hiding cover along open roads or in areas easily accessible by foot.

If disease and insect populations return to endemic levels and overstocking is reduced by inter-tree competition and mortality, suppressed seedling and saplings may begin to develop into hiding cover over the next 15 to 40 years. Hardwood shrubs previously suppressed by overstory trees would grow up in areas not fully stocked with tree species and would continue to prosper until a closed canopy condition develops.

Direct, Indirect, and Cumulative Effects of Alternative Two – The Proposed Action

Timber management can enhance, maintain, or degrade elk habitat, and can be used to restore some sites to productive forage areas. Results depend on how treatments move habitat towards management objectives and how these objectives relate to the needs of elk herds in the project area.

1. Effects of Silvicultural Treatments

The primary purpose of proposed treatments is to retain continuous forest cover in harvest units while improving the quality of remaining trees and improving long-term wildlife habitat. Some general effects of proposed vegetation treatments are:

- CT (Commercial Thinning): Primarily reduces the amount of canopy cover, therefore reducing thermal protection values to big game.
- IT (Intermediate/Selection Harvest): Effects would vary depending on the type of cutting (single tree or group selection) done and resulting stand structure and density. Effects on big game would depend upon the amount of canopy closure that is maintained and the extent of the stands in this condition. This treatment offers an excellent opportunity for removal of trees that have encroached on and are competing with more desirable species in important habitats such as aspen, riparian areas, big game winter range, LOS stands, natural meadows and shrub steppe/grasslands.
- PCT (Precommercial Thinning): This affects big game cover values by reducing hiding cover characteristics. This treatment would not likely alter overall thermal values of the overstory.

To improve stand vigor, reduce overstocking-dependent mortality, manage stand structure, and improve or maintain sustainable stand cover, intermediate harvest and commercial thinning would focus mainly on the removal of excess trees from mid-story tree canopies. Removal of these trees would leave most of the overstory and would have little effect on overstory canopy conditions. However, since mid-story trees are contributing to canopy cover, their removal would reduce canopy closure (Vegetation Specialist's Report).

Most untreated satisfactory and marginal cover blocks are predicted to alternate between meeting and failing cover standards. Effects would be the same as described in Alternative One.

As suppressed understory trees are harvested and precommercial thinning takes place, small openings in the canopy would occur. These small openings in existing canopies should create optimal growing conditions for herbaceous vegetation, shrubs, and natural regeneration of seedlings and should promote the development of multistory hiding and thermal cover. This should promote the development of more sustainable cover over time. In units where existing canopy structure is retained, less natural regeneration would occur and development of understory hiding cover and understory canopies would be slowed or not occur at all.

During precommercial thinning, wildlife patch cuts and leave patches would be left to create a mosaic pattern of various ages of cover. Over time, these leave patches will deteriorate in cover value. Stand treatments and post-treatment fuels reduction (grapple or hand piling of generated slash and landscape level prescribed burning) should reduce the risk of large scale stand replacement wildfire and may prevent or reduce the scope of unexpected loss of large blocks of cover.

Effects on Thermal Cover

Several characteristics associated with the structure of forest canopy should be taken into account to understand the theoretical value of cover. During the day, the forest canopy creates an umbrella effect that prevents incoming radiation from adding heat energy to the airmass under the canopy. At night, it helps reduce the animal's radiational heat loss to the open sky. Tree trunks and low ground vegetation reduces air movement which protects the animal from the chill factor associated with low temperature and increased windspeed.

In the project area, there is relatively little low ground vegetation under thermal cover. At midday during hot summer months, air movement in such stands may be an important factor that helps keep animals cool (Thomas 1979).

Energetic contributions of thermal cover have been widely assumed to be valuable to big game during the winter. Cook et al. (1998) tested the hypothesis that the sheltering effect of thermal cover is important to elk. This study concluded that there was no positive effect of thermal cover on elk. Instead, they found that dense cover provides a "…costly energetic environment, resulting in significantly greater overwinter mass loss, fat catabolism and mortality…" These authors also reported that previous studies of winter thermal cover for white-tail deer (*Odocoileus virginianus*) and mule deer had reached similar conclusions.

Some researchers (Brown 1989, Thomas 1979) reported that elk appear to use summer thermal cover to escape from high ambient summer temperatures. Thinning of cover stands may cause an increase in daytime ambient air temperature and a decrease in nighttime ambient air temperature profiles. This may cause elk and deer to expend more energy in maintaining homeothermy (Thomas 1979). In some cases, similar relief may be found on north aspect slopes and through topographic relief.

Regarding summer thermal cover, recent studies in the shrub-steppe of south-central Washington and southeastern Idaho have demonstrated that Rocky Mountain elk can prosper with cover types not associated with coniferous forest structure (Toweill and Thomas 2002). Cook et al. (1998) found no indication that during summer, elk performance was influenced in any way by forest cover treatments, despite temperatures significantly above normal during the study. Other researchers have found elk to be surprisingly tolerant of high summer temperatures. "Because elk populations successfully establish in areas lacking classically defined thermal cover, cover requirements need further quantification (Toweill and Thomas 2002, pg. 540).

The assumed energetic benefits of thermal cover seem inconsequential, thus leaving forage effects as the primary mechanism through which habitat influences individual animal performance. Thermal cover may be important under certain conditions, but its value should be considered in relation to that of other habitat attributes. This consideration needs to be in the context of the ability of each attribute to contribute to the productivity of local elk herds. Cook et al. (1998) suggests that habitat managers should give more attention to forage relationships and vulnerability of ungulates to hunting and harassment when managing habitat for big game.

While thermal cover may have less importance to elk than previously thought, its value to other species that use the structure provided by closed canopies (canopy nesters and canopy gleaners) should not be ignored.

Summer Range: This alternative reduces cover values in all subwatersheds for about 20 years (see Table 4-18). Because of the reduction in cover, Sage Hen Creek would not meet Forest Plan standards for satisfactory cover.

In the short-term, total cover would be reduced by about half in Burnt Mountain, Myrtle Park, Red Hill, and Sage Hen Creek subwatersheds, though total cover remains above Forest Plan standards in Sage Hen Creek. In Stancliffe Creek, cover would be reduced by about 2/3. In two subwatersheds, Boulder/Fawn and Myrtle Creek, the reduction in cover is minor (see Table 4-18). Harvest generally occurs over a 2-year period, and will occur in about 1/3 of the project area at a time (see the project implementation schedule, Table 2-21, Chapter 2).

Although cover would be unavailable in most stands proposed for treatment for about 20 years, proposed vegetative treatments would create more sustainable cover in the long term. After about 20 years marginal cover is expected to develop in YFMS and SE stands while OFMS stands would mostly remain below 40% canopy cover. The canopy cover that does redevelop is expected to be more sustainable because it will be provided by fewer, but larger and healthier trees that are more adapted to site conditions than those there presently.

The response of elk to these changes in their habitat is not certain, though elk on the Malheur National Forest appear to select for habitat with [thermal] cover. Elk in some subwatersheds (such as Stancliffe Cr.) may be adapted to low levels of cover, and they may adjust to the changes in habitat. Other elk may be displaced and may move out of the immediate habitat, move to other subwatersheds, or move to private or BLM lands. The degree of displacement is expected to be minor. Little movement of big game onto private/BLM land is expected to occur due to the loss of [thermal] cover, because [thermal] cover is more available on the Malheur National Forest than on private and BLM land. In addition, well-distributed, untreated areas would be available to provide habitat for displaced elk between units, in the roadless area, and in large parts of the bald eagle management area during the entire project. Elk may also move into areas that are not being treated or are only partially treated (generally 2/3 of the area remains untreated or lightly treated at any time during the project; see implementation schedule, Table 2-21, Chapter 2). While elk are likely to move around within the Malheur National Forest, no net change in the number of elk using the project area is expected due to proposed activities. Proposed activities are not expected to permanently displace elk off the Forest. Mule deer are not expected to be displaced off-Forest by changes in habitat (R. Garner, ODFW, pers. com.)

Elk that may be displaced from their home ranges are prone to higher predation and increased interactions with hunters due to their lack of knowledge of the home range. However, elk populations have not declined in the area (Chapter 3-Big Game Population Management Objectives) because of past activities, and they are not expected to decline because of proposed activities. Mule deer forage would increase as the reduced cover and competition for water increases shrub production; this could benefit the deer population.

Although cover is being reduced, habitat effectiveness improves in this alternative on both summer and winter range due to road closures (see HEI discussion below). Big game animals might move from an area during treatments, but they are expected to return upon completion. Although cover is being reduced, the effect on big game populations is not expected to be measurable.

Winter Range: This alternative maintains thermal cover at Forest Plan standards for winter range in three subwatersheds (see Table 4-19). The most pronounced reductions in winter range thermal cover following treatment would occur in portions of Sage Hen Creek subwatershed. Proposed commercial thin and intermediate thin would likely reduce winter range cover from near standards to well below standards.

Similar to the discussion of effects under summer range thermal cover, the response of elk to these changes in their habitat is not certain. Although cover is being reduced, habitat effectiveness improves in these alternatives on both summer and winter range due to road closures (see HEI, below). Big game animals might move from an area during treatments, but they are expected to return upon completion. Although cover is being reduced, the effect on big game populations is not expected to be measurable.

Table 4-18. Percentages[1] of satisfactory and marginal[2] thermal cover remaining in summer range by Alternative.

Subwatershed	Alt One			Alt Two			Alts Three and Six			Alts Four, Seven and Seven-A			Alt Five		
	S	M	T	S	M	T	S	M	T	S	M	T	S	M	T
Boulder/fawn	3	14	17	3	13	15	3	14	17	3	13	16	3	14	17
Burnt Mtn.	1	15	16	1	8	9	1	15	16	1	8	9	1	11	12
Myrtle Creek	5	4	9	5	2	7	5	4	9	5	2	7	5	3	8
Myrtle Park	5	25	30	5	13	18	5	25	30	5	13	17	5	16	20
Red Hill	0	27	27	0	18	18	0	27	27	0	18	18	0	27	27
Sage Hen Cr.	12	47	59	3	26	29	12	47	59	1	19	20	8	27	35
Stancliffe Cr.	0	9	9	0	3	3	0	9	9	0	3	3	0	8	8

S = Satisfactory cover; M = Marginal cover; T = Total cover; Hatching indicates where the standard is not met.
Forest Plan Standards are S=8%, M=5% and T=20% per Subwatershed.
[1]Numbers in table are percentages of available cover relative to total area of subwatershed.
[2]Satisfactory cover can be substituted for marginal cover when standard is exceeded.

Table 4-19. Percentages[1] of satisfactory and marginal[2] thermal cover remaining in winter range by Alternative.

Subwatershed	Alt One			Alt Two			Alts Three and Six			Alts Four, Seven and Seven-A			Alt Five		
	S	M	T	S	M		S	M	T	S	M		S	M	T
Boulder/fawn	6	22	28	5	18	23	6	22	28	5	13	18	6	21	27
Burnt Mtn.	16	19	35	16	12	28	16	19	35	16	11	27	16	14	30
Myrtle Creek	19	40	59	15	37	52	19	40	59	15	37	52	16	38	53
Myrtle Park	21	51	72	21	50	71	21	51	72	21	50	71	21	50	71
Red Hill	0	13	13	0	13	13	0	13	13	0	13	13	0	13	13
Sage Hen Cr.	5	31	36	3	21	23	5	31	36	2	19	21	4	29	33
Stancliffe Cr.	0	12	12	0	12	12	0	12	12	0	12	12	0	12	12

S = Satisfactory cover; M = Marginal cover; T = Total cover; Hatching indicates where the standard is not met.
Forest Plan Standards are S=8%, M=5% and T=20% per Subwatershed.
[1]Numbers in table are percentages of available cover relative to total area of subwatershed.

[2]Satisfactory cover can be substituted for marginal cover when standard is exceeded.

Effects on Security (Hiding Cover)

This alternative would result in the loss of most hiding cover in units where understory trees are removed to reduce stress on retained overstory trees and where prescribed burning would occur.

To mitigate the short-term loss of hiding cover and resulting potential increases in vulnerability to hunting and harassment, road densities would be reduced across the project area. This should help negate the effects of hiding cover loss.

A slight increase in hunter success may occur because of reduced hiding cover, but the level of change is expected to be low because of reductions in road density. This is not expected to affect local bull/cow or buck/doe ratios, impact the quality of the local herd, or herd vigor across the wildlife management unit.

Wildlife patch cuts and leave patches in precommercial thinning units as well as a Design Criterion that leaves hiding cover in FPA #2 corridors and in stands adjacent to corridors (see Chapter 2) should help offset hiding cover losses.

Areas where vegetation management practices were deferred would experience the same effects as those described in Alternative One.

Effects on Forage

Most investigations of the effect of timber stand thinning have suggested favorable results for big game, usually in the form of improved forage production (Toweill and Thomas 2002). In addition to measurable increases in total forage production, higher protein content, greater palatability of forage plants, and greater species diversity in created openings usually occurs.

Increased forage production would be limited in stands where more than 50% canopy closure remains after treatment. In most cases, canopy closure would be opened (on patch scale or entire unit) enough to allow some increases in forage production.

Effects on Big Game (Disturbance from Logging)

Thomas and Toweill (1982) suggest that displacement of elk during logging operations is temporary, and animals usually return to the affected area within days. This is the expected response of elk and deer to logging activities in the Silvies Canyon Project Area.

As discussed under summer range thermal cover, the degree of displacement of big game is expected to be minor. Elk may move to the untreated areas that are well distributed across the project area, or into areas that are not being treated or are only partially treated. Mule deer are not expected to be displaced (R. Garner, ODFW, pers. com.). Disturbance from logging may cause some movement of elk but because of the amount of habitat that is untreated, elk movement would mostly occur within the Forest. Little to no movement of elk is expected off the forest because of disturbance. The effect of such a movement would not be measurable.

A certain amount of physiological stress is likely to result from the involuntary displacement of elk from portions of the project area during logging activities. To avoid compounding stress from displacement with stress caused by adverse weather conditions, limited food supply, and pregnancy, seasonal restrictions would be applied to limit the amount and duration of disturbance to elk while on winter range (see EIS, Chapter 2).

Other activities, such as sale prep, layout, marking, and post-harvest treatments would also disturb and potentially displace elk and deer from treatment units. This disturbance would be relatively short and animals should reoccupy the area quickly after the disturbance ceases.

2. Effects from Fuels Treatments

Prescribed burning can be used effectively to improve elk habitat in this watershed. Timing and intensity of burning affects the results of the burn. Prescribed burns can open up the vegetation, improve forage under the retained canopy, and set succession back to earlier stages that improve forage quality and quantity for big game. Underburning would reduce overstocking and help to promote the development and retention of more sustainable canopy cover. As some suppressed understory trees are consumed by fire, small openings in the canopy could develop, which should create optimal growing conditions for limited regeneration of tree seedlings and improve forage quantity and quality (Thomas et al. 1988).

Hobbs and Swift (1985) noted that burns contained more forage with high nutrient concentrations but less forage overall. They noted that forage quality is inversely related to its abundance in many ecosystems. Improvements in diet quality for ungulates after fires can be related to removal of standing herbage and litter on the ground, and removing coarse vegetation from old decadent plants (Thomas et al. 1988).

Prescribed burning also caused a short-term difference in initiation of plant growth between burned and unburned areas. This benefits ungulates by offering two temporally distinct flushes of nutritious plant tissue, early on the burned areas and later on the unburned areas. This prolongs the time when nutritious forage is available for utilization (Thomas et al. 1988).

Most untreated cover is predicted to degrade to lower quality cover over the next 10 to 40 years. Effects on these areas would be similar to discussion under Alternative One.

With maintenance burning, the development of hiding cover would be limited. Most stands would remain in an open, widely spaced condition. Big game security would be provided mainly from reduced access because of road closures.

Prescribed fires are expected to burn relatively cool, move slowly, and burn in a mosaic of burned and unburned patches. Large, highly mobile animals like deer and elk tend to move calmly in response to fire, tending towards the periphery of the fire (Smith 2000). Depending on burn size and complexity, crews of 20-50 people would manage the fire. Disturbance would be short-term, unlikely to last more than a week on the larger burning operations. Animals could return to burn areas as soon as the ground cools.

Direct fire-caused mortality would be unlikely; mortality typically occurs only in uncontrolled wildfire situations where fire fronts are wide and fast moving, fires are actively crowning, and thick smoke occurs (Smith 2000).

3. Effects of Other Proposed Activities

The effects of road activities are discussed below under "Open Road Densities and their Effects on Elk." Juniper reduction effects on big game are discussed under Mountain Shrubs. Weed treatments proposed in the action alternatives would all be done mechanically (no herbicides would be used). Big game may experience localized minor disturbance, but weed treatments should benefit all wildlife by creating space for native or desired plants. Spring and aspen restoration would return these small inclusions to healthier conditions that more closely resemble historical conditions. A small amount of forage in these areas would be unavailable or difficult to access for several years due to fencing/protection of these areas. However, as these habitats are restored, they may provide small pockets of foraging, hiding cover, and calving and fawning habitat to elk and deer.

Direct, Indirect, and Cumulative Effects from Alternatives Three and Six

Alternative Three proposes a substantial amount of precommercial thinning in stands to thin and space densely stocked understories. This treatment would essentially be a mechanical pretreatment for prescribed burning. Alternative Six would treat the same total amount of the landscape but would reduce the amount of precommercial thinning and substitute prescribed burning as the primary tool to thin stands. The outcome of treatments and resulting effects are similar; therefore, these two alternatives are combined.

1. Effects of Silvicultural Treatments

Understory thinning would remove a portion of the structure from the understory, resulting in a possible reduction in canopy layers. Overall, stand structure would remain intact.

The residual stand should become more vigorous as competition from the understory is reduced. This would make this stand more stable over time as the remaining trees become increasingly resilient to the effects of pathogens, drought and fire. Habitat loss due to these factors may be reduced.

Most of the overstory would remain intact; therefore, light penetration would be less than that seen in commercial treatments that open up both the understory and overstory structure. Slightly increased light penetration to the ground and a reduction in understory conifers may allow for increased growth of some understory grasses, forbs and shrubs that occur in the understory. This would result in a slight increase in forage availability for big game.

Effects on Thermal Cover

There would be a slight reduction in canopy closure following precommercial thinning due to the removal of suppressed understory trees. The canopy closure could be reduced by up to 5-10%. This treatment would not reduce thermal cover values because the remaining larger trees provide most of the canopy cover and the understory trees thinned through this type of treatment do not contribute to thermal cover. The availability of cover would similar to that seen in Alternative One (see Tables 4-18 and 4-19).

The slight change in canopy closure may result in a slight increase in ambient and ground temperature as more light is allowed through the canopy.

2. Effects on Security (Hiding) Cover

This alternative would result in the loss of most hiding cover in units where understory trees are removed to reduce stress on retained overstory trees and where prescribed fire would be introduced. Trees $\geq$9" dbh would be retained in the mid-story. These additional trees would increase the amount of stems per acre that could provide additional limited hiding cover for big game.

To mitigate the short-term loss of hiding cover and resulting potential increases in vulnerability to hunting and harassment, road densities would be reduced across the project area, more so with Alternative Three. This should help negate the expected effect of lost hiding cover.

Wildlife patch cuts and leave patches in precommercial thinning units as well as a Design Criteria that leaves hiding cover in FPA #2 corridors and in stands adjacent to corridors (see Chapter 2) should help offset hiding cover losses.

Areas where vegetation management practices were deferred would experience the same effects as those described in the Alternative One.

2. Effects of Fuels Treatments

Through the removal of smaller diameter dead and dying trees from the understory, ladder fuels that are capable of carrying a ground fire into the canopy would be removed. Follow-up slash treatments would treat hand piled activity generated slash. Some fire creep is expected between piles depending on concentration of natural fuels and burning conditions. This treatment would result in an overall reduction of fuel levels throughout the stand and would reduce the risk of a stand-replacing fire.

Effects to elk would be similar to the effects described in Alternative Two.

3. Effects of Other Proposed Activities

Effects to elk would be similar to the effects described under Alternative Two.

Direct, Indirect, and Cumulative Effects from Alternatives Four, Seven and Seven-A

The effects of these alternatives on cover and big game would be similar to those discussed under Alternative Two. The intensity of treatment would also be similar; however, additional acres would be treated. This would affect the availability of cover across the project area.

Summer Range: Pronounced reductions in summer range thermal cover would occur in all subwatersheds. Cover would fall below the Forest Plan standard for all subwatersheds except Sage Hen Creek following treatment (Table 4-18).

Winter Range: Cover values continue to meet Forest Plan standards or do not go further below standards on five subwatersheds, but fall further below cover standards in two subwatersheds (Table 4-19). The most pronounced reductions in winter range thermal cover would occur in Boulder/Fawn and Sage Hen Creek subwatersheds.

Direct, Indirect, and Cumulative Effects from Alternative Five

The effects of this alternative on cover and big game would be similar to those discussed under Alternative Two; however, the intensity of treatment would be reduced because fewer acres of cover would be treated.

Summer Range: Reductions in summer range thermal cover would occur in several subwatersheds; generally, however, marginal rather than satisfactory cover would be treated. Cover would remain below Forest standards (Table 4-18).

Winter Range: Cover values would continue to meet Forest Plan standards or do not go further below standards on five subwatersheds, but would fall further below cover standards in two subwatersheds (Table 4-19). The most pronounced reductions in winter range thermal cover would occur in Boulder/Fawn and Sage Hen Creek subwatersheds. Satisfactory cover would remain at or close to existing conditions.

Open Road Densities and their Effects on Elk

Road density was calculated using road prescriptions (Table 4-20). Only open roads were included.

For the purpose of this analysis, roads proposed for closure under previous decisions were included as closed in Alternative One road densities. They are or would be closed regardless of the outcome of this project.

Table 4-20. Road density comparison in summer and winter range.

Subwatershed	Alt. One		Alt. Two		Alt. Three and Four		Alt. Five		Alt. Six, Seven and Seven-A	
	Sum.	Winter	Sum.	Winter	Sum.	Winter	Sum.	Winter	Sum.	Winter
Boulder/fawn	2.8	2.1	2.1	1.5	2.1	1.3	2.5	1.9	2.3	1.7
Burnt Mtn.	3.9	2.2	2.1	0.5	1.7	0.4	3.9	2.0	2.6	1.5
Myrtle Creek	5.2	1.9	2.0	0.7	2.0	0.5	4.8	1.7	3.9	1.4
Myrtle Park	4.0	< 0.1	2.4	0.0	2.1	0.0	3.5	0.0	2.8	0.0
Red Hill	3.8	2.9	1.0	1.2	1.0	1.2	3.4	2.6	2.6	2.2
Sage Hen Cr.	3.1	2.9	1.5	1.5	1.8	1.3	2.8	2.3	2.2	1.9
Stancliffe Cr.	3.0	3.7	2.4	2.9	2.0	2.6	2.8	3.3	2.6	3.0
Project Area Total	3.7	2.4	2.2	1.1	2.0	0.9	3.2	2.1	2.7	2.1

Forest Plan Standards for road densities In Silvies Canyon Watershed are **3.2 mi/mi² in Summer Range** and **2.2 mi/mi² in Winter Range.**

Most discussions of roads and their effects on wildlife center on big game related effects. While there are strong correlations between road densities and suitability of habitat for many forest species, the Malheur Forest Plan specifically ties roads to big game habitat effectiveness. Roads may directly and indirectly affect big game species. Direct effects can include direct harassment, elimination of habitat, blockage of travel and migration routes to essential forage resources, and higher harvest rates due to improved access and reduced security (Joslin and Youmans 1999, Cole et al. 1997). Indirect effects are primarily in the area of reduced habitat effectiveness, displacement from quality habitat, overgrazing of marginal areas, and possibly reduced reproduction (Joslin and Youmans 1999, Thomas 1979). Table 4-23 summarizes the road-associated factors that can negatively affect habitat or wildlife, including big game.

Harassment: In general, greater traffic flow on higher quality unpaved roads produces a larger area of avoidance. Disturbance to elk can also occur on lower quality primitive roads especially if vehicle traffic is slow (Thomas 1979).

Elimination of Habitat: Construction and maintenance of roads permanently removes a portion of the land from forage or cover production. On average, most forest roads are at least 20 feet wide (road prism and drainage); therefore, every mile of road potentially removes 2.5 acres of habitat from production. Vehicular traffic on and off roads has also been linked with high rates of establishment and spread of noxious weeds in wildlife habitat. Resulting establishment of noxious weeds can reduce quality and quantity of summer forage for ungulates, resulting in poor reproductive performance during the lifetime of an animal (Joslin and Youmans 1999).

Reduced Security (Reduced Bull ratios): One of the surest methods of increasing elk security has been to close roads and/or areas to motorized vehicles (Joslin and Youmans 1999). High road densities make elk highly vulnerable to hunter harvest while closures generally increase the time hunters spend hunting. This tends to prolong the time required to achieve the desired harvest, reduces the rate of bull harvest, increases bull carryover, and improves the recreational quality of the hunt (Joslin and Youmans 1999). However, security is more complex than just low road densities and can be influenced by a multitude of factors that may vary from one population or habitat complex to the next. Road closures must encompass large areas to be effective (Hurley 1994).

Reduced habitat use and effectiveness: It is commonly accepted that during hunting season elk avoid areas occupied by humans. Most evidence supports the conclusion that free ranging elk prefer to be at least 0.5 miles from humans engaged in out-of-vehicle activities (Leege 1984). Avoidance of this nature results in less effective use of available habitat and can displace animals from high quality habitat into reduced quality areas. Lyon (1983) concluded that open road densities as low as 2 mi/mi^2 can easily affect half of the available elk habitat.

Displacement: Vehicle traffic on open roads can cause elk to develop spatial shifts and/or avoid habitat adjacent to the road. Vehicular use of open roads can spatially shift elk away from roadside habitat, which in turn displaces co-occupying mule deer toward less effective roadside habitat (Wisdom et al. 1999b, Rowland et al. 1999).

Limited-vehicle access ("Administrative Access" - fire suppression, emergency access, and access for forest management) can still reinforce avoidance behavior, influence core area size, home range size, and daily movements of elk (Joslin and Youmans 1999). Reductions in elk movement would likely occur with reduced vehicular access but would still occur on a limited basis when roads are used for administrative or emergency use.

The potential benefits of reduced elk movement would be reduced energy expenditure, increased fat reserves, increased overwintering survival rate, and increased productivity which would provide more recreational and economic opportunities (Cole et al. 1997).

Another possible indirect result of disturbance of wintering elk and deer can be movement from historical and accepted winter ranges to private land (Joslin and Youmans 1999).

Effects of Alternative One

Under this alternative no new road closures or decommissioning would occur. Road densities in most summer subwatersheds and about half of the winter subwatersheds, as well as the watershed as a whole, would continue to exceed Forest Plan standards (Table 4-20). Approximately 314 miles of roads would remain open in this watershed. This would maintain the existing conditions that contribute to less effective use of available habitat and probable displacement of animals from high quality habitat into reduced quality areas. Five percent (3,150 acres) of the project area is 0.5 mile or more from an open or seasonally closed road (Security Zone map, Wildlife Project Record).

Road closures under other decisions (approximately 63 miles) would continue to occur as funding comes available.

Effects of Alternative Two

Under this alternative, road densities would be reduced in all subwatersheds. Year-round open road density for the planning area would range from 2.9 to 0.0 mi/mi2 (Table 4-20). Lower road densities would decrease the potential for legal take, poaching, collisions, and avoidance of roads, and increase habitat, habitat effectiveness, and security. Year-round road densities would be reduced by about 41% in summer range and 54% in winter range upon completion of all road management activities. Expected road densities would meet or move toward Forest Plan standards for both winter and summer range, and would meet watershed standards.

Proposed road decommissioning would return approximately 8.0 acres of roaded surface (based on average road width of 20 feet) to forage and future cover production. Vehicle traffic would be mostly eliminated from 78 miles of permanently closed roads (some with allowable administrative use) and 62 miles of seasonally closed roads. This reduction in disturbance would positively influence animals that were avoiding roads or using habitat less effectively because of current road use. The amount of the project area that would be 0.5 mile or more from an open or seasonally closed road would increase to 4,370 acres (7% of the project area – security zone map, Wildlife Project Record).

Alternatives Three and Four

Year-round open road density for the planning area would range from 2.6 to 0.0 mi/mi^2 (see Table 4-20). Lower road densities would decrease the potential for legal take, poaching, collisions, and avoidance of roads, and increase habitat, habitat effectiveness, and security. Year-round road densities would be reduced by about 49% in summer range and 63% in winter range upon completion of all road management activities. Expected road densities would meet or move toward Forest Plan standards in all areas, and would meet watershed standards.

Proposed road decommissioning would return approximately 63 acres of roaded surface to forage and/or future cover production. Vehicle traffic would be mostly eliminated from 109 miles of permanently closed and 24 miles of seasonally closed roads. This reduction in disturbance would positively influence animals that were avoiding roads or using habitat less effectively because of current road use. The amount of the project area that would be 0.5 mile or more from an open or seasonally closed road would double to 6,290 acres (about 10% of the project area – security zone map, Wildlife Project Record).

Alternative Five

Year-round open road density for the planning area would range from 4.8 to 0.0 mi/mi^2 (see Table 4-20). Lower road densities would decrease the potential for legal take, poaching, collisions, and avoidance of roads, and increase habitat, habitat effectiveness, and security. Year-round road densities would be reduced by about 14% in summer range and 13% in winter range upon completion of all road management activities. Expected road densities would move toward Forest Plan standards, but densities would continue to fail standards in six subwatersheds. Overall, expected road densities would meet watershed standards.

Proposed road decommissioning would return approximately 24 acres of roaded surface to forage and/or future cover production. Vehicle traffic would be mostly eliminated from 23 miles of permanently closed and four miles of seasonally closed roads. This reduction in disturbance would have a minor positive influence on animals that were avoiding roads or using habitat less effectively because of current road use. The amount of the project area that would be 0.5 mile or more from an open or seasonally closed road would increase slightly to 3,700 acres (6% of the project area – security zone map, Wildlife Project Record).

Alternatives Six, Seven and Seven-A

Year-round open road density for the planning area would range from 3.9 to 0.0 mi/mi^2 (see Table 4-20). Year-round road densities would be reduced by about 28% in summer range and 29% in winter range upon completion of all road management activities. Expected road densities would meet or move toward Forest Plan standards for both winter and summer range in all subwatersheds, though two subwatersheds would continue to be below standards. Overall, expected road densities would meet watershed standards.

Proposed road decommissioning would return approximately 25 acres (Alternatives Six and Seven-A) to 35 acres (Alternative Seven) of roaded surface (based on average road width of 20 feet) to forage and future cover production. Vehicle traffic would be mostly eliminated from 70 miles of permanently closed and 10 miles of seasonally closed roads. This reduction in disturbance would positively influence animals that were avoiding roads or using habitat less effectively because of current road use. The amount of the project area that would be 0.5 mile or more from an open or seasonally closed road increases to 4,370 acres (7% of the project area – security zone map, Wildlife Project Record).

Cumulative Effects

Road systems provide the benefits of access and the costs of roads and road-associated effects. Road closures (and decommissioning) associated with this project, in combination with the 63 miles of road that, under other decisions, are or will be closed, will help to reduce road-associated effects on a variety of wildlife. However, road closures could potentially change recreational uses in the project area. Off-road vehicles may be used more often than they are currently to enter areas previously accessible by open roads. The amount of potential increased use is unknown, but is expected to be limited by the number of big game tags permitted and the rural nature of the area.

Effects on Habitat-Effectiveness Index

Monitoring changes in habitat effectiveness is necessary to predict impacts of land use proposals, to evaluate success of land use plans, and to establish trends in habitat condition. Calculated HEI and related values are displayed in Tables 4-21 (summer range) and 4-22 (winter range), below.

Table 4-21. Summer Range HEI values by Alternative.

Subwatershed	Component	Alt. One	Alt. Two	Alt. Three	Alt. Four	Alt. Five	Alt. Six	Alt. Seven and Seven-A	FP Standard
Boulder/Fawn	HEc	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.3
	HEs	0.34	0.35	0.34	0.35	0.34	0.34	0.35	0.3
	HEr	0.41	0.48	0.48	0.48	0.44	0.46	0.46	0.4
	HEI	0.43	0.44	0.44	0.44	0.43	0.44	0.44	0.4
Burnt Mtn.	HEc	0.52	0.53	0.52	0.53	0.53	0.52	0.53	0.3
	HEs	0.50	0.39	0.50	0.39	0.44	0.50	0.39	0.3
	HEr	0.30	0.48	0.52	0.52	0.30	0.43	0.43	0.4
	HEI	0.42	0.45	0.51	0.45	0.41	0.46	0.43	0.4
Myrtle Cr.	HEc	0.78	0.87	0.78	0.87	0.81	0.78	0.87	0.3
	HEs	0.24	0.16	0.24	0.16	0.21	0.24	0.16	0.3
	HEr	0.18	0.49	0.49	0.49	0.22	0.30	0.30	0.4
	HEI	0.34	0.41	0.44	0.41	0.35	0.39	0.36	0.4
Myrtle Park	HEc	0.58	0.63	0.58	0.63	0.61	0.58	0.63	0.3
	HEs	0.43	0.36	0.43	0.35	0.40	0.43	0.35	0.3
	HEr	0.30	0.45	0.48	0.48	0.34	0.41	0.41	0.4
	HEI	0.41	0.45	0.47	0.45	0.43	0.45	0.44	0.4
Red Hill	HEc	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.3
	HEs	0.49	0.36	0.49	0.40	0.49	0.49	0.40	0.3
	HEr	0.31	0.61	0.60	0.60	0.35	0.43	0.43	0.4
	HEI	0.42	0.46	0.52	0.47	0.43	0.45	0.43	0.4
Sage Hen Cr.	HEc	0.60	0.55	0.60	0.52	0.61	0.60	0.52	0.3
	HEs	0.69	0.69	0.69	0.64	0.75	0.69	0.64	0.3
	HEr	0.38	0.53	0.51	0.51	0.41	0.47	0.47	0.4
	HEI	0.53	0.56	0.57	0.54	0.55	0.56	0.56	0.4
Stancliffe Cr.	HEc	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.3
	HEs	0.32	0.24	0.32	0.24	0.31	0.32	0.24	0.3
	HEr	0.39	0.47	0.48	0.49	0.41	0.43	0.43	0.4
	HEI	0.40	0.39	0.42	0.39	0.40	0.41	0.38	0.4

Table 4-22. Winter Range HEI values by Alternative.

Subwatershed	Component	Alt. One	Alt. Two	Alt. Three	Alt. Four	Alt. Five	Alt. Six	Alt. Seven and Seven-A	FP Standard
Boulder/Fawn	HEc	0.61	0.61	0.61	0.64	0.61	0.61	0.64	0.4
	HEs	0.45	0.44	0.45	0.45	0.45	0.45	0.45	0.3
	HEr	0.48	0.54	0.56	0.56	0.50	0.52	0.52	0.5
	HEI*	0.48	0.49	0.50	0.50	0.48	0.49	0.49	0.5
Burnt Mtn.	HEc	0.73	0.79	0.73	0.80	0.76	0.73	0.80	0.4
	HEs	0.51	0.47	0.51	0.45	0.48	0.51	0.45	0.3
	HEr	0.47	0.76	0.78	0.78	0.49	0.54	0.54	0.5
	HEI	0.51	0.58	0.58	0.58	0.52	0.53	0.53	0.5
Myrtle Cr.	HEc	0.66	0.65	0.66	0.65	0.65	0.66	0.65	0.4
	HEs	0.42	0.42	0.42	0.41	0.42	0.42	0.41	0.3
	HEr	0.50	0.69	0.76	0.76	0.53	0.55	0.55	0.5
	HEI	0.48	0.52	0.54	0.53	0.49	0.50	0.49	0.5
Myrtle Park	HEc	0.66	0.65	0.65	0.65	0.65	0.65	0.65	0.4
	HEs	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.3
	HEr	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.5
	HEI	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.5
Red Hill	HEc	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.4
	HEs	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.3
	HEr	0.40	0.64	0.57	0.57	0.43	0.47	0.47	0.5
	HEI	0.40	0.45	0.44	0.44	0.41	0.42	0.42	0.5
Sage Hen Cr.	HEc	0.57	0.56	0.57	0.54	0.56	0.57	0.54	0.4
	HEs	0.61	0.59	0.61	0.56	0.69	0.61	0.56	0.3
	HEr	0.40	0.54	0.55	0.55	0.45	0.49	0.49	0.5
	HEI	0.49	0.52	0.53	0.51	0.52	0.51	0.49	0.5
Stancliffe Cr.	HEc	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.4
	HEs	0.45	0.47	0.45	0.45	0.47	0.45	0.47	0.3
	HEr	0.32	0.40	0.43	0.43	0.35	0.39	0.39	0.5
	HEI	0.41	0.44	0.44	0.44	0.43	0.43	0.44	0.5

*HEf was included in total HEI calculations as a constant value of 0.40.

Direct, Indirect, and Cumulative Effects from Alternative One - No Action

Under this alternative, most values meet Forest Plan standards except for HEr in most of the winter and summer subwatersheds and HEs in Myrtle Creek-Summer. This indicates that road densities are cumulatively impacting big game habitat. The high number of open roads contributes to low HEr values in most subwatersheds. The effects of road densities on big game are discussed in "Open Road Densities and their Effects on Elk," above.

Note: *This amount does not include an additional 63 miles of roads that were designated for closure under "past" decisions. Many of these roads are drivable due, in part, to poor implementation of proposed treatments and poor tracking of actual accomplishments. Closure of these roads is still viable and is planned to occur regardless of this project's outcome.*

HEs in the Forest Service-managed portion of Red Hill (summer) meets standards, though HEs in the subwatershed as a whole does not meet standards. The lack of well-distributed cover on non-Forest Service system lands negatively affects elk habitat in this subwatershed.

Direct, Indirect, and Cumulative Effects Common to All Action Alternatives

Proposed commercial harvest would alter the amount of cover available and spacing of the remaining blocks. The amount of change would be a direct result on these variables depending on the intensity of commercial thinning and intermediate treatments. Precommercial harvest would not affect HEI variables since canopy cover and spacing would not measurably change.

Commercial harvest would cause a mixed response of HEc. Values would increase or decrease depending on the intensity of harvest in any particular subwatershed. Commercial harvest would cause a general downward trend in HEs depending on the intensity of harvest.

Road density is one of the variables that management can influence to offset changes in cover values. To improve HEr and HEI, road densities would need to be reduced. Road closures would occur across all subwatersheds, in both summer range and winter range. Proposed road closures would cause a very favorable response in HEr. Projected values would increase depending on the intensity of closures in any particular subwatershed. As each road is closed it would contribute to reaching projected HEI values. These closures would be implemented over a 5-15 year schedule. Some roads would be closed immediately while others needed for management access would be closed after completion of planned management activities. See Table 2-21, Chapter 2, for the project implementation schedule. The final value would only be realized when all proposed closures are completed and effective (approximately 5-15 years after the activities begin).

Reductions in year round road densities should improve big game habitat effectiveness as well as reducing the potential for human caused disturbance (use of road for transportation and access) in the watershed. HEI values represent the outcome upon completion of all proposed commercial harvest and road closures.

Direct, Indirect, and Cumulative Effects from Alternative Two – Proposed Action

This alternative analysis shows a mixed response in HEc, a general reduction in HEs, and improvements in HEr in all subwatershed divisions. All HEc values would remain above Forest Plan minimum standards. Commercial harvest would cause a general downward trend in HEs depending on the intensity of harvest. HEs in Myrtle Creek-summer is moved further below Forest Plan standards. HEs in Stancliffe, summer is moved below Forest Plan standards. All other values would remain above Forest Plan minimum standards. The only area that would fail to meet Forest Plan standards for HEr would be Stancliffe Creek (winter). Road closures in this area would increase HEr above existing conditions, but because of small size of the area and the retained road network, the projected value would still fall short of the minimum standard. All other projected HEr values would meet minimum standards and contribute to generally improves habitat effectiveness. Summer and winter range HEI for most subwatersheds would be improved (Tables 4-21 and 4-22), but Stancliffe Creek summer range HEI would drop below Forest Plan standards.

Changes to HEI

Commercial harvest would cause a mixed response on HEI. Values would increase or decrease depending on the intensity of harvest and road closures in any particular subwatershed. Final values for most subwatersheds would remain above Forest Plan minimum standards or be moved towards standards, except for in Stancliffe Creek (summer).

In the long-term, proposed activities would likely have a neutral effect on elk. Effective road closures would offset reductions in thermal and hiding cover. Elk would also benefit from improved forage. Based on the general improvement in HEI, the project area would continue to provide habitat for the estimated 250 adult summer elk that use the project area. No net change in the number of elk using the project area is expected due to this alternative. Proposed activities are not expected to permanently displace elk off the Forest.

Although cover is being reduced, habitat effectiveness improves in this alternative on both summer and winter range due to road closures. Elk might move from an area during treatments, but they are expected to return upon completion.

Direct, Indirect, and Cumulative Effects from Alternative Three

Existing conditions indicate that most variables are within desired ranges but HEr generally is below Forest Plan standards in the watershed. To improve HEr and HEI road densities need to be reduced. This alternative would show a general improvement in HEr and Total HEI in all subwatershed divisions.

Most values meet Forest Plan standards except for HEs, HEr, and HEI in Myrtle Creek (summer), HEr and HEI in Stancliffe Creek (winter), and HEI in Red Hill (winter). Because no cover would be removed, HEc and HEs would remain at existing values. Proposed road closures would cause a favorable response to HEr. Projected values would increase depending on the intensity of closures in any particular subwatershed. The only area that would fail to meet Forest Plan standards is Stancliffe Creek (winter). Road closures in this area would increase HEr above the existing conditions, but because of small size of the area and access needs, the projected value would still fall short of the standard. All other projected final values would meet standards and contribute to improving HEI.

Changes to HEI

HEI in Stancliffe Creek and Red Hill (winter) would remain below forest plan standards, but would be moved toward standards. HEI values for most remaining subwatersheds would also improve. With no harvest and with road closures, HEI values in all subwatersheds would meet or move toward Forest Plan standards, providing improved habitat for elk.

Similar to Alternative Two, the project area would continue to provide habitat for the estimated 250 adult summer elk that use the project area. No net change in the number of elk using the project area is expected due to this alternative.

Direct, Indirect, and Cumulative Effects From Alternative Four

Analysis shows a mixed response in HEc, a general reduction in HEs, and improvements in HEr in all subwatersheds. All HEc values would remain above Forest Plan minimum standards. HEs in Myrtle Creek (summer) existing condition is below Forest Plan Standards and would move further below, and Stancliffe (summer) would move below Forest Plan Standards. All other values would remain above Forest Plan minimum standards. The only area that would not meet Forest Plan standards for HEr is Stancliffe Creek (winter). Road closures in this area would increase HEr above the existing conditions, but because of small size of the area and the needed access, the projected value would still fall short of the standard. All other projected final values would meet standards and contribute to generally improving HEIs. Summer and winter range HEI for most subwatersheds would be improved, but Stancliffe Creek summer range HEI would drop below Forest Plan standards.

Changes to HEI

Final HEI values for summer range show a mixed trend in this total value. This is due to a general reduction in HEc and HEs across most cover blocks. Improvement in HEr would occur, but the level of change would not be enough to completely offset reductions in cover and spacing in all subwatersheds. Negative change in HEs, with a corresponding slight increase in HEr would cause Stancliffe Creek (summer) to move below Forest Plan standards.

Final HEI values for winter range show an upward trend in the value. Improvement in HEr would occur at a level that would help offset most reductions.

Similar to Alternative Two, based on the general improvement in HEI, the project area would continue to provide habitat for the estimated 250 adult summer elk that use the project area. No net change in the number of elk using the project area is expected due to this proposed alternative. Proposed activities are not expected to permanently displace elk off the Forest.

Direct, Indirect, and Cumulative Effects from Alternative Five

Analysis shows a mixed response in HEc and HEs, and minor improvements in HEr in all subwatersheds. All HEc values would remain above Forest Plan minimum standards. HEs in Myrtle Creek (summer) existing condition is below Forest Plan Standards and would move further below. All other values would remain above forest plan minimum standards. Under this alternative, there would be slight overall improvements in HEr, but the level of closures is insufficient to move several areas above standards.

Due to the limited amount of cover areas being entered under this alternative, habitat variables HEc and HEs showed only a small reduction in value in some subwatersheds, however, there was an increase in HEr in most areas. This positive response in the HEr was the result of closing or decommissioning open roads in both winter and summer range across the project area.

Changes to HEI

Commercial harvest with proposed road closures would cause a mixed response of HEI. Values would increase or decrease depending on the intensity of harvest and road closures in any particular subwatershed. Final values for all subwatersheds would remain above Forest Plan minimum standards or be moved towards standards. Proposed actions would benefit elk habitat.

Based on the improvement in HEI, the project area would continue to provide habitat for the estimated 250 adult summer elk that use the project area. No net change in the number of elk using the project area is expected due to this proposed alternative. Proposed activities are not expected to permanently displace elk off the Forest.

Direct, Indirect and Cumulative Effects from Alternative Six

Existing conditions indicate that most variables are within desired ranges but HEr generally is below standards in the watershed. To improve HEr and HEI road densities need to be reduced.

Because no cover would be removed, HEc and HEs would remain at existing values. Proposed road closures would cause a favorable response in HEr. Projected HEr values would increase in all subwatersheds, but Myrtle Creek (summer), and Red Hill, Sage Hen Creek, and Stancliffe Creek (winter) would continue to remain below Forest Plan standards for HEr.

Changes to HEI

HEI in Myrtle Creek (summer), and Boulder/Fawn, Stancliffe Creek and Red Hill (winter) would remain below forest plan standards, but would be moved toward standards. HEI values for most remaining subwatersheds would also improve. With no harvest and with road closures, HEI values in all subwatersheds would meet or move toward Forest Plan standards. Effects would be similar to those discussed under Alternative Three.

Direct, Indirect and Cumulative Effects from Alternatives Seven and Seven-A

Analysis shows a mixed response in HEc, a general reduction in HEs, and improvements in HEr in all subwatersheds. All HEc values would remain above Forest Plan minimum standards. Commercial harvest would cause a general downward trend in this HEs. HEs in Myrtle Creek (summer) and Stancliffe (summer) are moved lower or below Forest Plan Standards. All other values would remain above Forest Plan minimum standards.

Proposed road closures would cause a favorable response in HEr. Projected HEr values would increase in all subwatersheds, but Myrtle Creek (summer), and Red Hill, Sage Hen Creek, and Stancliffe Creek (winter) would continue to remain below Forest Plan standards for HEr. These alternatives show improved HEr values in both summer and winter and improved HEI in much of the winter and summer range. Summer and winter range HEI for most subwatersheds would be improved, but Stancliffe Creek (summer) HEI would drop below Forest Plan standards.

Changes to HEI

Final HEI values for summer range show a mixed trend in this total value. This is due to a general reduction in HEc and HEs across most cover blocks. Improvement in HEr would occur, but the level of change would not be enough to completely offset reductions in cover and spacing in all subwatersheds. Negative change in HEs, with a corresponding slight increase in HEr would cause Stancliffe Creek (summer) to move below Forest Plan standards.

Final HEI values for winter range show an upward trend in the value. Improvement in HEr would occur at a level that would help offset most reductions.

Similar to Alternative Four, the project area would continue to provide habitat for the estimated 250 adult summer elk that use the project area. No net change in the number of elk using the project area is expected due to these alternatives. Proposed activities are not expected to permanently displace elk off the Forest. Cover is reduced, but habitat effectiveness would improve in this alternative in most subwatersheds in summer and winter range due to road closures. Big-game animals might move from an area during treatments, but they are expected to return upon completion. Although cover would be reduced, the effect on big-game populations is not expected to be measurable.

Cumulative Effects

Natural conditions (low site potential and past fire history), past harvest and road activities, recent growth of trees in formerly non-forested areas, and increased stocking and changes in tree species composition due to past treatment or lack of treatment have lead to existing HEIs and HEI component values in the subwatersheds. The No Action alternative would likely reduce existing HEIs as canopy cover is reduced through natural mortality or stand-replacing fire (see the sections titled "Effects on Dedicated Old Growth and Replacement Old Growth" and "Effects on Late and Old Structure, Connectivity, and Fragmentation").

Past harvest (between 1982 to present) removed timber on about 15,000 acres in the Silvies Canyon project area. It's estimated that 6,000 to 10,000 of these acres may have provided marginal or satisfactory cover prior to harvest. Up to 6,000 acres of these past harvested areas have regrown or are close to regrowing into marginal cover. The proposed alternatives commercially and/or precommercially re-treat approximately 6,200 to 6,400 of these recently harvested acres. Much of this re-treatment is occurring in those areas that have regrown into marginal cover. Since these 6,000 acres are back to or close to being cover, there is no overlap in time of effects and therefore no cumulative effect on these 6,000 acres.

Alternatives Three, Five and Six would have no cumulative effect on elk through cover removal since a similar amount of cover would be available after Silvies Canyon treatments in the watershed (between 17,000 and 21,500 acres) as was present after post-1983 harvests (estimated at 15,500 to 19,500 acres). The remaining action alternatives would cumulatively add to the reduction of cover in the watershed by reducing cover to 13,600 acres (Alternatives Four, Seven and Seven-A) to 14,700 acres (Alternative Two). The degree of cumulative reduction is not considered substantial. Although cover is being reduced, habitat effectiveness improves in these alternatives on both summer and winter range due to road closures. Elk might move from an area during treatments, but they are expected to return upon completion. Although cover is being reduced, the effect on elk populations is not expected to be measurable.

Big game harvest, regulated by the State of Oregon, would continue to be the largest cumulative impact on deer and elk populations in the Silvies Canyon project area. Big game harvest is managed to maintain big game populations at objective levels set by the State. Elk have met or exceeded management objectives while mule deer remain stable, but below objectives, indicating that vegetative condition combined with big game harvest are cumulatively maintaining big game populations.

Action alternatives show a mix of increased and reduced HEIs. The reported HEI values would be maintained or slightly improved in the future as canopy cover increased. Treatments should improve elk forage, though this improvement would not show up in HEIs, as calculated here. There are no reasonably foreseeable activities planned or scheduled that would further impact HEIs. However, future maintenance treatments, if planned, would likely keep cover values at more sustainable levels, similar to those described in Alternatives Two, Four, Five, Seven and Seven-A. Since, in the past, the benefit of thermal cover to elk habitat may have been overestimated (Cook et al. 1998, Toweill and Thomas 2002), the removal of canopy cover in the action alternatives may cause less of an effect to elk than that suggested by other literature (Thomas 1979).

Cook et al. (1998) suggest that habitat managers should give more attention to forage relationships and vulnerability of ungulates to hunting and harassment when managing habitat for big game. Thermal cover would be lost in some action alternatives, but the action alternatives would improve elk forage and reduce elk vulnerability.

Effects on Calving and Fawning Habitat

A complete assessment of potential and currently used big game calving and fawning was not available for the project area. In general, calving areas are poorly defined in the watershed and transient depending on snow melt. There are no identified concentrated calving areas within the watershed. The full effects of these alternatives cannot be addressed but prescribed fire activities could have a direct impact on the structural component of calving and fawning habitat for the first few years. Then as vegetation begins to regenerate calving/fawning habitat should improve.

Effects from Alternative One – No Action

This alternative does not propose any treatments in potential calving or fawning habitat. Existing degraded hiding cover within these areas would remain in the short-term, but over time, insects and disease would naturally thin much of the remaining understory cover. This would limit effectiveness and function of cover for calving/fawning by big game. As tree mortality and insect outbreaks create open canopy condition, new understory cover would begin to develop. This increase in understory cover may provide improved security for newborn calves and fawns.

Effects Common to All Action Alternatives

In the short-term, potential or actual calving/fawning habitat may be altered by removal of understory trees. Pregnant deer and elk may have to alter their historical use patterns and find new suitable areas or utilize remaining cover. Some localized decreases in calf and fawn survival may result from competition for remaining habitat and/or utilization of poor quality habitat when other alternatives are not available. Retention of large down wood in treatment units and riparian vegetation adjacent to most units would offset some losses of understory cover from prescribed burning or other treatments. Since treatments won't occur in RHCAs (which are often used for calving/fawning) and since hiding cover would be retained in patches, these impacts would be limited in scope and very localized and would not affect overall reproductive success of local herds.

Over the next 15 to 40 years, the development of hiding cover would begin to offset the impacts of altered structural components within the burn blocks. As stands approach multi-canopy later seral stages, most of the habitat components needed to provide conditions for calving/fawning should become available. By initiating a 5 to 15 year burning cycle, the Forest Service could perpetuate these conditions over many years.

Young calves/fawns could be trapped and killed by fire, although losses would probably not be substantial. Ignition would not occur in category 1 and 2 RHCAs, which would help mitigate effects to calving and fawning habitat. Burning crews would watch for lone female elk, deer, or antelope. If crews see lone animals, they will search the immediate area for calves, fawns or kids and avoid lighting where newborns are found.

Effects on Migration And Travel Corridors

Direct, Indirect, and Cumulative Effects from Alternative One - No Action

This alternative does not propose any activities that would disrupt potential migration or travel corridors between cover and LOS stands. As habitat conditions along these corridors change under the influence of insects and disease, movement patterns may shift and naturally fragmented islands of habitat would be created that are not connected to adjacent habitat blocks.

Direct, Indirect, and Cumulative Effects Common to All Action Alternatives

These alternatives do not propose any activities that would disrupt potential migration or travel corridors. Proposed treatments would retain sufficient overstory cover to provide cover for most animals using the area. Overall, movement through the planning area would not be restricted or disrupted.

Effects on Mountain Shrubs

Effects of Alternative One – No Action

This alternative would have no direct impact on existing mountain shrubs. Existing stands of mountain mahogany would continue to decline in vigor in the short-term. With continued juniper encroachment and browsing pressure from both livestock and big game, most new growth on existing plants and seedling starts would continue to be suppressed.

Effects Common to Alternatives Two, Three, Four, Five, Seven and Seven-A

Most shrub patches (>1/4 to 2 acre) would be avoided during the burning operations. They would not be actively treated (ignited) with prescribed fire though a small amount of light intensity burning may occur on the fringes of these habitats. In these areas, shrubs would likely be killed, but burning would create a seedbed for shrub reproduction. Since 15% or less of these habitats within burn blocks are expected to burn (G. Mackey, pers. com.) and additional acreage of habitat occurs outside of burn blocks, effects to existing shrub habitats would be minor.

With the removal of overstory cover in many stands, woody vegetation previously suppressed would prosper under conditions that are more open. Additional moisture may also be available to shrubs, allowing for increased growth. The alteration of surrounding habitat after prescribed burning may result in decreased use by big game for up to two years, which could benefit shrub growth.

The density of juniper in the project area is low enough that juniper provides minimal quality and quantity of hiding cover. Removal of junipers would remove a minor amount of hiding cover, but would not affect thermal cover, since project area juniper does not provide thermal cover. Overstory and juniper removal should allow for increased growth of grass, forbs, and shrubs due to increased availability of water (Vegetation Specialists Report), which should increase forage availability for big game and livestock.

As big game acclimate to these changes in cover and as surrounding vegetation recovers over the next one to five years, the availability and use of these patches as hiding cover and browse should return to pre-treatment levels.

With increased openness, livestock would have improved access to these patches and may browse on available shrubs. This may result in high levels of competition of key forage plants including mountain shrubs.

Effects of Alternative Six

For shrubs, the effects of this alternative are expected to be similar to the other action alternatives. This alternative is expected to have minimal affects on juniper because burning would not effectively remove juniper. Effects of juniper treatment from Alternative Six would be similar to Alternative One.

Big Game Management Objectives

Effects of Alternative One – No Action

In the short-term, there would be no change in the numbers of elk and deer using the area. The vulnerability of big game to human-caused disturbance and hunting pressure would remain at current levels.

If cover conditions deteriorate as predicted, local habitat quality and quantity could be reduced. This would result in a slight reduction in the local carrying capacity and a possible decline in local herd size. This condition would continue until cover develops from remaining healthy or degraded cover.

Effects Common to All Action Alternatives

The alternatives address ODFW's concerns on variables limiting deer and elk habitat to varying degrees. All action alternatives would reduce human disturbance through road closures and would likely improve forage and shrub components, though cover components would be reduced to varying degrees. Hiding cover would be maintained at historical levels. In connectivity corridors (see Map #28), 50% of current hiding cover would be retained with most of this left unburned; in other areas, 5-20% of areas designated for precommercial thinning would be left unthinned to provide additional hiding cover (see Chapter 2, Design Features). Following prescribed burning, hiding cover is expected to be retained on at least 5-10% of treated areas. Existing hiding cover would be available in untreated areas. The effects of these alternatives on local big game populations were discussed in the preceding sections. The ability of the area to contribute to big game MOs established for the area should not measurably change. It is expected that under all alternatives, there would be no change in the numbers of elk and deer using the area.

Summary of Cumulative Effects to Big Game

Cumulative Effects Common to All Alternatives

As described under existing conditions, past treatments have reduced [thermal] cover in some subwatersheds; fire suppression in combination with a lack of treatments has increased cover in many subwatersheds. The risk of stand replacing fire has been reduced by some past treatments and increased by others. Stand-replacing events would result in the loss of most thermal and hiding cover in the area. While burned over areas are used by big game for foraging, the loss of forest habitat would impact local big game and many other species of wildlife.

Ongoing activities, in addition to fire suppression, would continue to affect big game and big game habitat. Road closures of 63 miles of road (under other decisions) would bring HEI values to those displayed under the existing condition, but road densities and HEI values would remain above Forest Plan standards.

Permitted livestock grazing would continue in the area. Appropriately managed livestock grazing can be compatible with big game management. In 1996, Myrtle, Devine and West Myrtle Allotments were assessed for the issuance of term grazing permits. In these NEPA documents, the effects of continued grazing on big game was assessed. The resulting EAs were developed to provide for continued recovery of riparian vegetation, provide for better control and distribution of livestock, and balance wildlife needs for forage with that allocated for livestock. Other allotments within the watershed are currently being managed under existing Allotment Management Plans and Annual Operating Plans.

Cumulative Effects from Alternative One - No Action

Lack of treatment in combination with ongoing management would allow many big game habitat components (cover, road densities) to remain below or go below Forest Plan standards.

Cumulative Effects Common to All Action Alternatives

Big game habitat conditions are expected to improve in the long-term because of these alternatives. This would be accomplished through a combination of restoring forest vegetation to more historical conditions and reintroducing fire into the landscape (thus creating more and higher quality forage), reducing road densities, and reducing noxious weeks.

Past vegetation management activities have reduced (thermal) cover in the project area and these project activities will continue that trend (though to a much lesser degree for Alternatives 3 and 6). Since, in the past, the benefit of thermal cover to elk habitat may have been overestimated (Cook et al. 1998, Toweill and Thomas 2002), the removal of canopy cover in the action alternatives may cause less of an effect to elk than that suggested by other literature (Thomas 1979)

Cook et al. (1998) suggest that habitat managers should give more attention to forage relationships and vulnerability of ungulates to hunting and harassment when managing habitat for big game. In combination these projects move the area toward a more healthy, sustainable forest that provides for all the needs of big game including more and higher quality forage and lower road densities. The planned activities will generally improve elk and mule deer habitat conditions through silvicultural practices that benefit wildlife though an amended Forest Plan Standards (for Alternatives Two, Four, Five, Seven and Seven-A) will be necessary.

Proposed burning activities would have additive and synergistic beneficial effects with past burning activities implemented under the Silvies South and other prescribed burns. Proposed burning will result in up to 39,300 acres burned inside the watershed. This is in addition to the approximately 7,000 acres already burned under other projects. Burning would occur in landscape level blocks ranging in size from about 900 acres to almost 7,800 acres. Within each block, burning would likely actually treat 40 to 70 percent of the total area. Burning would occur over the next 5 to 15 years. With staggered burning, not all acres would be impacted during the same burning season (see Implementation Schedule, Table 2-21, Chapter 2).

Short-term adverse effects from burning may result in additional loss of hiding cover, green trees, shrubs and wildlife trees. The long-term beneficial effect would be a reduction in the potential for stand replacement wildfire in the watershed, and improvement in forage quality and quantity.

Proposed road management activities associated with this project would have synergistic beneficial effects with road closures occurring under other decisions (considered as part of the existing condition) and with proposed vegetation management. In most areas, road closures would offset changes to cover (thermal and hiding). Road closures and decommissioning would result in a reduction in local road densities, improved habitat effectiveness, and reduced vulnerability throughout the area.

Ongoing weed treatments as well as treatments proposed in the action alternatives would benefit all wildlife by creating space for native or desired plants.

Each of the individual responses discussed above can be subjectively evaluated as favorable or deleterious. However, the most comprehensive appraisal of each alternative should look at responses collectively. The prominent preharvest stand feature was excessive tree density that had resulted in reduced overstory vigor from competitive stress, diminished health and cover of understory vegetation, and continuous ladder and crown fuels that would support stand-replacement fires. Thinning of the overstory and understory trees in excess of that needed to provide structure to the stand is essential to overcome competitive stress among desired trees, rejuvenating understory vegetation, and reducing the threat of stand replacement wildfire.

The seemingly negative specific responses described above can be viewed as necessary consequences of forest restoration that impact site features in a manner thought to resemble that of historical fires.

All actions produce an array of changes to the landscape ranging from transient to long-term, some of which would be considered positive and some negative. It is unlikely that the impacts of any alternative would reduce the overall persistence rating for big game species.

Likelihood Of Persistence

Rocky Mountain elk and mule deer are currently well distributed across western North America with few if any isolated populations. Interaction between populations, reproductive success, and survival is high and human activities pose few threats to their continued existence. The likelihood of persistence is high.

Effects of Roads on Wildlife and Habitat

Wisdom et al. (1999a) identified 13 major road-associated factors that negatively affected habitat or terrestrial wildlife found throughout the Interior Columbia Basin (Table 4-23). Most of these effects can be seen at some level in the Silvies Canyon Watershed. Effects of these factors can be direct, such as habitat loss and fragmentation, or indirect, such as population displacement or avoidance in areas near roads in relation to motorized traffic and associated human activities. Some roads were closed specifically to benefit the wildlife resource (see Appendix A); however, no site-specific data linking certain roads to negative impacts were available.

Disturbances are caused by roads themselves and by the increased contact with humans that they provide. Roads disturb wildlife habitat in a number of different ways, favoring some species while harming others. Roads offer a competitive advantage to disturbance-adapted species, which typically do not need such an advantage, while creating "sink habitat" for others; roads create both edge habitat and habitat fragmentation. Roads serve as corridors for pests and non-native plant species, but also sever the travel corridors used by some species. Road construction and failed culverts threaten aquatic populations in some areas with increased silt and sediment. The effects of human contact with wildlife range from animals being killed to habitat being destroyed by human-caused fires.

Table 4-23. Road-associated Factors that Negatively Affect Habitat or Terrestrial Wildlife

Factor	Effect
Snag Reduction	Removal of large snags for safety and for firewood.
Down Log Retention	Loss of down wood due to loss of snags removed for safety and for firewood.
Habitat Loss and Fragmentation	Loss and fragmentation due to establishment and maintenance of roads and road right-a-ways.
Negative Edge Effect	Creation of linear edge created by the road.
Overhunting	Non-sustainable or non-desirable legal harvest by hunting, as facilitated by road access. This can be compensated by controlling the number of hunting permits issued for a given area.
Overtrapping	Non-sustainable or non-desirable legal harvest by trapping, as facilitated by road access.
Poaching	Increased illegal take, as facilitated by road access
Collection	Collection of live animals for pets, as facilitated by the physical characteristics of roads or by road access.
Harassment or Disturbance	Increased disturbance at specific use sites due to human or motorized activities, as facilitated by road access.
Collisions	Death or injury resulting from a motorized vehicle running over or hitting an animal on a road.
Movement Barrier	Interference with dispersal, migratory or other movements as posed by a road itself or by human activities on or near a road or road network.
Displacement or Avoidance	Spatial shifts in populations or individual animals away from a road or road network in relation to human activities on or near a road or road network.
Chronic Negative Interaction with Humans	Increased mortality of animals due to increased contact with humans, as facilitated by road access.

Transportation System Management and Select Groups or Habitats

Temporary road construction facilitates temporary use of an area. When temporary roads are built and used, wildlife may be disturbed and collisions can occur. Habitat may be altered in the road prism. Only Alternatives Two, Four, Five, Seven, and Seven-A would have effects from temporary roads. Due to the limited amount of temporary roads proposed (2.8 to 3.5 miles), effects would be limited. In addition, roads would be closed after use and reseeded, reducing the potential for long-term effects to wildlife based on use by humans, fragmentation, and loss of forage.

Road closures reduce impacts on wildlife to varying degrees. A seasonally closed road will affect wildlife similar to an open road during the time it is open, but will reduce effects when closed. A closed road is not expected to result in effects from interactions of vehicles and wildlife (such as collisions); however since the road prism still exists, the road itself may still be a movement barrier to small mammals and people may still walk on it to hunt or recreate. Decommissioned roads reduce all road impacts to near pre-road condition because, after revegetation, the road resembles its surroundings and no longer looks like or functions like a road.

Forest Carnivores

Development and use of roads is a primary factor that influences distribution and abundance of most carnivores (Quigley and Arbelbide 1997).

Black bear, mountain lion, coyote, lynx and wolverine all show a negative response to high road densities (Joshlin and Youmans 1999). Effects of roads on carnivores and their habitat includes direct mortality from vehicle collisions, access for hunting and trapping, habitat fragmentation, species displacement and avoidance, reduction of habitat effectiveness, and direct loss of habitat to road and right-of-way construction and maintenance (Ruediger 1999, Joslin and Youmans 1999, Witmer et al. 1998).

The impacts of roads on carnivores are exponential, based on the road standard. As road standards are increased, there is generally an increase in road use and an increase of possible impacts. Open "local" roads generally have a "Moderate" impact on carnivores, unpaved main access roads have a "Moderate to High" impact, and paved 2-lane roads have a "High" impact (Ruediger 1999). At the "High to Very High" level, some carnivores may be excluded from the affected ecosystem. Roads also act as barriers to movement for some species. The effects of roads on animal movements are not well documented for species other than gray wolves and grizzly bears.

Reductions in year round road densities should improve habitat effectiveness, thereby improving the potential forage base for large forest carnivores as well as reducing the potential for human caused disturbance in the area. In general, the reduction in road densities should result in a reduction in potential human-animal conflicts.

Effects of Alternative One – No Action

Year-round road densities would remain at current levels (range from 5.1 to <0 mi/mi^2 depending on subwatershed).

Effects of the Action Alternatives

There would be a decrease in human access and a potential decrease in human-carnivore encounters relative to the road reductions discussed in the section titled "Open Road Densities and their Effects on Elk," above. Lower road densities would lead to decreased potential for legal taking, poaching, road kill, and incidental mortality.

Snags/Woodpeckers

The Malheur National Forest allows the taking of firewood for personal use as well as commercial sale. While some firewood is provided by blowdown, the majority appears to come from standing dead trees. Permitted personal use firewood cutting is allowed between the beginning of May and the end of November, but special permit cutting may be allowed in winter and spring. Firewood cutting can occur on much of the Forest. In areas with high open road densities and easy access, the likelihood that large numbers of snags will be felled for firewood increases. This has the potential to remove a good deal of shelter, food or reproduction habitat used by many species of birds, mammals and amphibians.

Access tends to dictate where woodcutters will cut snags; therefore, a reduction in open road densities would contribute to higher retention of snags in areas where road closures and decommissioning reduces access.

There is a demand for firewood and a reduction in access does contribute to higher competition between firewood cutters for available snags. This competition can lead to an increase in snag removal in more accessible areas and from restricted areas, during closed portions of the years and without permit or in excess of permit.

Effects of Alternative One – No Action

Year-round road densities for roads would remain at current levels. Removal of snags for firewood and safety would remain at current levels.

Effects of All Action Alternatives

There would be a general decrease in human access and a decrease in the number of snags removed for firewood and safety in the closed areas. The level of change is discussed in the above section. Increased snag removal would likely occur along roads left open.

Effects on Proposed, Endangered, Threatened and Sensitive Species

Surveys were conducted to determine if proposed, endangered, threatened and sensitive (PETS) species are present in the planning area, and in some cases, surrounding areas. If plant, animal, or suitable habitat presence was identified, management actions were analyzed to determine if activities would:

- Likely jeopardize the continued existence, or cause adverse modification of habitat, for species listed or species proposed to be listed as endangered or threatened by the U.S. Fish and Wildlife Service, or
- Contribute to the loss of viability of species listed as sensitive by Region 6 of the Forest Service, or any native or desired non-native species; or cause any species to move toward federal listing.

The Biological Evaluation/Biological Assessment made the following findings:

Table 4-24. Summary of Effects on PETS Species.

Species	Alt One No Action	Alt Two Proposed Action	Alt. Three	Alt Four, Seven and Seven A	Alt Five	Alt Six
gray wolf (**T**)	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
bald eagle (**T**) - nesting	**NE**	**NLAA**	**NLAA**	**NLAA**	**NLAA**	**NLAA**
bald eagle (**T**) – potential roosting	**NE**	**NE**	**NE/BE**	**NE/BE (NE-7A)**	**NE/BE**	**NE/BE**
lynx (**T**)	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
wolverine (**S**)	**NI**	**NI**	**NI**	**NI**	**NI**	**NI**
pygmy rabbit (**S**)	**NI**	**NI**	**NI**	**NI**	**NI**	**NI**
peregrine falcon (**S**)	**NI**	**NI**	**NI**	**NI**	**NI**	**NI**
western sage grouse (**S**)	**NI**	**MIIH**	**MIIH**	**MIIH**	**MIIH**	**MIIH**
gray flycatcher (**S**)	**NI**	**MIIH**	**MIIH**	**MIIH**	**MIIH**	**MIIH**
bufflehead (**S**)	**NI**	**NI**	**NI**	**NI**	**NI**	**NI**
Columbia spotted frog (**S**)	**NI**	**MIIH**	**MIIH**	**MIIH**	**MIIH**	**MIIH**

P = *Proposed*, **E** = *Endangered*, ***T*** = *Threatened*, **S** = *Sensitive*
NI = ***N****o* ***I****mpact*, ***NE*** = ***N****o* ***E****ffect*, ***BE*** = ***B****eneficial* ***E****ffect*
NLAA = *May Effect –* ***N****ot* ***L****ikely to* ***A****dversely* ***A****ffect*
MIIH = ***M****ay* ***I****mpact* ***I****ndividuals or* ***H****abitat,*
but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species.

Full disclosure of effects on PETS species are addressed in the Silvies Canyon Watershed Restoration Project Biological Evaluation/Biological Assessment (Appendix C).

Gray Wolf

Alternative One (No Action)

Due to the nature of the No Action alternative, and the fact that there are no wolf populations currently occupying the Malheur National Forest and no denning or rendezvous sites on the Malheur National Forest, there would be **NO EFFECT (NE)**. There are potential indirect, long-term effects from potential large-scale insect and disease outbreaks infestation and catastrophic wildfire that could occur because of not addressing current forest heath issues. The magnitude and timing of these potential impacts are unknown, but they could drastically modify potential wolf and big game habitat conditions for many years to come.

Action Alternatives

The determination for all action alternatives is **NO EFFECT (NE)** for the following reasons:

- There is an abundance of prey on the forest and timber, fuel management, and other proposed actions (juniper reduction, aspen restoration) are not expected to affect big game populations measurably; therefore prey availability is not a limiting factor.
- No wolf populations currently occupy the Malheur National Forest.
- No denning or rendezvous sites have been identified on the Malheur National Forest.
- Road closures would increase seclusion habitat and reduce the potential for wolf/human interactions.
- Most management activities for non-breeding populations are compatible with wolf protection and recovery.

Bald Eagle

Alternative One (No Action)

Because no proposed actions would occur in the No Action alternative, there would be **NO EFFECT (NE)** to nesting bald eagles, bald eagle nest habitat, or potential roosting habitat. However, there are potential indirect, long-term effects to habitat from probable high intensity wildfire that could occur because of not creating resilient forest ecosystems. The magnitude and timing of this potential impact is unknown, but it could drastically modify nest and roost stands and could remove nest and roost trees.

Action Alternatives

A Biological Assessment for bald eagle was completed and signed in May 2001 for commercial thinning on 29 acres and precommercial thinning on 144 acres in the BEMA, as well as the remaining activities occurring in Alternative Seven of the Silvies Canyon Watershed Restoration Project. A letter of concurrence, dated September 26, 2001, was received from the USDI Fish and Wildlife Service for this determination.

Implementation of any Action alternative (Alternatives Two, Three, Four, Five, Six, Seven and Seven-A) **MAY EFFECT but is NOT LIKELY TO ADVERSELY AFFECT (NLAA)** nesting bald eagles or occupied nesting habitat (Silvies River Nest Site #807-009). Vegetation management and fuels treatments are designed to lower the risk of wildfire initiating in forest stands adjacent to the nest stand and moving into and impacting bald eagle nesting habitat. Impacts would be greater in Alternatives Four, Seven and Seven-A than the actions on which consultation was completed, so further consultation would be needed to implement the treatments in these Alternatives in BEMA habitat. Other proposed actions would not occur within close proximity to the nest stand and would not affect bald eagles. There are inherent risks whenever forest structure is altered and when fire is used in an uncontrolled setting; however, timing of entry and careful use of fire would limit the risk to a very low level. With incorporation of mitigation measures, no adverse effects should result from implementation of the proposed actions. Potential effects from disturbance are based on a low level of risk and may not occur at all.

Implementation of restoration treatments proposed by Alternatives Three, Four, Five, Six, and Seven within the Silvies River and Myrtle Creek potential winter roosts would have **NO EFFECT** on bald eagles in the short-term. Vegetation management and fuels treatments are designed to lower the risk of stand replacement fire in these areas that could otherwise adversely affect habitat structure important for roosting. Stand restoration may have a long-term **BENEFICIAL EFFECT** on potential bald eagle winter roosting habitat by improving stand conditions.

The effect to potential roost habitat in Alternatives Two and Seven-A would be the same as for Alternative One (No Action) – **NO EFFECT** on bald eagles.

Lynx

All Alternatives

From a review of currently available research, lynx habitat was always found in association with spruce and subalpine fir habitats (Ruggiero et al. 2000). This watershed lacks any association with spruce or subalpine fir, is too dry and the site potential too limited to provide anything more than poor lynx foraging habitat or marginal connectivity/dispersal habitat. The closest area of possible lynx habitat is located over 22 miles to the north.

Research indicates that lynx need at least 15 square miles (9,600 ac) of low-hare-density habitat to support a functional home range (Ruediger et al. 2000, pg. 1-5). Reudiger et al. (2000, pgs. 7-3 through 7-4) go on to recommend that Lynx Analysis Units (LAUs) should be 16,000-25,000 acres in contiguous habitat; at least 10 mi^2 (6,400 ac) of primary vegetation should be present in the LAU to support survival and reproduction. With less than 1,400 acres of habitat available in the entire 65,000-acre watershed (294 acres of primary habitat and 1,011 of secondary habitat), the Silvies watershed/project area does not provide enough habitat to sustain a lynx home range. Throughout all versions of lynx habitat analysis, the Silvies Canyon project area was never in an LAU and was never considered to be lynx habitat because of the lack of adequate habitat. In addition, this project area is not within or adjacent to a Malheur or Ochoco National Forest LAU.

Many of the lynx records in the contiguous United States, including Oregon, are of transient animals that dispersed during cyclic population increases. Animals that are considered dispersing and found in unsuitable habitat are considered lost from the metapopulations; therefore, they are unlikely to survive unless they return to the boreal forest (USFWS 2000).

Although there is one confirmed sighting and other unconfirmed sightings in Grant and Harney Counties, there is no indication that lynx regularly occur in or use the project area. The likelihood of lynx using or frequenting the area is expected to be very low due to the lack of lynx habitat.

Since there is not sufficient habitat in this watershed to consider this area as contributing to lynx habitat and since no lynx are expected to inhabit the project area, all alternatives would have **NO EFFECT (NE)** on lynx.

Wolverine

Alternative One (No Action)

Due to the nature of the No Action alternative, and fact that wolverine are not known to inhabit the area, Alternative One would have **NO IMPACT (NI)** on wolverine or wolverine habitat. There are potential indirect, long-term effects from potential large-scale insect and disease outbreaks infestation and catastrophic wildfire that could occur because of not addressing current forest heath issues. The magnitude and timing of these potential impacts are unknown, but they could drastically modify potential wolverine habitat conditions for many years to come.

Action Alternatives

Wolverine dispersal habitat and prey species would be maintained. The potential benefit of reduced road densities or negative impact of disturbance is extremely small and would not be measurable. Because wolverine are not known to inhabit the area, because the project area is not remote, provides no denning habitat, and provides only travel/dispersal habitat, and because activities will not affect dispersal habitat, these alternatives would have **NO IMPACT (NI)** on wolverine or wolverine habitat.

Pygmy Rabbit

Alternative One (No Action)

Because of low habitat potential and the low likelihood of pygmy rabbit occurrence in these areas there would be **NO IMPACT (NI)** from implementation of any alternative.

Action Alternatives

Because these sites are already considered to have low habitat potential, any activities that alter vegetation structure or availability would not likely further reduce its potential. Because of this low habitat potential and the low likelihood of pygmy rabbit occurrence in these areas there would be **NO IMPACT (NI)** from implementation of any action alternatives.

Peregrine Falcon

Alternative One (No Action)

Because there are no peregrine falcons present in the project area and because proposed actions would not occur in the No Action alternative, there would be **NO IMPACT (NI)** to peregrine falcons or their habitat.

Action Alternatives

There is potential habitat for peregrine falcons in the project area, but monitoring has shown that this habitat is not occupied. Because no peregrine falcons are known to be currently using the area, activities would have no effect on this species. While no peregrines are known to be present, the highest potential for effects to peregrines would come from disturbance during treatments (including precommercial thinning, commercial harvest, and prescribed fire-other treatments such as aspen and spring restoration, and road decommissioning would not occur near the nest cliff).

Peregrine falcons are sensitive to disturbance near the nest cliff during the breeding season (February 1 – August 15), but are most sensitive prior to egg laying (USDI Fish and Wildlife Service 1982). If this species were found to be nesting in the project area, activities would be restricted within one mile of the nest from 2/1 – 8/1 (Pagel 1990).

Because there are no peregrine falcons present in the project area and falcon habitat would not be altered there would be **NO IMPACT (NI)** to peregrine falcons or peregrine falcon habitat by the implementation of any alternative.

Western Sage Grouse

Alternative One (No Action)

Because no proposed actions would occur in the No Action alternative, there would be **NO IMPACT (NI).**

Action Alternatives

Most proposed vegetation management would not affect this species, but some activities are expected to provide minor benefits to potential late brood-rearing habitat and potential nesting habitat. Juniper reduction in lower elevation dry ponderosa pine/shrub steppe areas may increase the availability of late brood-rearing habitat by removing encroaching conifers from historically non-forested areas.

There are no known leks within the project area. While nesting birds have not been observed in the project area, 938 acres of potential nesting habitat occur within two miles of a reported lek. If it is determined that nesting occurs in the project area, prescribed burning in any areas with known nesting sage grouse would be done during the fall to eliminate the potential to affect nesting sage grouse. Prescribed fire would be allowed to creep into up to 15% (in area) of sagebrush stands. These measures would avoid affects on nesting sage grouse and would have a minor benefit on nesting habitat by creating a mosaic of sagebrush and grassland habitat in treated areas (Kilpatrick no date, Call and Maser 1985). Activities may disturb undetected sage grouse, but individuals would be able to move to escape fire or other disturbances.

Due to the potential for impacts, the action alternatives **MAY IMPACT INDIVIDUALS AND THEIR HABITAT, BUT WILL NOT LIKELY CONTRIBUTE TO A TREND TOWARDS FEDERAL LISTING OR CAUSE A LOSS OF VIABILITY TO THE POPULATION OF THIS SPECIES (MIIH)**. Potential impacts are minor and would be an overall benefit to this species. The level of proposed treatment represents only a small percent of sagebrush habitat available in the watershed. At this level, restoration would be slightly increased at the local level, but not at the landscape level.

Gray Flycatcher

Alternative One (No Action)

Because no proposed actions would occur in the No Action alternative, there would be **NO IMPACT (NI)** directly resulting from this alternative.

Without vegetation treatment, junipers would continue to dominate some sites, reducing or preventing shrubs from re-establishing. Open juniper woodlands have the greatest potential for maximum structural diversity and habitat potential when all layers are present (Miller 1999). Over the long-term, maintaining juniper-dominated sites would fail to restore the resilient, healthy shrubland habitat that favors the gray flycatcher and other open-grassland and shrub-steppe adapted species.

There are potential indirect, long-term effects from probable high intensity wildfire that could occur because of not creating resilient forest and shrubland ecosystems. The magnitude and timing of this potential impact is unknown, but it could drastically modify large areas of arid woodland shrublands and low elevation ponderosa pine habitat. The loss of sagebrush and other shrubs from stand-replacing fire would adversely impact gray flycatchers in the short term. As the shrub and understory layers recover from the effects of a fire, this species would benefit from the creation of relatively treeless grassland/shrub-steppe areas.

Direct and Indirect Effects of Alternative Six

The low to moderate intensity burning proposed in these alternatives is not expected to reduce larger juniper. Without a substantial reduction in the density of junipers, gray flycatcher habitat would not change significantly. Effects would be similar to Alternative One.

Other Action Alternatives

Gray flycatchers would be vulnerable to loss of nest productivity from juniper removal if the activities occurred during the nesting season. Nests, eggs and nestlings could be destroyed and brooding adults could be killed during felling operations (OR-WA PIF 2001). In most cases, adult birds can escape. Juniper stands to be treated would be treated outside the nesting season or would be monitored for gray flycatcher nests, and nest trees would be protected to reduce the potential for direct effects. Proposed treatment should improve habitat for open-grassland and shrub-steppe adapted species including gray flycatchers. Thinning of juniper would likely reduce belowground competition and increased availability of soil water and nutrients to shrubs and grasses (Bates et al. 1999). This would improve foraging habitat by increasing spacing between trees, which would encourage development of sagebrush, grasses and forbs.

Under these alternatives, prescribed fire would be used as a follow-up treatment to reduce natural fuels, kill off additional young juniper in the understory, and release stored nitrogen into the system. Because of limited continuity of fuels, low to moderate burning should have little effect on remaining mature and old growth junipers, grasses, or forbs. Burning under these site conditions should result in a mosaic burn that would enhance habitat conditions for the gray flycatcher.

Due to the potential for impacts, the action alternatives **may impact individuals and their habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population of this species**. Potential impacts are minor and would be an overall benefit to this species. The level of proposed treatment represents only a small percent of juniper habitat available in the watershed. At this level, restoration would be slightly increased at the local level, but not at the landscape level.

Bufflehead

This species does not breed in the Silvies Canyon Watershed therefore there would be **No Impact (NI)** to breeding birds regardless of the alternative selected.

This duck can be found in the watershed during the fall and possible spring migration and some birds may overwinter depending on the availability of open water. Proposed alternatives would not alter overwintering habitat used by the bufflehead. There would be **No Impact (NI)** to non-breeding birds regardless of alternative selected.

Columbia Spotted Frog

Alternative 1 (No Action)

There would be **NO IMPACT (NI)** directly resulting from the No Action alternative, but there are potential minor indirect, long-term potential effects from insects, disease, and stand-replacement wildfire because of not addressing current forest heath issues. The timing and extent of these effects is unknown.

Action Alternatives

Timber harvest activities are not planned in wet habitats used by spotted frogs. Little or no effect to frogs or frog habitat is expected from these treatments. Prescribed burn treatments and road activities have the potential to affect frogs and their habitat, though the effect is expected to be minimal. Spring and cottonwood restoration should improve water quality and may improve habitat, but the effects to frogs are not expected to be measurable. Spring developments would not dewater springs, so no effect to frog hibernation habitat is expected. Due to the potential for impacts, the action alternatives **MAY IMPACT INDIVIDUALS AND THEIR HABITAT, BUT WILL NOT LIKELY CONTRIBUTE TO A TREND TOWARDS FEDERAL LISTING OR CAUSE A LOSS OF VIABILITY TO THE POPULATION OF THIS SPECIES (MIIH)**.

Effects on Management Indicator Species

Federal Regulations (36 CFR 219.27 (a)(6)) requires that all management prescriptions shall provide for adequate fish and wildlife habitat to maintain viable populations of existing native vertebrate species and provide that habitat for species chosen under §219.19 is maintained and improved to the degree consistent with multiple-use objectives established in the plan.

Federal Regulation (36 CFR 219.19(a)) requires that each alternative shall establish objectives for the maintenance and improvement of habitat for management indicator species selected under paragraph (a)(1) of this section, to the degree consistent with overall multiple use objectives of the alternative.

Effects to Rocky Mountain elk are discussed in the section titled "Effects on Big Game and Big Game Habitat."

Effects on Indicators of Old Growth and Late- and Old-Structure Habitat

See sections titled "Effects on Dedicated Old Growth and Replacement Old Growth" and "Effects on Late and Old Structure, Connectivity, and Fragmentation" for a discussion of the effects of the alternatives on habitats used by the indicators of old growth and late- and old-structure habitats.

Pileated Woodpecker

Effects of Alternative One – No Action

Untreated stands that are experiencing reduced vigor and stand health would continue to be influenced by overstocking, fire exclusion, and drought, insect and disease related mortality.

Unless a stand-replacing event occurs, these stands should continue to provide marginal foraging habitat for resident pileated woodpeckers in the next 30 years.

The expected outcome within the foreseeable future in LOS is removal of old-forest characteristics due a stand-replacing event. Pileated woodpeckers would not have a favorable response to stand-replacing events, which would create abundant pileated woodpecker foraging opportunities, but would reduce the quality and amount of nesting habitat (Smith 2000). In such an event, large blocks of habitat that support pileated woodpeckers could be drastically altered or lost for 120 years or more.

Increased snag densities generated as LOS and old growth habitat deteriorates would benefit pileated woodpecker. However, benefits would only last for 30 years, and would come at the cost of reduced levels of large live trees.

In years with high tree densities and canopy closure (during years of low insect densities), stand structure will make these stands more suitable for pileated woodpeckers; in years of insect and disease outbreak, and subsequent defoliation, reduced canopy closure would make these stands less suitable for pileated woodpecker nesting, but still suitable for foraging.

Without an old growth and replacement old growth management strategy to maintain conditions that meet the requirements of pileated woodpecker, local viability of this species would be reduced until adjacent stands develop into LOS or until forests recover from stand-replacing events.

Effects Common to All Alternatives

Adjusted DOGs, designated/managed ROGs, and managed feeding areas should provide suitable nesting and foraging habitat capable of supporting an estimated 6-7 pair of pileated woodpeckers in the short and mid-term.

The proposed designation of five pileated woodpecker feeding areas (PWFAs) would meet Malheur Forest Plan standards (pg. IV-30, #49) for five old growth units. PWFAs and the areas in proposed ROGs (ROGs are included in the PWFAs) would equal 300 or more acres. These areas would be managed to meet the Forest Plan standard, as amended, for snags (2.39 21" or larger snags/acre). Within ROGs, the retention of snags and down logs and the mitigation that creates snags would allow these areas to provide feeding habitat for pileated woodpeckers (see effects of treatments on ROGs). The remainder of designated PWFA acreage is outside of proposed harvest units, but is mostly within prescribed fire fuel blocks (non-ROG acres of 02039 are not planned for burning). Effects to snags and down logs from burning are described in the pileated woodpecker section under Fuel Treatments. PWFAs are expected to continue to provide foraging habitat similar to existing levels. PWFA designation should not affect other wildlife species since it would not change the existing or proposed management of these areas.

These alternatives defer designation of a PWFA for DOG 02015PW. No suitable adjacent areas exist in Silvies Canyon Watershed.

Road closures in and outside DOGs could benefit pileated woodpeckers by reducing the number of snags cut for firewood. Other activities would have no measurable effect on pileated woodpeckers because treatments would occur outside habitats normally used by pileated woodpeckers.

LOS stands would be entered but forest structure would not be substantially altered, so existing conditions would persist in these stands. These areas may provide small patches of marginal nesting and foraging habitat capable of supporting one or more breeding pairs.

Direct and Indirect Effects of Alternatives Two, Four, Five, Seven and Seven-A

Silvicultural prescriptions for most units focus on commercial thinning or select harvest of conifers up to 21" dbh while retaining large, old-growth structural components and regenerating stands with early seral pine. Mechanical treatment would focus mainly on suppressed understory trees. Large and mid-story trees would be retained to provide horizontal and vertical structure to the stand. Snag habitat would be maintained at or near current levels under these alternatives.

Long-term management would strive to provide ponderosa pine forests with two or more canopy layers or younger forests that contain mature or old growth remnants and snags at or near Forest Plan standards. Average basal area after logging should be at about 60 ft^2/ac (plus or minus 20 ft^2/ac), a basal area substantially higher than the 10-25 ft^2/ac that Tiedemann et al. (2000) discussed.

In LOS stands (outside of DOGs) changes in general forest stand structure would be reflected in a reduction of canopy closure (by an estimated 20-40%), stand density, and stand level structural complexity. Managed stands would retain important old growth structural components, but may be less suitable as optimal pileated woodpecker nesting and foraging habitat. All treated LOS would retain key foraging structures so the overall availability of foraging habitat should not be substantially diminished.

While none of the action alternatives would cut snags (other than snags that pose an immediate hazard), Forest Plan snag levels would not be met because several areas do not currently meet Forest Plan snag levels (2.39 snags/ac. 21" dbh and larger).

Existing snag densities (averaging one snag per acre 15" dbh or larger) and even Forest Plan standard snag levels may not be sufficient for pileated woodpeckers. The project area is below DecAID's 50% tolerance level for snag density for pileated woodpecker (Mellen et al. 2003). However, information from Gunderson (A.G. Gunderson [USDA Forest Service] pers. comm. 2003) suggests that the drier parts of this project area (south and west exposures, moderate to steeper slopes) would have only provided snag and down wood habitat at the 30% tolerance level historically while the rest of the area may have provided habitat at the 50% to 80% tolerance level historically.

This woodpecker appears to select multistoried, mature and overmature stands for foraging and nesting but use many stand seral stages for foraging. With changes to stand structure of LOS and mid-seral stands, some foraging effort could shift from treated stands to adjacent unmanaged areas (Bull et al. 1995). Because of the retention of remnant old-growth structural components, use of treated stands as nesting and foraging areas is still expected but could be at a reduced level or frequency. This could likely affect pileated woodpeckers currently nesting outside of DOGs, bald eagle winter roost areas and the Myrtle-Silvies Roadless Area.

In response to changes in treated stands, resident pileated woodpeckers may expand their home ranges to incorporate more acreage of less productive habitat or shift established territories to adjacent untreated habitat. This species is known to maintain large home ranges so potential shifts in habitat use may be minimal.

After harvest, stand level prescribed burning and landscape level burning would occur. While prescribed burning is generally of low to moderate intensity, it often contributes to a reduction in the availability of existing down wood and snags and may cause some large tree mortality. Mortality of 21" dbh or larger trees is not expected to be over 5% (Burn objectives, Fuels Specialist Report), which would cause minimal negative effects to stand structure. While Design features and Mitigation Measures (Chapter 2) would be used to reduce potential loss of snags and down wood to burning, some larger snags and down wood may be removed through burning.

Tree mortality at or below 5% in large trees could contribute up to one large snag for every two acres in many stands within five years after treatment. Generally larger snags are removed through burning and smaller snags are recruited through burning. Induced mortality would help to offset snags lost during harvest and post-harvest burning. This "snag exchange" would offset potential losses of snags.

Stand conditions after harvest and burning are relatively short lived. Within 5 to 20 years (assuming limited additional mosaic prescribed burning in the mid-term) the residual dead overstory (existing snags retained after burning) would likely fall and become large down wood, fire caused tree mortality would be fully realized and understory pine regeneration would likely reach 5 to 15 feet tall. These conditions would provide ground based foraging cover for pileated woodpeckers, which forage on insects that have colonized large diameter down wood.

Logging would remove over-stocked trees from many stands in the project area. As a result, vigor of larger trees should increase, overall structure should become sustainable, and species composition should shift to better match site conditions. Stands should show increased resiliency, and be more sustainable.

As these treated stands mature, there should be an increase in the distribution and abundance of OFMS and OFSS stands with species composition appropriate to site conditions.

Cumulative Effects of Alternatives Two, Four, Five, Seven and Seven-A

These alternatives would begin to move stand structure and habitat towards HRV and contribute to restoring ecological balance to forest habitat. Because of proposed harvest and burning, there is an expected net loss or a reduction in value of some marginal pileated woodpecker foraging habitat outside of DOGs. Habitat conditions in these stands would be less favorable to pileated woodpeckers, but they would be more in line with historical conditions and would be more sustainable over time. Untreated stands would continue to provide marginal foraging habitat for resident pileated woodpeckers.

Management of area DOGs, ROGs, and PWFAs in combination with a network of other DOGs across the Forest and areas selected for other purposes (roadless areas, wilderness, wildlife emphasis areas, and research natural areas) should maintain habitat for old-growth associated species such as the pileated woodpecker. This management approach should maintain old-growth species at 30% or more above minimum viable population levels.

Ongoing grazing is not expected to affect pileated woodpecker and would not contribute to cumulative effects on pileated woodpeckers.

Maintenance burning may be planned in the future in these areas; burning would help retain lower fuel levels, thus maintaining reduced fire hazards. Reduced fine fuels around tree bases (due to burning proposed in this project) would help protect trees and snags from future burning. More large trees and snags would likely be retained during future burning, providing more sustainable old growth characteristics, which would benefit pileated woodpeckers.

Direct and Indirect Effects of Alternatives Three and Six

Silvicultural prescriptions for most units focus on precommercial thinning of conifers or thinning with fire to 9" dbh while retaining large, old growth structural components and most mid-story structure. Average basal area after logging should be at about 70-80 ft^2/ac, a basal area substantially higher than the 10-25 ft^2/ac that Tiedemann et al. (2000) discussed. Medium and large diameter pine would make up most of the basal area.

Alternative Six would rely on fire to thin dry pine stands while pretreating (precommercial thinning) dense mixed conifer stands. Because prescribed burning is not a precise science, mortality higher or lower than desired could occur in the 0.1-9.0" dbh size classes and more mortality could occur in larger trees depending on site and burning conditions.

Resulting changes in stand structure would be reflected in a minor reduction in canopy closure (by an estimated 0 to 5%) and minor reduced stand level structural complexity (e.g. reduction of one or more understory canopy layers and loss of some dead and defective tree habitat).

Because of the old growth structural components and most mid-story trees would be retained, use of treated stands as foraging areas is not expected to change.

Effects of fuels treatments would be similar to those described for Alternatives Four, Five, Seven and Seven-A except that stocking levels would not be reduced as much, which may increase the potential for more intense fires. This would contribute to an increased potential for loss of existing down wood and snags and fire-caused tree mortality.

Due to increased basal area, increased numbers of large and mid-sized trees may be killed because of underburning. Burn objectives are that no more than 5% of the standing large trees would be killed, so there should be minimal negative effects.

Cumulative Effects of Alternatives Three and Six

While the low intensity treatments proposed under these alternatives would not aggressively treat stands in the project area, they would begin to move many stands and habitat towards HRV.

Because of proposed treatments, there would be no net loss or a reduction in value of marginal pileated woodpecker foraging habitat present in the area. Resulting habitat conditions would not be more in line with historical conditions and would not likely increase habitat sustainability over time.

White-Headed Woodpecker

More species of vertebrates use ponderosa pine and mixed conifer forests for reproduction and feeding than any other forest type found in eastern Oregon and Washington (Thomas 1979). While this analysis focuses on the habitat and conservation needs of the white-headed woodpecker, implementation of vegetation management that preserves and restores mature single story, open ponderosa pine landscapes would have broad scale beneficial impacts on other species such as the flammulated owl, white-breasted nuthatch, pygmy nuthatch, and yellow chipmunk, which find prime habitat under the conditions described as being optimal for white-headed woodpeckers (Marshall 1997).

Effects of Alternative One – No Action

Encroachment of late-seral species into ponderosa pine-dominated stands predisposes large tracts of forest to stand-replacing fires. Such high intensity fires reduce the probability of ponderosa pine reaching larger size classes important to this woodpecker. Without thinning, density-related stress factors would reduce growth and vigor of ponderosa pine (Blair 1993) and development of old-growth ponderosa pine structure (Smith and Arno 1999).

Without treatment and with continued fire suppression, most white-headed woodpecker habitat would be lost to stand-replacing events within the foreseeable future. Stand replacement fires can benefit certain woodpecker species (Smith 2000) and this woodpecker is known to use trees recently killed by fire (Marshall 1997), but the resulting loss of large live ponderosa pine would eliminate key winter foraging habitat for this species. This could dramatically reduce population densities and local viability.

Post-fire recovery of this habitat type would take several hundred years under the best of conditions. During this time, white-headed woodpecker densities would remain very low and there is no guarantee that large park-like stands of ponderosa pine would return following a typical stand replacement fire.

White-headed woodpecker habitat would continue to degrade due to species conversion of current ponderosa pine habitat. Increased large snag recruitment in the first 20 years of ongoing management may benefit white-headed woodpeckers. Over time (30-50 years), however, a reduction in large tree and snag recruitment would reduce habitat suitability that is already marginal at best for this woodpecker. Resident pairs would have to expand their home ranges to find sufficient habitat to support breeding (Blair 1993). This would expose these birds to disproportionately greater risk of mortality and predation. Stands would continue to provide poor to marginal habitat for resident white-headed woodpeckers until a stand-replacing event occurs.

Without a management strategy to maintain and improve ponderosa pine habitat, population densities and local viability would be reduced. Ongoing fire suppression in combination with no additional treatment could drastically modify potential white-headed woodpecker habitat conditions for 150 or more years.

Direct and Indirect Effects of Alternative Two – Proposed Action

This woodpecker requires habitat restoration in terms of returning natural processes such as fire to its habitat. Thinning of small trees from ponderosa pine stand and periodic selective cutting to provide conditions for growing of widely spaced pine is often recommended to reduce fuel loads in order to reintroduce fire (Marshall 1997).

This alternative mainly removes midstory shade-tolerant species (white fir and Douglas-fir) that have encroached into historically pine-dominated sites, and also reduces white fir in mixed conifer stands.

Direct and indirect effects on white-headed woodpeckers are expected to be minimal. Little high-quality habitat is available in the project area. Stands would retain large pine, large diameter snags and other important old-growth structural components.

This alternative would retain existing desirable white-headed woodpecker habitat components in most treated stands. Resulting canopy closure, tree spacing, and species composition would be closer to levels preferred by this species and retention of large live pine would provide key winter foraging habitat.

White-headed woodpeckers can thrive in ponderosa pine habitat that has received limited timber harvest. They commonly use stands that have undergone silvicultural treatments where large diameter trees were retained (Marshall 1997).

After harvest, stand level prescribed burning and landscape level burning would occur in most treated acres as well as on the landscape level. Treatment of activity-generated slash would reduce the probability of stand-replacing fires in historical ponderosa pine habitat types that have been altered by past fire suppression and vegetation management. With continued use of prescribed fire, natural fire frequencies may be restored and natural prescribed fire could maintain more open stand conditions dominated by fire adapted vegetation.

Tree mortality at or below 5% in large trees could contribute up to one large snag for every two acres in many stands within five years after treatment. Generally larger snags are removed through burning and smaller snags are recruited through burning. Induced mortality would help to offset snags lost during harvest and post-harvest burning. This "snag exchange" would offset potential losses of white-headed woodpecker habitat in treated stands.

Road closures could benefit white-headed woodpeckers by reducing the number of snags cut for firewood. Other proposed activities would have little or no effect on white-headed woodpeckers because treatments would not involve white-headed woodpecker habitat.

Cumulative Effects of Alternative Two – Proposed Action

After treatment, stands should show increased resiliency, and be more sustainable, both biologically and structurally. As these treated stands mature, there should be an increase in the distribution and abundance of OFMS and OFSS stands with species composition appropriate to site conditions. As stands of ponderosa pine mature, the quantity and quality of white-headed woodpecker habitat would increase.

Future maintenance treatments would continue to improve and maintain habitat conditions preferred by this species.

Alternatives Three and Six

Effects of these alternatives would be similar to Alternative Two except for the intensity of prescribed stand treatment.

Proposed precommercial thinning would act as a pretreatment for prescribed burning but prescribed treatments would not affect stocking and species composition of the midstory. Thinning at this level would maintain higher mid-story tree density and canopy closure than that preferred by white-headed woodpeckers, and retention of these trees (predominately shade-tolerant species) would slow development of stand structure that would be more suitable for this woodpecker.

Over time, this treatment, in combination with subsequent maintenance burns, could contribute to the partial reestablishment of natural fire processes that once played an important role in reducing ladder fuels and stand replacement fires. However, development of this condition would be delayed by retention of midstory structure that detracts from or does not contribute to suitable habitat conditions.

Alternatives Four, Seven and Seven-A

Effects of these alternatives would be similar to Alternative Two except for the intensity of prescribed stand treatment. More acres of pine would be placed into management. This would result in future improvements in a greater portion of the watershed.

Alternative Five

Overall, effect on this alternative would be similar to Alternative Two except for the intensity of prescribed stand treatment. Slightly fewer acres of ponderosa pine would be treated under this alternative.

Three-toed Woodpecker

Effects Common to All Alternatives

While this species was documented in the project area, it is considered an incidental species to the area. In addition, there are no management activities planned in three-toed woodpecker designated habitat (DOG 01101) or surrounding forest stands. Old growth lodgepole would not be treated in any alternative. Therefore, this project is expected to have no effect on three-toed woodpecker.

Northern Goshawk

Effects of Alternative One – No Action

This alternative would perpetuate the current vegetation condition and contribute to the decline of functional goshawk habitat. Medium and large trees would grow at very slow rates. Forests would continue to provide goshawk nesting, foraging, and fledging habitat, but would tend to degrade over the next 50 years until habitat characteristics were lost to a stand-replacing event.

In years when forested stands are at the high end of canopy cover, more nest habitat may be available to goshawks. Because canopy cover will oscillate depending on insects and other environmental conditions, nesting habitat would be become unavailable after trees were defoliated or trees died. Without the removal or treatment of ground and ladder fuels the potential for landscape level stand replacement fires in goshawk nesting and foraging habitat would continue to increase. When a stand-replacing event occurs, large blocks of habitat that may support goshawk would be drastically altered or lost. Resulting even-aged forest structure that would develop as the affected area recovers would not provide suitable habitat for nesting and only marginal habitat for foraging for the next 50 to 150 years.

Effects Common to All Action Alternatives

Four of the nest sites and corresponding PFAs located outside the project boundary would not be affected by any treatments; two (Hall Creek and Lost Cabin) are completely outside the Silvies Canyon project area and two (Rainbow Spring and Five Hundred Flat) would not have treatments occurring near them. Precommercial thinning would reduce small trees on about 130-170 acres of the Crooked Creek PFA that overlaps with the Silvies Canyon project area. This treatment would have negligible impact on goshawk since it would not reduce hiding (canopy) cover for goshawk fledglings, would have a negligible impact on goshawk prey, and may improve goshawk hunting success.

Table 4-25. Goshawk nest core acres treated[1] by the action alternatives.

Nest[2]	Alternative Two		Alternatives Three and Six		Alts Four, Seven and Seven-A		Alternative Five	
	CT	PCT[3]	CT	PCT	CT	PCT[3]	CT	PCT[3]
HJ Spring (YFMS)	11 ac.	13 ac.	0 ac.	24 ac.	24 ac.	24 ac.	11 ac.	13 ac.
Van Zandt (SEO)	23 ac.	23 ac.	0 ac.	0 ac.	14 ac.	14 ac.	7 ac.	7 ac.
Bellows Spring (YFMS)	30 ac.	30 ac.	0 ac.	0 ac.	30 ac.	30 ac.	0 ac.	0 ac.
FL Spring (OFMS)	0 ac.	0 ac.	0 ac.	0 ac.	0 ac.	0 ac.	0 ac.	0 ac.
Myrtle Creek (YFMS)	30 ac.	30 ac.	0 ac.	30 ac.	30 ac.	30 ac.	30 ac.	30 ac.
Crane Creek (OFMS)	30 ac.	30 ac.	0 ac.	30 ac.	30 ac.	30 ac.	30 ac.	30 ac.
Bennett Spring (OFMS)	0 ac.	0 ac.	0 ac.	0 ac.	0 ac.	0 ac.	0 ac.	0 ac.
Ranger Spring (YFMS)	30 ac.	30 ac.	0 ac.	30 ac.	30 ac.	30 ac.	30 ac.	30 ac.
South Fawn (SEC)	30 ac.	30 ac.	0 ac.	11 ac.	30 ac.	30 ac.	30 ac.	30 ac.

[1]CT = commercial harvest includes commercial and intermediate thinning, PCT = precommercial thinning.
[2]Nest name and predominant structure of nest stand .
[3]In all action alternatives but Alternatives Three and Six, the amount of precommercial thinning may be the same as the amount of commercial harvest; the amount needed would be determined after commercial treatment.

Prescribed burning would not occur in identified nest core areas. Therefore, there would be no direct effects on habitat or nesting birds.

To improve stand vigor, reduce overstocking dependent mortality, manage stand structure, and improve or maintain overall stand cover, underburning would occur in most PFAs (Table 4-26). Burning activities within ¼ to 1 mile (depending on lighting method) of documented goshawk nests would not be permitted December 1 through August 30 unless nest sites are documented to be inactive. Seasonal restrictions on prescribed burning activities within the PFAs would prevent prolonged and undesirable disturbance to local goshawk pairs during bonding, nesting, and rearing periods.

Table 4-26. Prescribed Burning in Goshawk PFAs.

Nest Site	Burn Block
HJ Spring	3 (100 percent of PFA)
VanZandt	12 (100 percent of PFA)
Bellow's Spring	3 (80 percent of PFA)
FL Spring	8 (50 percent of PFA)
Crane Creek	10 (100 percent of PFA)
Myrtle Park	N/A
Bennett Spring	6 (100 percent of PFA)
Ranger Spring	12 (70 percent of PFA)
South Fawn	12 (20 percent of PFA)

Suppressed trees detract from the potential canopy development of dominant trees and increase the risk of stand replacement wildfire and disease (Reynolds et al. 1992). Removal of suppressed trees from understory and middle story tree canopies would reduce these risks. After treatment, the residual stand structure should become more vigorous as competition from the understory is reduced. This would make these stands more stable over time as the remaining trees become increasingly resilient to the effects of pathogens, drought and fire. Habitat loss due to these factors may be reduced.

Prescribed burning in the project area would mimic natural non-lethal fires and would create stands that provide excellent foraging habitat and open understory canopies that enable goshawks to find prey (Graham et al. 1995).

Prescribed burning would overlap acres treated with thinning, and burn additional acres so some additional cumulative benefits should be realized in each PFA. Mitigation would be used to provide a feedback loop on the effects of burning to ensure that adequate amounts of small trees (hiding cover) remain to provide habitat for goshawk prey species.

Treatment of surrounding habitat, designed to improve stand structure, composition and vigor, would reduce the potential that insect or disease epidemics or stand replacement fires would start in treated stands and move into core areas.

Goshawks use juniper, aspen and other nonforest vegetation types for foraging. Proposed treatments in these vegetation types should maintain prey diversity in the short term and improve prey diversity and availability in the long term. Timing restrictions would be used when necessary to prevent disturbance to active nest sites. Treatment (commercial and precommercial) of the aspen stand associated with the HJ Spring nest would have the same negative affect on goshawk (due to cover removal) as the effects of treatment described above. Precommercial treatment by itself could benefit both goshawk and aspen.

Goshawks show some tolerance towards disturbance near the nest site. Grubb et al. (1998) found that goshawk showed no adverse response to log truck noise >1/4 mile (>400 meters) away from the nest site. While the data is limited to vehicle noise, this indicates that harvest and haul activities outside of ¼ to ½ mile of the nest site should not disturb nesting goshawk.

Effects on Nest Core Areas

Nest core areas were established for all known goshawk nest sites. Commercial harvest (Alternatives Two, Four, Five, Seven and Seven-A) would occur in nest core areas as displayed in Table 4-25, above. Commercial harvest treatments would require a non-significant Forest Plan amendment to allow harvest within the 30 acres surrounding these active or historical sites. Precommercial thinning would occur in nest core areas by itself or in combination with commercial harvest as displayed in Table 4-25. There would be no direct effect to nesting goshawks from any alternative, as no actions would take place within ¼ mile of an active nest site during the breeding season.

Alternatives Two, Four, Five, Seven and Seven-A

Commercial harvest would reduce canopy cover to about 20 to 30%. Since goshawks tend to nest in stands with dense canopy cover (50-70% according to Reynolds et al. 1992), removal of canopy cover through commercial harvest would have a detrimental impact on goshawk. Generally, precommercial sized trees (8" dbh and smaller) contribute little to the primary overstory canopy; therefore, removal would have limited effect on overstory canopy closure. However, precommercial sized trees do contribute to the total canopy closure in a stand. Commercial harvest in combination with precommercial thinning would open up stands and canopy more than either treatment by itself.

Treatments would not directly impact goshawk since treatment would not occur when birds were present (see Mitigation Measures, Chapter 2). However, removal of cover in nest stands would likely make those stands unsuitable or less suitable for nesting. Goshawks that may have used these nest sites in the past may adapt to the changed condition, or may abandon nest sites where critical habitat elements (such as dense canopy cover) have been removed. Goshawks use the same nest areas year after year or in intermittent years. Retaining previously occupied nest areas may be critical for maintaining nesting populations because they contain the habitat elements that attracted the goshawk originally (Reynolds et al. 1992). Commercial harvest of seven nest stands in Alternatives Two, Four, Seven and Seven-A or six nest stands in Alternative Five would likely have a negative affect on goshawk populations in the Silvies Canyon project area.

Young, thinned forest stands grow quickly. In commercially harvested stem exclusion stands and young forest, trees would grow larger in diameter and height, and the amount of canopy cover should increase to pre-harvest levels in about 20 years. Habitat suitability based on canopy cover should recover after 20 years. In young forest, the removal of fuels through harvest would have a long-term benefit to goshawk by minimizing the potential for loss of habitat through stand-replacing events such as a wildfire.

In commercially treated old forest (OFMS) stands, canopy cover is not expected to recover to preharvest levels in the foreseeable future because old trees do not substantially increase their canopy coverage after the stand is thinned. There would be no benefit to goshawk from fuels reduction, since nesting habitat would no longer be available.

Harvest would affect goshawk prey, though little foraging is done in the nest stand. With the application of the proposed silvicultural treatments, maintenance of a large tree component in the overstory should provide habitat for a wide variety of potential goshawk prey. The loss of some mid and understory commercial sized trees in harvest units may result in lower densities of some bird species, such as bark foragers, canopy-forage gleaners, and cavity nesters (Reynolds et al. 1992). With reduced tree density and a thinner duff layer, shrubs and herbaceous vegetation would increase; this would likely lead to a short-term increase in the number of wildlife dependent on this habitat. Patches of dense understory trees (hiding cover) retained in thinned nest stands should help to maintain prey species associated with dense understories as well as provide vertical cover for fledglings. Overall there would likely be no net change in the amount of prey available to goshawk.

Because of visual limitations in dense forest, open understories enhance detection and capture of prey by goshawk (Reynolds et al. 1992). All treatments proposed would reduce tree densities, thus improve the goshawk's ability to detect prey.

Alternatives Three and Six (and untreated nests in other Action Alternatives)

Five nest stands would be treated with precommercial thinning and four would receive no vegetation treatment at all (see Table 4-25). These stands would continue to provide marginally suitable to suitable habitat for nesting goshawk in the short-term and possibly into the long-term (up to about 50 years) or as long as large, live trees are available for nesting and sufficient canopy closure remains.

Precommercial thinning would reduce understory canopy cover but is not expected to measurably reduce overstory canopy cover. Since overstory canopy would remain at or near existing levels, goshawk would benefit from precommercial thinning since precommercial thinning would maintain goshawk prey densities, enhance goshawk hunting success, and reduce hazardous fuels.

Without further treatment, large overstory trees in nest stands may be killed by insects and disease, and some stands may fall out of old growth classification, shifting from OFMS to YFMS (Vegetation Specialist's Report). A reduction in large trees would reduce habitat suitability. Canopy cover may or may not be available depending on insect infestations. Over time, and without further treatment, these stands could become ineffective as nesting habitat.

Trees in younger (SEC and SEO) nest stands (Van Zandt and South Fawn) would likely continue to grow and provide nesting habitat, though growth may be slow due to high tree densities. Potential for insect outbreaks, which could result in removal of canopy cover, would continue to increase.

Effects on Post-Fledging Areas

None of the PFAs in the project area meet Forest Plan/Regional Forester's Forest Plan Amendment #2 standards for the amount of large old forest required in PFAs. However, only six acres of treatment are proposed in OFMS in goshawk PFAs (see footnote to Table 4-27, below), and none of the treatments would change late old structure to a younger structure. LOS would be retained. While all treatments do retain the forest structure required by the Regional Forester's Forest Plan amendment, commercial treatment would adversely impact components of forest structure important to goshawk. Treatment of YFMS in PFAs, especially when there is not sufficient OFMS to provide high quality goshawk habitat, would affect goshawk by reducing the quality of available habitat.

Table 4-27. Acres of YFMS/OFMS/OFSS in existing (610 acre) PFAs and percentage YFMS treated with commercial harvest in PFAs *.

PFA	Existing (Alt 1) YFMS/OFMS/OFSS	All Action Alts YFMS/OFMS/OFSS remaining**	YFMS treated			
			Alt Two	Alts Three and Six	Alts Four, Seven and Seven-A	Alt Five
HJ Spring	257 ac (42%)	257 ac (42%)	100 ac (16%)	0 ac (0%)	127 ac (21%)	119 ac (20%)
Van Zandt	49 ac (8%)	49 ac (8%)	49 ac (8%)	0 ac (0%)	49 ac (8%)	49 ac (8%)
Bellows Spring	273 ac (45%)	273 ac (45%)	154 ac (25%)	0 ac (0%)	154 ac (25%)	0 ac (0%)
FL Spring	453 ac (74%)	453 ac (74%)	45 ac (7%)	0 ac (0%)	45 ac (7%)	12 ac (2%)
Myrtle Creek	140 ac (23%)	140 ac (23%)	130 ac (21%)	0 ac (0%)	130 ac (21%)	130 ac (21%)
Crane Creek	433 ac (71%)	433 ac (71%)	96 ac (16%)	0 ac (0%)	173 ac (29%)	21 ac (4%)
Bennett Spring	326 ac (54%)	326 ac (54%)	0 ac (0%)	0 ac (0%)	0 ac (0%)	0 ac (0%)
Ranger Spring	367ac (60%)	367ac (60%)	83 ac (14%)	0 ac (0%)	159 ac (26%)	83 ac (14%)
South Fawn	61 ac (10%)	61 ac (10%)	49 ac (8%)	0 ac (0%)	49 ac (8%)	49 ac (8%)

*Commercial harvest includes commercial and intermediate thinning. Juniper reduction was not included as commercial harvest since juniper is not used by goshawk fledglings for cover.
**Only six acres of OFMS/OFSS are proposed for treatment in PFAs; 4 acres are in Crane Cr., 2 acres are in Ranger Spring. The remaining acres of treatment are in YFMS.

Table 4-28. Acres of young forest in existing (610 acre) PFAs, percentage of young forest treated with commercial harvest in PFAs *.

PFA	Existing (Alt 1) young forest	Young forest (SEC/SEO/UR)			
		Alt Two	Alts Three and Six	Alts Four, Seven and Seven-A	Alt Five
HJ Spring	210 ac (35%)	0 ac (0%)	0 ac (0%)	0 ac (0%)	0 ac (0%)
Van Zandt	452 ac (74%)	265 ac (43%)	0 ac (0%)	268 ac (44%)	172 ac (28%)
Bellows Spring	220 ac (36%)	135 ac (22%)	0 ac (0%)	135 ac (22%)	88 ac (14%)
FL Spring	47 ac (8%)	28 ac (5%)	0 ac (0%)	28 ac (5%)	0 ac (0%)
Myrtle Creek	125 ac (21%)	29 ac (5%)	0 ac (0%)	29 ac (5%)	29 ac (5%)
Crane Creek	133 ac (22%)	0 ac (0%)	0 ac (0%)	0 ac (0%)	0 ac (0%)
Bennett Spring	61 ac (10%)	0 ac (0%)	0 ac (0%)	0 ac (0%)	0 ac (0%)
Ranger Spring	121 ac (20%)	0 ac (0%)	0 ac (0%)	117 ac (19%)	0 ac (0%)
South Fawn	407 ac (66%)	209 ac (34%)	0 ac (0%)	274 ac (45%)	209 ac (34%)

*Commercial harvest includes commercial and intermediate thinning. Juniper reduction was not included as commercial harvest since juniper is not used by goshawk fledglings for cover.

Effects of Alternative Two – Proposed Action

Commercial harvest is proposed within eight of the nine PFAs (610 acres surrounding the 30-acre nest site) in the project area (Tables 4-27 and 4-28). Precommercial thinning would occur in most forest structures in HJ Spring (4% of the PFA), Bellow's Spring (1%), FL Spring (10%), Crane Creek (28%), Ranger Spring (48%), South Fawn (19%) and Van Zandt (9%).

In PFAs, the Malheur Forest Plan, as amended, requires that 60% of the PFA be in late and old forest structure. To provide protective cover for goshawk fledglings, dense overstory canopy cover should be retained (Reynolds et al. 1992). Forest on the Malheur National Forest can generally provide about 40% canopy cover. Mature and old forest in PFAs should also have well developed understories that provide habitat for goshawk prey.

Commercial and precommercial treatments in Alternative Two would retain the overall forest structure. However, commercial harvest would reduce canopy cover to about 20 to 30%. Since young goshawk need overstory canopy cover as protection from predators, canopy cover removal makes birds more vulnerable to predation (Reynolds et al. 1992). The quality of fledging areas and amount of potential goshawk nesting habitat (outside of nest core areas) would decrease in stands treated with commercial harvest in the short-term because of the reduction in canopy cover.

Generally, precommercial sized trees (8" dbh and smaller) contribute little to the primary overstory canopy; therefore, removal would have limited effect on overstory canopy closure. However, precommercial sized trees do contribute to the total canopy closure in a stand. Commercial harvest in combination with precommercial thinning would open up stands and canopy more than either treatment by itself.

Treatments would not directly impact goshawk since treatment would not occur when birds were present (see Chapter 2 Mitigation Measures). However, removal of cover in post-fledging stands, particularly in mature and old forest structure, would likely make those stands unsuitable or less suitable for providing protection for fledglings. Goshawk may continue to use these sites but fledgling survival rates could be reduced, or goshawk may abandon habitat where critical habitat elements (such as dense canopy cover) have been removed. Commercial harvest in seven PFAs would likely negatively affect goshawk populations in the Silvies Canyon project area (see below).

Commercial harvest in five PFAs would have substantial adverse short-term (20 years) effects on goshawk by removing canopy cover to a level below that needed by fledgling goshawk over large portions of the PFAs. HJ Spring, Van Zandt, Bellows Spring, Myrtle Creek, and South Fawn PFAs contain less than adequate YFMS/OFMS/OFSS structure for goshawk and portions of this structure are planned for treatment (see Table 4-27). Commercial harvest would treat about ½ of the YFMS structure in the HJ Spring PFA and the Bellows Spring PFA. Only about 26% (157 ac.) of HJ Spring PFA and about 20% (119 ac.) of the Bellows Spring PFA would provide adequate cover for fledgling goshawk after treatments; this falls well below the Southwest Recommendations (of 60% of the PFA being in YFMS/OFMS/OFSS structures-Reynolds et al. 1992) for goshawk habitat. All or most of the existing acres of YFMS would be commercially harvested in the Van Zandt PFA and the South Fawn PFA, and more than half of the young forest (SEC/SEO/UR) in these PFAs would be commercially harvested (Table 4-28). Only 29% (187 ac.) of the Van Zandt PFA and 32% (198 ac.) of the South Fawn PFA would remain untreated, and all of this would be young forest, which generally is not considered suitable fledgling habitat. Most of the existing acres of YFMS would be commercially harvested in the Myrtle Creek PFA, and some of the young forest in this PFA would be commercially harvested (Table 4-28). Only about 2% (10 ac.) of Myrtle Creek PFA would provide adequate cover for fledgling goshawk after treatments; about 16% (96 ac.) of this PFA would remain as untreated young forest, which generally is not considered suitable fledgling habitat. These PFAs have inadequate YFMS/OMS/OFSS structure in the PFA, and between half and all of the YFMS would be treated. Few areas of cover would be provided for fledglings, making them very vulnerable to predation.

Commercial harvest in two PFAs would have moderate adverse short-term (20 years) effects on goshawk by removing canopy cover to a level below that needed by fledgling goshawk over limited portions of the PFAs. Crane Creek and Ranger Spring do not meet Forest Plan standards, as amended, for the amount of old forest habitat available in goshawk PFAs (see Chapter 3, Table

3-16), but these PFAs provide YFMS/OFMS in excess of Southwest Recommendations (Reynolds et al. 1992) of 60% of the PFA. However, treatments would reduce the amount of habitat providing quality fledgling canopy cover to below Reynolds et al.'s (1992) recommendations. Commercial harvest would treat around ¼ of the old forest structure in the Crane Creek and Ranger Spring PFAs. About 55% (333 ac.) of Crane Creek PFA and about 46% (282 ac.) of the Ranger Spring PFA would continue to provide existing cover for fledgling goshawk after treatments; these values are close to, but are still slightly below the Reynolds et al. (1992) recommendations. Several of the commercial harvest units in the Ranger Spring PFA are being proposed to enhance bald eagle nesting habitat. These treatments would reduce the quality of goshawk habitat. Similar to Alternative One, forest health in untreated stands would continue to decline unless further treatment was proposed.

Two PFAs would be wholly or largely unaffected by commercial harvest. Bennett Spring PFA would remain unharvested (including precommercial thinning, see Tables 4-27 and 4-28) so no direct effects would occur from harvest. No indirect effects are expected from lack of harvest because much of this PFA has been treated recently with prescribed burning. Burning reduced tree density to a more natural condition that is more resilient and less fire prone than other parts of the project area. (see Tables 4-27 and 4-28). Commercial harvest would reduce canopy cover in FL Spring on a limited number of acres of YFMS and in young forest structures; however, about 68% of the PFA would remain untreated YFMS and OFMS, leaving existing, moderate to high canopy cover intact. Because of the vast amount of untreated YFMS and OFMS remaining available for fledgling goshawk hiding cover, commercial harvest would have little effect on goshawk in this PFA. According to the SW Management Recommendations (Reynolds et al. 1992), PFAs should provide adequate cover for goshawk nesting and fledglings. However, similar to Alternative One, forest health in these stands would continue to decline unless further treatment was proposed.

The short-term effect of harvest would be detrimental to goshawk, but young, thinned stands grow quickly. In commercially harvested stem exclusion forest and young forest, trees would grow larger in diameter and height, and the amount of canopy cover should increase to pre-harvest levels in about 20 years. Habitat suitability based on canopy cover should recover after 20 years. In young forest, the removal of fuels through harvest would have a long-term benefit to goshawk by minimizing the potential for loss of habitat through stand-replacing events such as a wildfire. Since only six acres of OFMS would be treated in goshawk PFAs, the effect of reduced cover in these stands would be extremely minor. In the long term, more nesting habitat and higher quality fledgling habitat may be provided in all treated stands as trees grow to larger diameters (Reynolds et al. 1992).

Prey availability an important factor in maintenance of goshawk habitat (Reynolds et al. 1992). Harvest would affect goshawk prey; effects would be similar to those discussed under "Effects on Nest Core Areas." Overall, there would likely be no net change in the amount of prey available to goshawks.

Some treatments would occur in wildlife corridors. Corridor treatments would retain higher canopy cover and more hiding cover than treatments in other stands. This added diversity would likely benefit goshawk prey and increase hiding cover for fledgling goshawks, but may make prey detection and hunting more difficult in wildlife corridor stands.

Commercial harvest combined with precommercial thinning would reduce the total canopy closure in a stand more than either treatment by itself. Combined, these treatments increase the likelihood that fledgling goshawk would be vulnerable to predation due to lack of canopy cover (see above). Precommercial thinning alone (without commercial treatment) would reduce understory canopy cover but is not expected to measurably reduce overstory canopy cover. Since overstory canopy would remain at or near existing levels, goshawk would benefit from precommercial thinning by itself since precommercial thinning would maintain goshawk prey densities, enhance goshawk hunting success, and reduce hazardous fuels.

Reynolds et al. (1992) stated that thinning from below (removing understory trees) is preferred for maintaining desired forest structure, and variable spacing of trees is preferred for developing groups of trees with interlocking crowns. Proposed silvicultural treatments follow this recommendation, though treatments are substantially more extensive than those suggested by Reynolds et al. (1992). In the short term, commercial harvest aggressively treats goshawk habitat and would be detrimental to goshawks in five of the nine PFAs. On two of the nine PFAs (Crane Creek and Ranger Spring), commercial harvest treats limited goshawk habitat and would be slightly detrimental to goshawks in these PFAs. On two of the nine goshawk PFAs (FL Spring and Bennett Spring), treatments would optimize or maintain conditions for goshawk to persist (Desimone 1997).

In the long-term (over 20 years) proposed treatments could benefit goshawk habitat by helping preserve stand integrity, maintaining moderate overstory canopy closure, and maintaining connectivity to alternate nest stands. They would also help contribute to maintaining a mosaic of forest conditions in the area that would support goshawk as well as its prey species.

Effects of Alternatives Three and Six

Precommercial thinning is proposed within eight of the nine PFAs (610 acres surrounding the 30-acre nest site) in the project area (see Tables 4-27 and 4-28). PCT would occur in most forest structures in HJ Spring (19% of the PFA), Bellow's Spring (1%), FL Spring (23%-Alt 3, 0%-Alt 6), Myrtle Creek (27%), Crane Creek (46%), Ranger Spring (67%), South Fawn (39%-Alt 3, 13%-Alt 6) and Van Zandt (17%-Alt 3, 0%-Alt 6).

Under these alternatives, no commercial treatment would occur. Only PCT and juniper reduction would occur. All acres would continue to provide cover from predators for fledglings, though in most places the condition of overstory trees would continue to deteriorate similar to conditions in Alternative One.

More thinning would occur in Alternative Three than in Alternative Six. In Alternative Six, FL Spring and Van Zandt PFAs would not be treated so the result would be the same as the No Action alternative (Alternative One). Bellow's Spring PFA would have so few acres entered that the result would be the same as Alternative One.

The remaining PFAs would have 13 - 67 % of the area treated with precommercial thinning. The effect of this treatment would be similar to that of Alternative Two. Precommercial thinning alone (without commercial treatment) would reduce understory canopy cover but is not expected to measurably reduce overstory canopy cover. Since overstory canopy would remain at or near existing levels, goshawk would benefit from precommercial thinning since it would maintain goshawk prey densities, enhance goshawk hunting success, and reduce hazardous fuels.

Effects of Alternatives Four, Seven and Seven-A

Commercial harvest is proposed within eight of the nine PFAs (610 acres surrounding the 30-acre nest site) in the project area. Precommercial thinning would occur in most forest structures in HJ Spring (0% of the PFA), Bellow's Spring (1%), FL Spring (11%), Crane Creek (15%), Ranger Spring (0%), South Fawn (19%) and Van Zandt (7%).

Effects of these alternatives would be similar to Alternative Two except that YFMS structure would be more intensively treated with commercial harvest in HJ Spring, Crane Creek, and Ranger Spring PFAs. The increased acres of commercial harvest in seven of the nine PFAs would have adverse short-term (20 years) effects on goshawk by removing canopy cover to a level below that needed by fledgling goshawk over large portions of the PFAs. Commercial harvest would treat ½ of the YFMS structure in the HJ Spring PFA leaving only about 21% (130 ac.) of HJ Spring PFA to provide adequate cover for fledgling goshawk after treatments. Commercial harvest in these alternatives would treat over 40% of the YFMS structure in the Crane Creek and Ranger Spring PFAs. About 42% (256 ac.) of Crane Creek PFA and about 34% (206 ac.) of the Ranger Spring PFA would continue to provide existing cover for fledgling goshawk after treatments; these values are below the Southwest Recommendations (of 60% of the PFA being in YFMS/OFMS/OFSS structures that provide quality fledgling canopy-Reynolds et al. (1992)). Most young forest in Ranger Spring (117 of 121 ac.) would also be commercially harvested. Several of the commercial harvest units in the Ranger Spring PFA are being proposed to enhance bald eagle nesting habitat. These treatments would benefit bald eagle, but reduce the quality of goshawk habitat.

These alternatives would have a greater negative effect in the short-term to goshawk than Alternative Two, but potentially have a greater benefit to goshawk habitat in the long-term because they improve forest conditions over a larger area.

Effects of Alternative Five

Commercial harvest is proposed within eight of the nine PFAs (610 acres surrounding the 30-acre nest site) in the project area. Precommercial thinning would occur in most forest structures in HJ Spring (4% of the PFA), Bellow's Spring (1%), FL Spring (11%), Crane Creek (28%), Ranger Spring (48%), South Fawn (19%) and Van Zandt (10%).

Effects of this alternative would be the same as Alternative Two for Myrtle Creek, Bennett Spring, Ranger Spring, and South Fawn PFAs since the treatments are the same. Effects of treatments would be similar to Alternative Two, though commercial treatment is reduced from Alternative Two in Van Zandt, Bellow's Spring, FL Spring, and Crane Creek PFAs and increased from Alternative Two in HJ Spring. Commercial harvest in four PFAs (HJ Spring, Van Zandt, Myrtle Creek, and South Fawn) would have adverse short-term (20 years) effects on goshawk by removing canopy cover to a level below that needed by fledgling goshawk over large portions of the PFAs. Commercial harvest in two PFAs (Bellow's Spring and Ranger Spring) would have adverse short-term (20 years) effects on goshawk by removing canopy cover to a level below that needed by fledgling goshawk over limited portions of the PFAs. Three PFAs would be wholly or largely unaffected by commercial harvest. Bennett Spring PFA would remain untreated and be unaffected by treatments or lack of treatment (see Tables 4-27 and 4-28).

Commercial harvest would reduce canopy cover in FL Spring and Crane Creek PFAs on a limited number of acres of YFMS; however, about 72% and 67% of the PFAs would remain untreated YFMS/OFMS structure, leaving existing, moderate to high canopy cover intact. Because of the vast amount of untreated YFMS/OFMS remaining available for fledgling goshawk hiding cover, commercial harvest would have little effect on goshawk in these PFAs. According to the SW Management Recommendations (Reynolds et al. 1992), these PFAs should provide adequate cover for goshawk nesting and fledglings. However, similar to Alternative One, forest health in untreated stands would continue to decline unless further treatment was proposed.

Effects of precommercial thinning would be the same as Alternative Two.

Cumulative Effects of the Action Alternatives

Alternatives One, Three and Six have the lowest potential to contribute to short-term cumulative effects on goshawk but also have the highest long-term potential to contribute to cumulative effects by allowing a long-term reduction goshawk habitat quality. The remaining Action alternatives would negatively impact goshawk in the short-term, but could provide more sustainable habitat in the long term. The action alternatives would all begin to move stand structure and habitat towards HRV and contribute to restoring ecological balance to forest habitat, but proposed commercial harvesting would result in an expected net loss or a reduction in value of goshawk habitat.

Past management has reduced the existing canopy cover in parts of the Silvies Canyon project area including areas potentially used by goshawk (see Big Game Existing Conditions and Effects). Since proposed commercial harvest would substantially reduce canopy cover in nest and PFA areas, proposed commercial harvest treatments in combination with past treatments would reduce goshawk habitat and therefore likely reduce the area's goshawk nesting capacity until canopy cover increases to pre-harvest levels and functions as goshawk habitat (about 20 years in YFMS/SE forest). In goshawk nest stands that are OFMS, canopy cover is not expected to return to pre-harvest levels and the area would not function as goshawk nesting habitat in the future, potentially reducing the area's goshawk nesting capacity. Past and proposed precommercial thinning (by itself) contributes to an overall benefit to goshawk.

Ongoing grazing would continue in the project area. Grazing can reduce ground vegetation and shrubs and impact riparian habitat, which in turn can affect goshawk prey species. However, managed grazing is not expected to contribute to cumulative effects on goshawk or their prey species.

Maintenance burning may be planned in the future in these areas; burning would help retain lower fuel levels, thus maintaining reduced fire hazards. Reduced fine fuels around tree bases (due to burning proposed in this project) would help protect trees and snags from future burning. More large trees and snags would likely be retained during future burning, providing more sustainable old growth characteristics, which could benefit goshawk.

American Marten

Effects Common to All Alternatives

Marten have not been observed in or near the Silvies Canyon project area, the project area is outside the known range of marten, and there is little potential habitat for marten in the project area. Therefore, marten are not likely to be present in the project area and this project is expected to have no effect on American marten.

Effects on Indicators of Dead and Defective Tree Habitat

This section will look at the effects on specific MIS woodpeckers. See the section titled "Effects on Indicators of Old Growth and Late- and Old-Structure Habitat" for discussion of pileated, white-headed and three-toed woodpeckers.

Black-backed Woodpecker

Effects of Alternative One

Under this alternative, the project area would continue to experience reduced vigor because of overstocking, fire exclusion, and high levels of past and potential insect and disease related mortality. Stands that are heavily overstocked and stressed would continue to be vulnerable to insect outbreaks and disease above endemic levels.

Fuel loading would remain high and contribute to the high potential for stand replacement fires. In the event of such a fire, large blocks of forest habitat would be drastically altered. Fire-killed trees would be abundant; bark beetles infest trees for a period of several years after they have been killed by fire, providing foraging habitat for this and several other woodpeckers for 10-20 years (Smith 2000, Marshall 1992).

Until a stand-replacing event, predicted changes over the next 50 years (oscillating canopy closure, lost understory and mid-story trees, and a reduction in large tree and snag recruitment), could reduce the suitability of some habitat elements but dead and defective tree habitat used for nesting and foraging would likely remain available.

Because this species thrives under conditions that produce abundant bark beetle larvae (stand replacement fire, insect infestations, and overstocked stands) resident black-backed woodpeckers would benefit from deterioration of forest stands.

Direct and Indirect Effects of Alternatives Two, Four, Five, Seven and Seven-A

Forest practices that focus on removing trees before they become susceptible to bark beetles and salvage logging of beetle attacked or killed trees and fire killed trees can be counterproductive to maintaining the black-backed woodpecker (Marshall 1992b). This impact can vary depending of the intensity and scope of treatment.

Silvicultural Treatments

Silvicultural prescriptions for most units focus on commercial thinning or select harvest of conifers up to 21" dbh while retaining large, old-growth structural components (large diameter trees, snags, old stumps, and down wood) and regenerating stands with early seral pine. Mechanical treatment would focus mainly on suppressed understory trees. Large and mid-story trees would be retained to provide horizontal and vertical structure to the stand. Snag habitat should be maintained at current levels under these alternatives. Long-term management would strive to provide snags at Forest Plan standard levels (2.39 21" or larger snags per acre).

Changes in stand structure would be reflected in a reduction of canopy closure (of 20 to 40%), stand density, and stand level structural complexity (e.g. removal or reduction of one or more understory canopy layers, creation of canopy gaps and loss of some dead and defective tree habitat). Stands would retain important old-growth structural components, but may be less suitable as optimal black-backed woodpecker foraging habitat because managed conditions would not favor eruptions of bark beetles. With changes to stand structure of LOS and mid-seral stands, most foraging effort may shift from treated stands to adjacent untreated areas. Because of the retention of remnant old-growth structural components, use of treated stands as nesting and foraging areas is still expected but could be at a reduced level and frequency.

In response to changes in treated stands, resident black-backed woodpeckers may expand their home ranges to incorporate more acreage of less productive habitat or move established territories to adjacent untreated habitat. This species is known to maintain large home ranges (Marshall 1992b) so potential shifts in habitat use may be minimal.

Data in DecAID (Mellen et al. 2003) suggest that some areas should have pockets of snags with very high densities. Marshall (1992b) suggests that snag retention at the 60% level is not likely to be sufficient for species that are highly dependent on wood-boring insects. Typically post-fire habitat conditions are considered ideal for black-backed woodpeckers, but DecAID suggests that post-fire snag densities of 25 to 80 snags per acre, 10" dbh or greater would provide for use only up to about the 50% tolerance level. This snag level is higher than could be managed for in treated or untreated stands.

Many acres of forest experiencing reduced vigor because of overstocking, fire exclusion, and high levels of past and potential insect and disease related mortality would not be treated. Untreated areas include most of the two three-toed woodpecker lodgepole old growth stands (159 acres) that exist in the northern (Blue Mountain) portion of the watershed, the Myrtle-Silvies semi-primitive area, stands where treatment was deferred, and stands not needing treatment.

While this species is present in all major forest types (Bull et al. 1986) lodgepole pine appears to be preferred for foraging Marshall 1992b). Untreated portions of this key forest type and other untreated areas would continue to provide foraging habitat for resident black-backed woodpeckers.

Fuels Treatments

Effects of fuels treatments would be as described in the section titled "Effects on Dead and Defective Tree Habitat (Snags) and Dead and Down Wood Habitat." During prescribed fire, small pockets of snags may be created; this could benefit black-backed woodpeckers. Bark beetles could infest dead trees, but because of the limited number of dead large trees, the benefit to black-backed woodpeckers would be minor.

Stand conditions after harvest and burning are relatively short lived. Within 5 to 20 years the residual dead overstory (existing snags retained after burning) would likely fall and become large down wood, and fire caused tree mortality would be fully realized.

Prescribed burning and landscape level burning would not occur in lodgepole stands or the Myrtle-Silvies Roadless Area.

Effects of Other Proposed Activities

Other proposed activities (spring, aspen, and cottonwood restoration, and juniper reduction) would somewhat increase snag and down wood levels but would occur in habitat generally not used by black-backed woodpeckers. These activities would have little or no impact on black-backed woodpeckers or their habitat.

Cumulative Effects of Alternatives Two, Four, Five, Seven and Seven-A

Marshall et al (2003) concluded that black-backed woodpeckers are uncommon in the Blue Mountains. Past and ongoing extensive eruptions of bark beetles may be causing an increase in this species population density and distribution.

Logging in the project area would remove over-stocked trees from many stands in the project area. As a result, vigor of larger trees should increase, overall structure should become sustainable, species composition should improve, and insects and disease should stabilize at endemic levels. Stands should show increased resiliency, and be more sustainable and stable, both biological and structurally. As these treated stands mature, there should be a stable supply of snags as normal mortality occurs. This should provide stable endemic levels of insects and support densities of this woodpecker that resemble historical levels.

While the intermediate intensity treatments proposed under this alternative do not aggressively treat all priority stands in the project area, they begin to move many stand and habitats towards HRV. It also contributes to restoring ecological balance to forest habitat, allows reestablishment of natural fire regimes, and reduces the need for aggressive fire suppression.

No snags or down wood would be actively treated as part of the vegetation management or fuels reduction prescriptions (see Design Features, Chapter 2). This habitat would be retained for PCEs, secondary cavity users and other wildlife that requires this habitat. Personal use firewood cutting, commercial firewood cutting, and removal of hazard snags across the watershed would remove some snags retained by management and reduce the distribution of snag habitat across the area. Reduced road densities and related access should reduce this impact.

Lodgepole stands in the northern portion of the watershed are popular firewood cutting areas and large numbers of post and poles are removed for personal use. This activity would continue to remove dead and dying lodgepole pine trees that would or could provide food sources for bark beetles. This in turn, would impact this woodpecker by removing or limiting the availability of its prey base. The level of this impact likely contributes to natural and management induced limitations on this species.

Effects of Alternatives Three and Six

Under this alternative, treatments focus on precommercial thinning to reduce ladder fuels. Approximately 15 acres of lodgepole would be precommercially thinned. This should reduce some of the density-induced stress on overstory lodgepole but retained trees would remain very susceptible to bark beetles.

The overall effects of thinning would be similar to those of Alternative One. Overall effects of fuels treatments would be similar to Alternative Two except for the intensity of prescribed stand treatment.

Hairy Woodpecker

Effects of Alternative One – No Action

Upland areas would continue to experience reduced vigor because of overstocking, fire exclusion, and high levels of past and potential insect and disease related mortality. Stands that are heavily overstocked and stressed would continue to be highly vulnerable to insect outbreaks and disease. Tree mortality caused by high insect populations should create a great deal of habitat for this species.

Aspen and cottonwood stands provide a special habitat need for many wildlife and plant species. Stand level restoration treatments, protection, and landscape level prescribed fire would not be used to rejuvenate degraded aspen stands. Cottonwood habitats would not be restored. As these stands continue to decline in vigor or vanish, aspen dependant and cottonwood-associated species including several species of woodpecker would be adversely impacted.

Direct and Indirect Effects Common to All Action Alternatives

All action alternatives would maintain breeding densities similar to densities found in untreated forests.

This species can be impacted when all decayed trees are removed from its habitat (The Nature Conservancy 1999). Under these alternatives, old-growth structure, including snags and snag replacements would be retained in treatment units. Snag habitat would be maintained at current levels and managed to provide Forest Plan standard levels (2.39 21" dbh or larger snags per acre) in the long-term. By providing snags at this level, snags should not be a limiting factor for this woodpecker.

This species shows a positive correlation with burning (The Nature Conservancy 1999). The effect of burning on old forest, snag and down wood retention and creation are discussed in MIS, Snags, and Down Wood. The expected "snag exchange" should offset potential losses of snags if the ratio of fire caused snag recruitment exceeds losses. Prescribed burning should create stand conditions that benefit this species.

With stand level restoration treatments as well as treatments designed to improve and increase aspen and cottonwood habitats, an overall increase in the availability of deciduous trees such as aspen and cottonwood of various successional stages should be seen. Snag creation in aspen and cottonwood would benefit this species by making more snags available for foraging and nesting (snags 12" dbh and larger are at the 50-80% tolerance level for foraging and 30-50% tolerance level for nesting according to DecAID (Mellen et al. 2003)). Woodpeckers that use these stands should benefit directly from these treatments now and in the long-term.

Cumulative Effects Common to All Action Alternatives

Logging in this watershed would remove overstocked trees from many stands in the project area. As a result, vigor of larger trees should increase, overall structure should become sustainable, species composition should improve, and insects and disease should stabilize at endemic levels. Stands should show increased resiliency, and be more sustainable and stable, both biologically and structurally. As these treated stands mature, there should be a stable supply of snags as normal mortality occurs. This should provide stable endemic levels of insects and support densities of this woodpecker that resemble historical levels.

While the treatments proposed under these alternatives do not aggressively treat all priority stands in the project area, they begin to move many stand and habitats towards HRV. Treatments also contribute to restoring ecological balance to forest habitat, allowing reestablishment of natural fire regimes, and reducing the need for aggressive fire suppression to varying degrees

No snags or down wood would be actively treated as part of the vegetation management or fuels reduction prescriptions. Regional direction for retention of snags and down wood would be applied to retain this habitat for PCEs, secondary cavity users and other wildlife that requires this habitat. Personal use firewood cutting, commercial firewood cutting, and removal of hazard snags across the watershed would remove some snags retained by management and reduce the distribution of snag habitat across the area. Reduced road densities and related access should reduce this impact.

Downy Woodpecker

The effects of all alternatives would be similar to those described for hairy woodpeckers.

Lewis' Woodpecker

The effects of all alternatives would be similar to those described for white-headed woodpeckers.

Underburning or any management method that improves the condition of the shrub understory is beneficial to the Lewis' woodpecker (Galen 1989).

Common Flicker

All alternatives would maintain breeding densities similar to densities found in untreated forests. The ability to use most types of habitat for foraging and reproduction makes this species very adaptable and less vulnerable to the effects of timber management or changes to the forest. No measurable change in habitat suitability or local species viability should occur. Similar to the effects of other actions on Hairy Woodpecker, snag creation in aspen, cottonwood, spring and ROG areas could benefit flickers.

Red-naped Sapsucker

Due to the prevalent use of aspen as nest trees, maintenance or regeneration of aspen is important. High snag densities also appear to improve red-naped sapsucker habitat. The No Action alternative would increase snag densities but would lead to a reduction or loss of aspen and cottonwood. As aspen and cottonwood continue to decline in vigor or vanish, this woodpecker would be adversely impacted.

All action alternatives would improve the condition and availability of aspen, maintain or improve the densities of snags, and retain important old-growth stand structure across the watershed, which should benefit this species and not likely reduce current density or distribution.

Williamson's Sapsucker

Effects of Alternative One – No Action

Effects are the same as described in the black-backed woodpecker section, Alternative One.

Effects Common to All Action Alternatives

Thomas et al. (1979) suggest that snag retention at the 40-60% level is sufficient for this species. Conway and Martin (1993) support this by suggesting managing for clumped large snags at a rate of about two snags per acre, especially within drainages and low-laying areas. When existing snags are retained and long-term snag densities are provided at Forest Plan standard levels (2.39 21" or larger snags per acre), snag availability should not be a limiting factor for this species.

Restoration of aspen within the watershed is expected to be very beneficial to this species, due to the woodpeckers' preference for aspen as nest trees. Restoration of existing aspen and probable increases in the availability and distribution of aspen should ensure that this key nesting habitat type is available to this species.

This species may benefit to a small degree after burning. The expected "snag exchange" should offset potential losses in local Williamson's sapsucker densities if the ratio of fire-caused snag recruitment exceeds losses. Additionally, dead trees could be infested by bark beetles, but because the number of dead large trees would be limited, the benefit to Williamson's sapsucker would be minor.

Large blocks of LOS would be retained under all action alternatives. This would provide mature forest stands capable of supporting this sapsucker. All action alternatives would improve the condition and availability of aspen and maintain or improve the densities of snags in the watershed. Treatments under all action alternatives are expected to have no net change on this species and treated stands should be able to support possibly up to 3.9+ pair/100 acres.

Effects on Featured Species

Blue Grouse

Effects of Alternative One – No Action

Under this alternative, many forest stands currently in a densely stocked, closed canopy condition would alternate in and out of this condition and many other stands would progress to this condition. In years with high tree densities and canopy closure (during years of low insect densities), stand structure will be less suitable for blue grouse. In years of insect and disease outbreak, and subsequent defoliation, reduced canopy closure may allow for development of open stand structure and, possibly, limited growth of large trees needed by this grouse.

Effects Common to All Action Alternatives

Some wintering habitat would be reduced by treatments; however, the area that would be affected by each of the alternatives is relatively small when compared to the total habitat that is available in the planning area. Mitigation (Chapter 2 of the EIS) would retain blue grouse winter roost habitat at Forest Plan levels. Due to the abundance of Douglas-fir mistletoe, silvicultural and fire activities would not reduce habitat to an extent that will affect population viability. Spring, summer and fall habitat would be improved by an increase in shrubs and forbs through opened tree canopies providing more light and moisture to the understory.

Pronghorn Antelope

Effects of Alternative One – No Action

Under this alternative there would be no management to reduce juniper. As encroachment and increased juniper canopy cover occur, with resulting loss of shrubs and forbs, the suitability of this area for pronghorn would decrease.

Effects Common to Action Alternatives Two, Three, Four, Five, Seven and Seven-A

Junipers less than 12-18" dbh would be removed on 500 or more acres depending on the alternative. Alternatives Four, Seven and Seven-A would reduce juniper encroachment to the greatest extent with 715 acres proposed for thinning. Bates et al. (1999) found that thinning encouraged development of bluegrass, perennial bunchgrasses, annual forbs, total ground cover, and biomass. This occurred on both grazed and ungrazed sites. Removal of juniper reduces belowground competition and increases availability of soil water and nutrients to understory species, which explains understory response after cutting. This vegetation response would benefit pronghorn. Fuel treatments in shrublands, meadows, and sagebrush habitats may kill a minor amount of sagebrush and other forage species, negatively impacting pronghorn. Mitigation measures designed to protect shrub habitats and sage grouse would help to keep impacts at very low levels.

Weed treatments proposed in the action alternatives in pronghorn habitat are along roads and would be done manually. Pronghorn may experience localized minor disturbance near roads, similar to disturbance from normal road use, but weed treatments should benefit pronghorn foraging habitat by creating space for native or desired plants.

Effects of Alternative Six

While burning may reduce a small number of young junipers, it is not expected to reduce larger juniper. Effects would be similar to those of Alternative One.

Osprey

Effects of Alternative One – No Action

Effects of this alternative on the large old trees and snags used for nesting habitat are the same as described in the section titled "Effects on Late and Old Structure (LOS), Connectivity and Fragmentation." The long-term effect of No Action is a loss of large trees and snags with a resultant loss of potential nest sites.

Effects Common to All Action Alternatives

There would be no direct effect to osprey or their nesting habitat from silvicultural treatments, as all action alternatives focus on removing mid-story shade tolerant species. Stand treatment would retain important old-growth structural components such as large pine and large diameter snags. There would be no cutting of trees greater than 21" dbh. Disturbance of active nests would not occur since management activities are restricted within ½ mile of active nests during the breeding season, April through August. Nests and nest site characteristics would be retained since treatment would not occur within 100' of nest sites. Treatment of surrounding habitat, designed to improve stand structure, composition and vigor would reduce the potential that stand replacement fires would remove nest trees and riparian vegetation.

After harvest, stand level prescribed burning and landscape level burning would occur in most treated acres as well as on the landscape level, which would reduce the probability of stand-replacing fires in osprey nest stands.

Some large trees or clumps of trees may be killed by prescribed burning regardless of the timing of the underburn or other conditions. Tree mortality of 21" dbh or larger trees is not expected to be over 5% (Burn objectives, Fuels Specialist Report), which would cause minimal negative effects to stand structure. Tree mortality at or below 5% in large trees could contribute up to one large snag for every two acres in many stands within five years after treatment. Generally larger snags are removed through burning and smaller snags are recruited through burning. Induced mortality could help to offset snags lost during harvest and post-harvest burning. This "snag exchange" should offset potential losses of suitable nest trees.

Effects of Other Proposed Activities on Featured Species

Proposed juniper treatments have the potential to affect pronghorn antelope (see discussion on Pronghorn Antelope, above). Other proposed activities (such as spring, aspen, and cottonwood restoration, juniper reduction, and weed treatment) may provide enhanced habitat diversity, but would have no measurable effect on featured species or their habitat.

Cumulative Effects on Featured Species

After treatment, stands should show increased resiliency, and be more sustainable, both biologically and structurally. As these treated stands mature, there should be an increase in the distribution and abundance of OFMS and OFSS stands with species composition appropriate to site conditions.

While the intermediate intensity treatments proposed under these alternatives do not aggressively treat all priority stands in the project area, they begin to move stand structure, habitat and wildlife populations towards HRV. They also contribute to restoring ecological balance to forest habitat. Because of treatments, all habitat elements important to featured species (including sagebrush, Douglas-fir mistletoe, and large nest trees) would be less prone to removal due to a fire spreading into these habitats.

Permitted livestock grazing would continue in the area. Grazing would have no effect on osprey. At moderate grazing levels, livestock grazing can be compatible with grouse and antelope management. Grazing is not expected to contribute to cumulative effects on these species. New and ongoing weed treatments should benefit all wildlife species by creating space for native or desired plants.

Proposed harvest and burning should result in a net increase and improvement in large nest trees and open sagebrush habitat, and a potential increase in local viability of osprey and pronghorn. Viability of blue grouse should be maintained at existing levels.

Effects on Local Land Birds Including Neotropical Migratory Birds

In 1918, the MBTA (Migratory Bird Treaty Act, 16 U.S.C. 703-712; 50 CFR 21; and 50 CFR 13) was passed to enforce a treaty between the United States, Mexico, and Canada. This law addressed the issue of poaching migratory birds. Under the MBTA, it is unlawful "by any means or manner, to pursue, hunt, take, capture (or) kill" migratory birds except as permitted by regulation (16 U.S.C. 703-704). The regulations at 50 CFR 21.11 prohibit the take, possession, import, export, transport, sale, purchase, barter, or offering of these birds, except under a valid permit or as permitted the in the implementing regulations (Director's Order No. 131). The Regulation implementing the MBTA defines "take" as to pursue, hunt, shoot, wound, kill, trap, capture or collect NTMBs (50 CFR 10.12).

Forest Service compliance with the MBTA has been challenged several times with regard to the "take" provision. Recently (July 2000), a United States Court of Appeals for the District of Columbia ruled that Federal Agencies are subject to provisions of the Migratory Bird Treaty Act.

Current Forest Service policy regarding bird conservation and the MBTA is:

- Permits must be obtained from the FWS for banding, capturing, or any other activity where there is intentional killing of birds, including control of depredating birds.
- The FS must analyze the effects of actions on migratory birds and document such effects in a NEPA document.
- Negative effects to birds should be mitigated to the extent possible and where possible, plans to benefit birds should be incorporated in project or activity design.
- There currently is no process for reviewing projects with FWS or applying for a permit for "unintentional" take. The FWS will be providing additional guidance regarding the permits for Federal Agencies through the formation of an interagency working group.

General Effects

Direct, Indirect, and Cumulative Effects of Alternative One – No Action

This alternative would have no direct effects on any NTMB species. Indirect effects to birds from this alternative are substantial.

In the short term, NTMBs that favor denser understory structures would benefit from No Action, while species that prefer open to park-like conditions would fare less well. Bird species composition would shift away from those species that used the project area historically (target species such as white-headed woodpecker, flammulated owl, chipping sparrow) to species that use denser, mixed conifer stands (non-target species such as Vaux's swift, Townsend's warbler, red-breasted nuthatch) (OR-WA Partners In Flight 2001).

Through on-going fire suppression and the lack of management actions that reduce fuels and improve forest health, all species' habitats would be expected to be degraded by stand-replacing events within the foreseeable future. Some habitats, particularly large old forest structure, and associated bird populations would be drastically altered by stand-replacing fires. Fires would likely kill some birds, but most would be able to fly to other areas to escape the fire. Some species would benefit in the first 30 years after a fire (e.g. black-backed woodpecker, bluebirds, and olive-sided flycatcher); other species would have negative or mixed reactions (e.g. pileated woodpecker, hermit thrush, and chipping sparrow) (Kotliar et al. 2002; Smith 2000). Bird habitat would recover over the next 30-120+ years as forests and aspen regenerate. Some habitats, such as riparian areas, may have only partial habitat changes due to fire, but may be completely altered by other stand-replacing events like insect defoliation. All stand-replacing events would change population levels of native birds, some species increasing and others decreasing, for 10 to 120 plus years.

Changes would occur because of the No Action alternative. However, this alternative is not expected to contribute to cumulative effects.

Direct and Indirect Effects of the Action Alternatives

All action alternatives incorporate Partners In Flight (PIF) (Altman 2000 - Rocky Mountains Landbird Conservation Plan) strategy elements in their design and should help assure local viability of species associated with habitats historically found in the Silvies Canyon project area. Biological objectives and conservation strategies from that plan (Altman 2000) such as retaining large trees, retaining and creating snags, and implementing road closures would be used to help support conservation of landbirds.

The majority of birds on the Malheur National Forest are NTMBs that migrate to the forest each year to breed. Many of these birds nest either on the ground or within the lower or mid-canopies of trees. Nesting generally begins in June in the project area (R. Sutcliffe, pers. obs.).

Birds that nest on the ground or in the low to mid-canopy would be vulnerable to loss of nest productivity from timber harvest (commercial harvest and precommercial thinning) and prescribed burning if the activities occur during the nesting season. Nests, eggs and nestlings could be destroyed and brooding adults could be killed during felling and burning operations (OR-WA PIF 2001). In most cases, adult birds can escape. Disturbance from harvest or burning could lead to nest abandonment and subsequent loss of nestlings.

Some loss of ground nesting birds can be expected because of prescribed burning during the nesting season. Turner (2001) found a 20% loss of artificial ground nests during low-intensity spring prescribed fires, although artificial nests were distributed at greater densities than natural nests would be. Spring prescribed fire may cause some mortality of young in early nests, but this is not necessarily a devastating effect to bird populations (R. Sallabanks [Idaho Dept. of Fish and Game] pers. comm. 2003). If a nest burns, in most cases, breeding opportunities are still available.

Adult birds escape the direct effects of the burn by leaving. Adult birds appear to be fairly resilient to spring prescribed burning, with renesting in remaining habitat common among neotropical migratory birds that suffer early-season nest failure (R. Sallabanks [Idaho Dept. of Fish and Game] pers. comm. 2003). Fall burning would have little direct effect on birds, because even young birds would be developed enough to fly away and escape a fire. The direct loss of adult birds and young through management is likely less of an effect to bird populations than the loss of habitat (R. Sallabanks [Idaho Dept. of Fish and Game] pers. comm. 2003).

Harvest and prescribed burning would alter bird habitat. In the first few years after harvest or burning, understory trees, shrubs and forbs would be reduced or removed, reducing nesting and feeding habitat for species that use the lower forest layers. Commercial harvest would remove some midstory and understory tree habitat. Because of changes to habitat, effects to birds could continue into the following seasons with reduced or improved recruitment throughout the area (OR-WA PIF 2001).

Weed treatments proposed in the action alternatives would all be done mechanically (no herbicides would be used). Birds may experience localized minor disturbance, but weed treatments should benefit all birds by creating space for native or desired plants.

Intermediate Thinning Practices

Comparatively little information exists on responses of forest birds to intermediate thinning, but some effects at the landscape level and stand level can be inferred from what is known about avian habitat associations (Martin and Finch 1995).

In most cases, intermediate thinning maintains a specific tree-diameter distribution in the stand through periodic removal of selected trees. Intermediate thinned stands typically retain much of the structure that can support mature forest-bird communities, and provide habitat for many species that use the ground-shrub-sapling layer. Such management would have both positive and adverse effect on some NTMBs.

Some species populations ("non-target species" such as red-breasted nuthatch, warbling vireo, American robin) would be reduced by this dry forest restoration while many other species native to dry forest (such as white-headed woodpecker, flammulated owl, chipping sparrow) would benefit (Altman 2000, OR-WA PIF 2001, Tiedemann et al. 2000). OR-WA PIF (2001) considers the alteration/loss of habitat for non-target species to be of low concern because:

- these [non-target] species are opportunistically present in Dry Forest sites, and generally not of conservation concern in this habitat because of their primary association with other forest types;
- the long-term benefit of habitat enhancement for target Dry Forest species outweighs the impacts of habitat loss for non-target species; and
- restoration of Dry Forest habitats is among the highest priorities for bird conservation in western North America.

With the application of the proposed intermediate thinning, maintenance of a large tree component in the overstory should provide a less dense but still functional habitat for canopy dwelling NTMBs. However, the loss of some mid and understory commercial sized trees in intermediate thinning stands is likely to result in lower densities of bark foragers (mostly resident species), canopy-forage gleaners, and cavity nesting species. The few studies that have compared selection cutting or partial cuts to unlogged stands have found that some bark foragers and foliage gleaners decrease, and some ground and shrub foragers or nesters increase.

Canopy gaps resulting from harvest of single trees or groups of trees provide habitat for a variety of NTMBs associated with young second growth forests or gaps in older forests. Many second-growth associated NTMBs need canopy gaps for breeding and likely benefit from harvest created gaps. In addition, many dry forest and area-sensitive species are adapted to internal forest disturbances such as tree-fall gaps, created by natural events, harvest, or prescribed burning. If the gaps created by harvest are not extensive, the effects of created gaps are expected to be minimal, but beneficial to species such as flammulated owl.

Canopy gaps resulting from commercial harvest should be minimal in the overstory. Most harvest would occur in the understory layers. As part of dry forest restoration, this harvest will benefit target species in the long term and reduce habitat for non-target species.

Source habitats typically used by dense forest-interior species are not abundant in the Silvies Canyon Watershed. Because of past management and natural conditions there is little interior conifer forest habitat in the area. There are some relatively large blocks of interior-forest within the Myrtle-Silvies Semiprimative Area, which would continue to provide some nesting habitat to non-target species.

Precommercial Thinning and Pile Burning

Precommercial thinning is an integral part of dry forest restoration. In the long-term thinning would benefit target species that prefer more open understories (including flammulated owls and chipping sparrow). In the short-term, thinning could reduce nests and nesting success of chipping sparrows and non-target bird species that nest in understories.

Magnitude of Treatments

The following discussions show the magnitude of potential effects by considering the timing of treatment, the amount of treatment, and the positive or negative effect for birds.

Timing

Both positive and negative effects are expected for NTMBs both in the short-term (first year or two after treatments) and in the long-term (anywhere from five to over 100 years).

The timing of treatments (burning, harvesting, thinning) and their intensity would have different effects on NTMBs. In all cases, if treatments occur during the nesting season (usually June 1 to July 15), birds present in the treated area would be negatively affected in the short-term due to impacts of disturbance and habitat removal on nest success and mortality. Because of the high potential for short-term negative impacts to NTMBs, most burning and precommercial thinning would not be planned to occur during the breeding season. Burning usually occurs in the early spring on the Emigrant Creek Ranger District; in nine out of years, prescribed burning ignition is completed by June 1 (G. Mackey, pers. com.). This would reduce the impact by generally avoiding nesting activities early in the year. If this were the case, the expected loss of NTMB reproduction for that year would be much less than with a late spring burn when the NTMBs are well into their nesting/brooding activities (OR-WA PIF 2001).

Fall burns may be planned in the future to better mimic what is believed to be the natural fire history of the area. However, due to excessive fuel loading in the project area, fall burning would have to be proceeded by at least one spring burn in any given area. This would reduce the potential of an escaped prescribed fire and the loss of valuable wildlife habitat.

Precommercial thinning would be limited during the breeding season (see Mitigation Measures). NTMB reproduction would be negatively affected on no more than 2,500 acres (4% of the project area) each spring.

Because fire restrictions and wet conditions generally shut down commercial harvest in the late summer/early fall and early spring, most commercial harvest would occur during the late fall and winter and during the bird breeding season. Harvest would have short-term negative impacts on bird reproduction if it occurred during the breeding season, long-term benefits for target species, and long-term negative impacts on non-target species that depend on more dense, closed canopy forest.

OR-WA PIF (2001) acknowledges that spring burning and mechanical treatments may impact landbird habitat and reproduction, but supports these treatments because of their long-term habitat and population benefits to dry forest birds (i.e. white-headed woodpecker, chipping sparrow, Townsend's solitaire, gray flycatcher).

Extent

The effects related to these action alternatives are lumped together because the relative effects related to implementation of the proposed harvest actions are similar. The magnitudes of the alternatives differ. See Table 2-21 (Chapter 2) for the project implementation schedule.

Under **Alternative Two** intermediate thinning would occur on about 14,348 acres. Commercial treatment would occur on about 22% of the project area over a four to seven year period (four separate timber sales in different portions of the watershed and other projects). Precommercial thinning would occur on about 23% of the project area over 10-15 years.

Under **Alternatives Four, Seven and Seven-A**, intermediate thinning would occur on about **17,005 acres**. Commercial treatment would occur on about 26% of the project area over a three to five year period (four timber sales and other projects). Precommercial thinning would occur on about 25% of the project area over 10-15 years.

Under **Alternative Five**, intermediate thinning would occur on about 11,044 acres. Commercial treatment would occur on about 17% of the project area over a three to five year period (four timber sales and other projects). Precommercial thinning would occur on about 21% of the project area over 10-15 years.

Under Alternatives Three and Six, no commercial treatment would be done, but precommercial thinning would occur on about 16,060 acres and 10,799 acres, 25% and 17% respectively, over about 10 years.

Alternatives Two, Four, Seven and Seven-A have the highest potential to negatively affect reproduction in the short-term and positively/negatively affect habitat in the long-term (dependent on bird species - see direct and indirect effects sections above). These alternatives treat 51-55% of the project area over 10-15 years. The remaining action alternatives treat 17-45% of the project area. In all alternatives, 45% or more of the area would remain untreated, providing refugia during treatment and areas of source habitat for species associated with dry forest (OR-WA PIF 2001). In addition, mitigation measures would assure that patches of precommercial-size trees would remain in treated stands in and adjacent to wildlife corridors. Under all action alternatives the affect to nesting by precommercial thinning would also be limited by mitigation measures that limit the amount of treatment (to 2,500 ac. per spring) and provide a method to maintain effects within that limit.

Fuels Treatment

Effects of All Action Alternatives

Prescribed burning improves wildlife habitat, reduces fuels, disposes of logging slash, prepares sites for seedlings or planting, regenerates fire dependent conifers, hardwoods, and herbaceous plants, manages competing vegetation, controls insects and disease, improves forage, and enhances aesthetic appearances of the forest understory. In this project area, natural fuel prescribed burning would be done mainly to benefit wildlife, restore fire-dependent plant communities by removing fire-intolerant species such as white fir, and reduce hazardous fuels.

Table 4-29 displays the extent of burning in the Silvies Canyon project area. Prescribed burning would create a mosaic of burned and unburned areas both within Burn Blocks and in the project area as a whole. One prescribed burn objective is to burn 40-70% of any block (leaving 30-60% of any block unburned). Thus, "Total Acres in Burn Blocks (the top line of Table 4-29) does not display the actual number of acres that are expected to burn; instead, this total acreage represents the outline within which burning will be contained. For example, burn blocks in Alternatives Two, Three, Four and Seven cover 39,277 acres (60%) of the project area. Due to the mosaic nature of burning, only 15,700 to 27,500 acres (24-42%) of the project area would actually be blackened, leaving 58-76% of the project area unburned.

Most prescribed burning would occur in the spring because spring-like conditions are preferable to have control over the intensity of the fire. Block 6 (5,526 acres) could be burned in the fall (and likely would be) because it has been treated recently with prescribed fire. Parts of other blocks would also be burned in the fall to protect other resources, such as bald eagle and goshawk nests. See "Magnitude of Treatments-Timing" for effects of spring burning on birds.

Table 4-29. Prescribed Burn Extent by Alternative.

Activity	Alts Two, Three, Four and Seven	Alt. Five	Alt. Six	Alt. Seven-A
Total Acres in Burn Blocks (% of project area)	39,277 (60%)	25,311 (39%)	33,374 (51%)	33,751 (52%)
Actual acres expected to burn (% of project area)*	15,711 – 27,494 (24-42%)	10125 – 17718 (16-27%)	13,350 – 23,362 (20-36%)	13,501 – 23,626 (21-36%)
Actual acres expected to burn in spring (% of project area)*	13,500-23,626 (21%-36%)	7,914-13,850 (12%-21%)	11,139-19,494 (17%-30%)	13,501-23,626 (21-36%)
Range of actual acres treated per spring	1,491 - 5,459 (2% - 8%)	358 – 5,459 (<1% - 8%)	0 – 5,459 (0 – 8%)	1,491 – 5,459 (2 – 8%)

*Actual acres expected to burn is based on burn objective which is to burn 40-70% of the block

Alternatives Two, Three, Four, Six, Seven and Seven-A would burn similar amounts of the project area, blackening 13,500 to 27,500 acres (24-42% of the project area) over an eight or nine year period. These alternatives have the highest potential to positively/negatively affect habitat in the long-term (dependent on bird species-see direct and indirect effects sections above). Alternative Six would burn up to 19,500 acres (30% of the area) in the spring versus up to 23,600 acres (36% of the area) for the other alternatives; therefore, Alternative Six has a reduced risk of affecting bird reproduction since fewer acres would be treated in the spring. Alternative Five proposes to burn up to 17,800 (27%) acres, with 7,900-13,900 acres burned in the spring over six years (12%-21% of the area). Of all the alternatives, Alternative Five would benefit fewer target species in the long-term, but would also have the lowest potential to negatively affect existing bird species reproduction. Because PIF (Altman 2000, OR-WA PIF 2001) recommends restoring large blocks of dry forest with prescribed fire, Alternatives Two, Three, Four, Six, Seven and Seven-A would have the most long-term benefit for dry forest (target) bird species. The reduction in burn acres (between DEIS and FEIS) reduced the amount of spring burning that would occur, thus reducing the potential beneficial and negative effects to nesting and resident birds.

In all action alternatives, prescribed burning would blacken between 400 and 5,500 acres each spring (<1-8% of the 65,200 acres in the FSS portion of the area). Because of weather conditions, fire managers may be unable to burn each year or may only treat a portion of a burn block. The treatments may be spread out, potentially with a year or more without burning, over 15 years. Assuming herbaceous plant recovery within three years, less than 20% of the project area would have reduced habitat quality at any time during the project due to prescribed fire. In all alternatives, 58-73% or more of the area would remain untreated by fire because of the mosaic nature of burning within blocks and the lack of proposed burning in some parts of the project area. Unburned areas would provide refugia during treatment and areas of source habitat for bird species to recolonize treated areas (OR-WA PIF 2001). In addition, mitigation measures would assure that patches of understory cover would remain in treated stands in and adjacent to wildlife corridors.

With prescribed burning of aspen stands, and other restoration work in progress, an overall increase in the availability of aspen of various successional stages should be seen. This would have beneficial long-term effects on aspen and aspen-associated species. Riparian, shrub, and scabland habitats would not be actively treated (ignited) with prescribed fire although a small amount of light intensity burning may occur on the fringes of these habitats (see Mitigation Measures, Chapter 2). Since 15% or less of these habitats within burn blocks are expected to burn (G. Mackey, pers. com.) and additional acreage of habitat occurs outside of burn blocks, effects to bird species habitats (and bird populations) in these types would be minor.

In these alternatives, some acres to be prescribed burned overlap with precommercially thinned units. Some acres in these units will be burned twice; the first entry (pile burning) is a fuel pretreatment with short-term localized effects (limited to the pile and a few feet around it for about a day), and the second entry is burning areas between piles (see effects above). These treatments would not cause additive effects to birds.

Effects on Neotropical Migratory Birds of Concern

Partners in Flight developed Bird Conservation Plans for all physiological areas within the United States, including the Central Rocky Mountains (Physiologic Area 64), which includes the Blue Mountains (Altman 2000). This plan included most of the following species as focal species for a variety of habitats. To help assure local viability of these species, all action alternatives incorporate PIF dry forest strategy (Altman 2000) elements in their design, such as:

- "Use prescribed fire and/or thinning…where appropriate to reduce fuel loads and accelerate development of late-seral conditions."
- "Implement road closures…to limit access to snags."
- "Retain all large trees…and all existing snags..."
- "Initiate snag creation and recruitment where necessary."

The USFWS (2002) "Birds of Conservation Concern" list was consulted in accordance with Executive Order 13186; effects of management were analyzed on species expected to be present.

Swainson's Thrush and Hermit Thrush

Alternative One would not directly impact forest habitats that might be used by these species. Lack of management may put habitat at risk through wildfire, insects, and disease.

Action alternatives would have little effect on these species due to the restricted amount of associated habitat in the Silvies Canyon watershed. Most suitable habitat is represented by aspen (currently in marginal to poor condition) and riparian shrub habitat. Restoration of aspen within the watershed would benefit these species, making more and higher quality habitat available. Spring restoration may also improve the quantity and quality of these species' habitat. Application of RHCA buffers would maintain forest habitat conditions along streams for nesting habitat. Prescribed burns may creep into riparian areas, which may impact nesting birds dependent on the timing of the burn and early nesting activity. Nesting season is mid-May to mid-July with a peak in mid-June (Sharp 1992). Since little burning would occur in riparian habitat, it is unlikely that burning would impact a significant number of nesting birds or nests. Renesting later in the season is also a possibility if fire should destroy a nest (R. Sallabanks [Idaho Dept. of Fish and Game] pers. comm. 2003).

Olive-sided Flycatcher and Vaux's Swift

These species are associated with moist forest, which does not in the Silvies Canyon project area. PIF (Altman 2000, OR-WA PIF 2001) would not consider these species a focal or target species for management in the project area due to the lack of habitat.

None of the alternatives (including Alternative One) would affect habitat associated with these species. Treatments in the action alternatives may reduce the quality and quantity of habitat in places where these species are using the current vegetation opportunistically since forest habitat would be moved toward dry forest species (ponderosa pine, larch) and away from wet forest species (white fir). However, OR-WA PIF (2001) considers the alteration/loss of habitat for non-target species to be of low concern as compared to the long-term habitat and population benefits to dry forest target species.

Chipping Sparrow

Alternative One would not directly impact forest habitats that might be used by this species. Lack of management may put habitat at risk through wildfire, insects, and disease. The high density of regenerating pine would continue to exceed the sparrow's habitat requirements and could negatively impact chipping sparrow populations (Altman 2000).

Precommercial thinning and burning in the action alternatives would reduce understory fir and pine regeneration, opening up the understory but leaving patches of understory trees. Chipping sparrows prefer an open understory with pockets of regenerating pine, so treatments would benefit this target species in the long-term (Altman 2000, OR-WA PIF 2001). In the short-term, however, thinning could reduce nests and nesting success of chipping sparrows since they nest in the understory. Under all action alternatives mitigation measures and project design would assure that patches of precommercial-size trees would remain in and adjacent to treated areas limiting negative effects by providing refugia and nesting sites during treatment and areas of source habitat after treatment (OR-WA PIF 2001). Negative effects to nesting due to precommercial thinning would also be limited by mitigation measures that both limit the amount of treatment (to 2,500 ac. per spring) and provide a feedback loop to maintain effects within that limit. Despite the potential for negative effects of spring burning and mechanical treatments, OR-WA PIF (2001) supports these treatments because of their long-term habitat and population benefits to chipping sparrow.

Williamson's Sapsucker

The effects of proposed management activities on this species are addressed in the MIS section.

Flammulated Owl

The effects of proposed management activities on this species are similar to those described for the white-headed woodpecker.

Veery and Red-eyed Vireo

Effects to these species are expected to be similar to those described for the Swainson's thrush. Benefits to veery from aspen and spring restoration would occur relatively quickly (likely within five years after treatment). Benefits to red-eyed vireo would occur over time as aspen begin to provide canopy cover.

Loggerhead Shrike

Areas that may provide nesting habitat, such as productive riparian shrublands or possibly mountain mahogany, would not be treated with harvest or prescribed fire in any alternative; no effect would occur from these activities. In the action alternatives, opening up forested stands (reducing basal area and/or reducing canopy cover) may make habitat more suitable for shrike since shrike prefer very open stands. Overall, proposed actions could benefit loggerhead shrike.

Brewer's Sparrow and Sage Sparrow

The effects of proposed management activities on these species are similar to those described for the Western sage grouse and gray flycatcher.

Long-billed Curlew

Areas that may provide habitat, such as Crane Flat and Myrtle Park, would not be treated with harvest in any alternative; no effect would occur from these activities. Prescribed burning would be avoided in meadows and prairies, though burning could occur along the edges of these habitats. Since the amount of burning would be minimal, the negative and positive effects to curlew of burning (such as disturbance, or increased grass/forb production) are expected to be minimal.

Cumulative Effects

Bird species that historically preferred open, park-like ponderosa pine forests and open mixed conifer stands have been negatively affected by contemporary forest management practices that emphasized extensive even-aged management, fire exclusion or suppression, and continuous or long-term grazing (Altman 2000). These practices produced a closed forest of dense, young to mid-aged trees with limited understory diversity, fragmented landscapes and, removed much of the structure that provided diversity at the stand-level and at the landscape-level.

While this project aims to restore dry forest and other habitats, restoration will take time. In acres with multiple treatments (11,000 to 21,000 acres or 11-33% of the project area), vegetation (and therefore habitat) recovery may occur briefly between treatments or may be delayed until treatments are completed. This may slow the recovery of target species. However, the restoration of dry forest is a PIF priority (OR-WA PIF 2001). Burning and harvesting have been planned to meet PIF conservation strategies (low intensity and severity, retaining snags and large trees, mosaic patterns with refuge areas of untreated habitat, among others) and should allow for restoration while reducing impacts on nesting birds. Grazing can impact migratory birds and their habitat. Livestock grazing would continue in the project area. Grazing, as managed in the project area, should not contribute to cumulative effects. Overall, the prescribed treatments in the project area are expected to benefit avian populations (OR-WA PIF 2001, Altman 2000).

Recent declines in population size of NTMBs have been attributed to problems on the breeding grounds as well as nonbreeding grounds (Martin and Finch 1995). It is extremely difficult to predict outcomes of localized management actions when the majority of birds on the Malheur National Forest are NTMBs that migrate to areas that are outside the United States during part of the year.

Effects on Dedicated Old Growth (DOG) and Replacement Old Growth (ROG)

Effects of Alternative One – No Action

This alternative would not directly affect DOGs that exist within the planning area because no treatment would occur. Unless a stand-replacing event (fire, bug-kill, windstorm, etc.) occurs in these stands, five of the seven DOGs would continue to provide habitat for old-growth associated species for the next 20 to 30 years. Two of the seven DOGs (02016 and 02017) would continue to provide habitat for about 40-50 years. ROGs would not be designated, so those areas would not be managed to provide for future old growth.

Fire suppression and a lack of fuels treatment or prescribed burning in most of the DOGs has led to high and increasing tree densities, ladder fuels, and ground fuels. With ongoing fire suppression only one outcome of the no-action alternative is expected within the foreseeable future (within about 50 years): removal of some or all old-growth characteristics, such as large trees, snags, and canopy cover through a combination of stress, insects, and disease and through stand-replacing fires or other stand-replacing events.

Recent prescribed burning in DOGs 02016 and 02017 reduced understory vegetation and fire hazard, and somewhat increased growth rates of remaining trees. Moderate densities of small tree and ground fuels still remain higher than desired in these two DOGs; in the absence of periodic underburns, these stands are also at risk to stand-replacing wildfires.

The effects of stand-replacing fires would be expected to be similar to those seen on other 2002 Malheur National Forest fires (Flagtail, Easy, and Monument), including:

- Loss of most live trees of all sizes and associated loss of cover (thermal and hiding cover),
- Creation of a multitude of various sized snags, increase in snag density until snags fall down (Knotts (1997) concluded that most snags will fall within 10 to 30 years),
- Salvage harvest of fire-killed trees, and
- Lack of old-forest characteristics (large trees, large snags, and associated wildlife species) for 120 years or more.

The recent history of fires on the Malheur National Forest indicates that with current fuel loads, stand-replacing fires are probable in the project area.

Until stand-replacing fires occur, much of the existing DOG and potential ROG habitat would continue to decline into a less productive condition that may not provide all habitat components for some old-growth dependent or associated wildlife. Old growth structure (large, live overstory trees and large snags) would gradually decrease after about 20 years of ongoing management without additional treatment. Large live overstory trees (usually pine) would die from stress, insect infestations, and disease; midstory trees (usually fir) would grow into or replace large trees, but at a slower rate than they do now because of increased competition for water and increased tree kill by beetles, tussock moth, and spruce budworm. As large overstory trees are lost to insects and disease, some stands might not continue to meet the old growth classification, shifting from OFMS to YFMS (Vegetation Specialist's Report).

Large snag and down wood recruitment would increase in the first 20 years of no-action as large overstory trees die from stress, insect infestations, and disease. These snags would likely stand for an additional 10-15 years, increasing snag levels above current conditions for about 30 years. Large snag recruitment would be reduced in the last 30 years (of the fifty prior to expected stand-replacing fires) as fewer large trees would be available to turn into snags. Increased snag densities would benefit many old-growth associated species. However, benefits would only last for 30 years, and would come at the cost of reduced levels of large live trees.

Depending on the condition of insect outbreaks, canopy cover would oscillate between about 40-60% in DOGs. As discussed, tree densities would continue to increase, resulting in increased canopy cover. At the same time, the probability of tussock moth and spruce budworm outbreaks increases with increasing tree densities. Insect outbreaks would likely occur in drought years when trees are under the most stress; one or several outbreaks are expected to occur over the next 50 years. Insect outbreaks would lead to trees being defoliated and killed, and to canopy cover being reduced. An alternating pattern of dense and light canopy cover would be expected to continue until stand-replacing fires or other stand-replacing events remove all or most of the trees that provide cover.

This alternative does not contribute to restoring ecological resiliency to forest habitat in the project area. Without a management strategy to maintain conditions that meet the management requirements of old-growth associated species, local populations of these species would be reduced until adjacent stands develop into late and old structure (LOS) or until forests recover from stand-replacing events.

Cumulative Effects of the No Action Alternative

Recent prescribed burning in DOGs 02016 and 02017 has reduced fuel loads and ladder fuels in these two DOGs. This prescribed burning provided a 10-20 year increase in these DOGs' vigor and resilience, and a reduction in their risk of stand-replacing fire. However, with no treatment and continued growth, these DOGs would be in a similar condition as the other DOGs within 10-20 years. Other DOGs have not been treated recently.

With no other past, present, or reasonably foreseeable actions in DOGS there are no cumulative effects. However, on a Forest-wide scale, burning of these DOGs or their replacements through a stand-replacing event would make it more difficult to meet Forest's strategy for old growth. When

DOGs and their replacements are burned by stand-replacement fire, they would no longer contribute to the network of managed DOG/ROG across the landscape. If possible these would replaced with stands outside the wildfire area; however, this might not always be possible.

Effects of the Action Alternatives

Reconfiguration of DOGs and Designation of ROGs

These alternatives would adjust existing boundaries of DOG 02011PW, 012PW, 015PW, 016PW, and 039PW to align DOG boundaries to existing GIS vegetation polygon layers and/or physical boundaries, such as roads. Logical breaks of vegetation polygons were used if splitting stand polygons was appropriate.

In addition, about 75 acres (16%) that is classified as YFMS of DOG 02017, would be reallocated as part of the corresponding proposed ROG. This would move this acreage into active management for development of future old growth.

Table 4-30. DOG Acres.

DOG #	Existing Acres	Adjusted acres
02011	344	376
02012	482	454
02015	684	715
02016	515	516
02017	475	398*
02039	286	289
TOTAL	2,786	2,748*

* Acreage decreased because 75 acres were reallocated to ROG 02017.

Table 4-31. ROG Acres.

ROG #	Existing Acres	Adjusted acres
02011	0	170
02012	0	265
02016	0	276
02017	0	221*
02039	0	214
TOTAL	0	1,146

* Acreage includes 75 acres reallocated from DOG 02017.

This action would result in a 38-acre reduction in total acres of DOG, and a 1,146-acre increase in total acres of ROG (see Tables 4-30 and 4-31). These actions do not relocate existing DOGs. These actions would benefit the DOG network by moving this area towards Forest Plan direction to provide and designate replacement old growth.

Reallocation of 75 acres of DOG 02017 would result in no change in total acres of old-growth habitat currently available in DOG 02017, since the reallocated acres are young forest and do not meet management direction. By allowing stands that don't meet habitat requirements for old-growth associated species to be managed as ROG, this action provides more options to allow for active management of this area.

The goal of adjusting DOG lines was to better define DOG boundaries, not to increase or decrease the size of DOGs. However, adjusting DOG lines would slightly increase the size of DOG 02039, moving it toward the Forest Plan standard, and would somewhat compensate for DOG acres lost to reallocating acres of DOG to ROG.

Adjusting DOG lines and reallocating 75 acres to ROG 02017 would have a negligible beneficial effect on old growth associated species. The 38-acre total decrease in Dedicated Old Growth seems like a small loss in habitat. However, adjusting DOG lines made several DOGs slightly larger. In addition, part of the 16-acre DOG reduction is reallocation of 75 acres to ROG 02017. This reallocation would result in no change in total acres of old-growth habitat currently available, since the reallocated acres are young forest that do not provide high quality pileated woodpecker habitat. Thus, the final effect of adjusting DOG boundaries is a 38-acre decrease in DOG but a net increase of 37 acres in high quality old-growth habitat within DOGs with a negligible effect on pileated woodpecker and other old-growth associated species.

These alternatives defer designation of a ROG for DOG 02015PW. No suitable adjacent areas exist in Silvies Canyon Watershed. DOG 01101 (Blue Mountain) has a ROG already established outside of the watershed.

Effects of Treatments on DOGs

Three DOGs, 01101, 02011 and 02012, would not be treated. Without future treatment, effects to these three DOGs would be similar to those described under the No Action alternative.

DOGs 02015 and 02039 would be precommercially thinned then prescribed burned through fire creeping between burn piles. With current fuel loads and the presence of above historical levels of ladder fuels, the ability of management to keep fire in the designated location and at the desired intensity would be limited. Prescribed burning would be continued in DOGs 02016 and 02017.

The intensity of these burns would be low enough to avoid mortality of mid-story and overstory trees but high enough to further thin understory trees. Treatments would simulate a natural low intensity/high frequency fire regime (see Fire Specialist's Report for definitions). Burn plans and burn monitoring would be reviewed annually to assure effects stay within prescriptions and to adjust burn methods, if needed (see Migratory Bird and Hiding Cover Mitigation, Chapter 2).

Reduction in Canopy Closure: There could be a slight reduction in canopy closure following thinning and burning due to the removal of suppressed understory trees. This change in canopy closure could result in a slight increase in ambient and ground temperature as more light is allowed through the canopy. The level of change would be very limited due to the nature of the treatment. Generally, precommercial sized trees contribute little to the primary overstory canopy; therefore, removal would have limited effect on canopy structure and microclimate conditions.

Simplification of Stand Structure: In dry forests, multilayered structure was historically rare. This was due to frequent low intensity fire that cleaned out the understory without impacting fire resistant overstory trees (Kohm and Franklin 1997). With fire suppression, unsustainable understory layers made up of shade-tolerant, fire-intolerant species developed. Historically this area's OFMS may have had a multiple-aged overstory that was also maintained by frequent fires (Vegetation Specialist's Report).

In these alternatives, precommercial thinning and burning would remove a portion of the shade-tolerant structure from the understory. This would result in a slight simplification or a reduction in existing canopy layers. Depending on the existing density of the understory, amount removed, and amount retained in wildlife clumps, precommercial removal in combination with burning could potentially convert a multilayered stand to a two-layered stand.

With retention of some of the understory (see Design Criteria for Big Game Cover, Chapter 2), a portion of the lower canopy would be retained to provide for future replacement trees and canopy structure for understory associated wildlife. The resulting vertical structure would approach that found prior to modern fire suppression and provide more sustainable structure over time.

Retention-based harvest would retain sufficient structural elements (large and intermediate trees, snags, and down wood); treatment would not convert stand seral stage or structure. Overall, stand structure would remain intact, continue to function as old growth, and support old growth associated species (Bull and Holthausen 1992).

Increased Stand Vigor: The residual stand should become somewhat more vigorous as competition from the understory is reduced (Tappeiner and Latham 1999, Smith and Arno 1999, Hatz 1991). This would make these stands more stable over time as the remaining trees become increasingly resilient to the effects of pathogens, drought and fire. Habitat loss from these factors could be reduced or at least the impacts could be limited.

The level of improvement would be limited because of the proposed treatments would deal with one element of overstocking and species compositions. Excessive stocking of mid-sized trees would remain and continue to compete with overstory trees.

Increased production of Herbs and Shrubs: Limited increased light penetration to the ground and a reduction in understory conifers would allow for a small amount of increased growth of understory grasses, forbs and shrubs (Smith and Arno 1999). This would result in a minor increase of forage availability for ungulates and cover for ground nesting and foraging wildlife.

Residual Structural Elements: All treatments would focus on suppressed understory trees. All large and mid-story tree cohorts would be retained to provide horizontal and vertical structure to the stand.

No snags or down wood would be actively treated as part of the vegetation management or fuels reduction prescriptions (see Design Features, Chapter 2). Some snags might be burned down during prescribed burning activities, but burning would create new snags. Dead and defective tree habitat would be retained at current levels. The net effect is that the existing levels of snags would remain after activities are completed.

Prescribed burning would kill some large trees or clumps of trees, though burning would be conducted under conditions that are least likely to kill large trees. Tree mortality of 21" dbh or larger trees is not expected to be over 5% (Burn objectives, Fuels Specialist Report), which would cause minimal negative effects to stand structure. Tree mortality at or below 5% of overstory trees would likely benefit wildlife by creating additional snags.

Reduction of Fuel Levels: These alternatives would result in an overall reduction of fuel levels throughout the stands and would reduce the risk of a stand-replacing fire (Graham et al. 1999, Kohm and Franklin 1997). Through the removal of smaller diameter dead and dying trees from the understory, ladder fuels capable of carrying a ground fire into the canopy would be reduced.

Landscape Level Burning: Once the initial restoration treatments have been completed, it should be feasible to maintain and manage old growth by using landscape prescribed fires, with or without additional silvicultural treatments (Smith and Arno 1999).

Effects of Other Proposed Actions on DOGs

Only DOGs 02039 and 02015 have other activities (such as roads and access changes and noxious weed treatment) proposed in or adjacent to them. The other DOGs would not be affected by other proposed activities because such activities would not occur in or near them. Permanent road closures in DOG 02039 (0.1 mile in Alternative Five, 0.5 miles in the remaining alternatives) would slightly reduce road-associated influences on this DOG, benefiting this DOG and associated species (see section titled "Effects of Roads on Wildlife and Habitat"). Mechanical weed treatments in DOG 02015 should benefit native plants in this DOG by reducing weeds and weed spread. No other DOG has a known noxious weed infestation. Spring and aspen restoration, and juniper reduction would also occur in DOG 02015. Treatments would return these small inclusions to healthier conditions that more closely resemble historical conditions. Retaining springs, aspen, and juniper would benefit this DOG by maintaining the natural diversity of habitats.

Cumulative Effects of Treatments on DOGs

Thinning as a preparation for reintroduction of prescribed fires can enhance old-growth conditions and habitat for species associated with late seral conditions, particularly if critical structural components are retained.

All Action Alternatives approach old growth management in a prudent manner. Proposed thinning treatments would occur in two of the seven DOGs that occur in the Silvies Canyon Watershed. Two additional DOGs would be managed with low intensity prescribed burning. The remaining DOGs would receive no active treatment at this time or in the foreseeable future. In addition, other large tracts of LOS occur within the Myrtle-Silvies Semi-Primitive Area. Most of these areas would not be actively managed at this time.

Maintenance burning may be planned in the future in these areas; burning would help retain lower fuel levels, thus maintaining reduced fire hazards. Reduced fine fuels around tree bases (due to burning proposed in this project) would help protect trees and snags from future burning. More large trees and snags would likely be retained during future burning, providing more sustainable old growth characteristics.

Effects of Treatments on ROGs

The goals of these treatments are development of suitable old-growth habitat within 20 to 40 years after treatment. This would likely coincide with the projected loss of old-growth characteristics of untreated DOGs in the watershed. The development of new old-growth habitat would allow for future reconfiguration of associated DOGs that provide habitat for old-growth associated and dependent species.

Thinning is a silvicultural tool which can be used to modify current stand structures and promote a more balanced structure in areas with either excess small trees or currently lacking in large tree component (Edminster and Olsen 1996). Under Alternatives Two, Four, Five, Seven and Seven-A, thinning is proposed in both young stands and in mature stands of trees.

Thinning of Young Forest ROG Stands (SE and YFMS)

This section applies to ROG # 02017, 02039, and parts of 02012 and 02016.

Wildlife generally respond not to stand age but to ecological characteristics (Hayes et al. 1997). Many of these characteristics vary with stand age, but management activities can change stand structure and the rate and direction of ecological succession. Large trees, snags and down wood habitat would be retained at current levels, while stand structure, diversity and cover would be altered in the short-term.

Commercial thinning in stem exclusion stands (ROG 02039) could change the stand from closed canopy to open canopy. In the remaining ROGs (YMFS stands), changes may simplify the structure but because of the low intensity of proposed treatment would not be to a level where it would alter overall stand structure or function (Vegetation Specialist Report).

Thinning young stands may provide growing conditions that more closely approximate those historically found in developing old-growth stands, thereby accelerating development of structure found in late seral forests (Hayes et al. 1997). Although thinning can reduce the total volume of wood in a stand, it promotes rapid growth of individual trees by reducing competition for light and water (Tappeiner and Latham 1999, Hayes et al. 1997, Edminster and Olsen 1996, Hatz 1991).

Thinning dense stands that are in mid-seral stages can increase the potential for windthrow, particularly on exposed sites and along ridgetops (Hayes et al. 1997). While this event is costly to wood production, it can create beneficial gaps in the retained canopy and provides coarse woody material to the forest floor.

Wildlife use of or movement through these ROG units may be limited, depending on the animal's sensitivity to changes in stand structure or a reduced level of canopy closure. Sufficient stand structure would be retained to provide habitat for most species that use this habitat type.

Over the next 20 to 40 years, stand structure and canopy closure should increase and the area should develop in to a more complex old-growth condition, characteristics important in replacement old growth, which should be sustainable over the next 60 or more years.

While thinning may affect these ROG stands in varying ways, there are no wildlife species that are unique to mid-seral stands with limited understory development (Wisdom et al. 2000, Hayes et al. 1997). Therefore, proposed treatment of these stands would have no adverse effect on specific species regardless of intensity of treatment. In addition, thinning at proposed levels would likely enhance future habitat for species associated with late seral conditions, particularly if critical structural components are retained (Hayes et al. 1997).

Thinning of Mature Forest ROG Stands (OFMS)

This section applies to ROG #02011, and parts of 02012 and 02016.

In later stages of stand development, thinning may lead to stands that resemble historical stand conditions that were once found across much of the watershed. Treated stands would have a well-developed understory beneath an open overstory made up of a few large trees per acre. After treatment, the resulting stand structure should more resemble a multistoried, uneven-aged stand (Hayes et al 1997).

Mechanical treatment would focus mainly on suppressed understory trees. Large and most mid-story trees would be retained to provide horizontal and vertical structure in the stand.

Thinning of shade tolerant conifers from stands of old trees can be beneficial to the large tree component by increasing vigor and possibly longevity of older trees (Tappeiner and Latham 1999). With appropriate harvest methods, thinning of trees from stands of old growth does not appear to damage old trees.

Effects would be similar to those described under "Effects of Treatments on DOGs." There would be no adverse effects to species associated with mature forest because OFMS would retain its old-growth structure (Vegetation Specialist Report) and because the snags or down wood component would not be actively treated as part of the vegetation management or fuels reduction prescriptions. Snag and down wood mitigation would assure that snags are retained. Regional direction for retention of down wood would be applied to retain this habitat component for primary cavity excavators (PCEs), secondary cavity users and other wildlife that require this habitat (see Design Criteria and Mitigation Measures, Chapter 2). If historical levels of snags were not present upon completion of fuels treatments, additional snags would be created to provide habitat for these species at historical levels. Snag creation may move ROGs towards Forest Plan standards for snags if sufficient 21" dbh live trees are available for snag creation. But even if snags 12" to 21" dbh were created, snag creation would help provide habitat for snag-dependent species.

Fuel Treatments

Similar to DOGs, fuel loads in ROGs are above historical levels. The excessive stocking of understory trees in ROGs precludes returning fire without a preparatory treatment.

Through the removal of smaller diameter dead and dying trees from the understory, accumulations of ladder fuels that are capable of carrying a ground fire into the canopy would be reduced. Follow-up slash treatments would treat hand piled activity generated slash. Some fire creep is expected between piles depending on concentration of natural fuels and seasonal burning conditions. This treatment would result in an overall reduction of fuel levels throughout the stand and would reduce the risk of a stand-replacing fire (Graham et al. 1999, Kohm and Franklin 1997).

All ROG units would be follow-up burned with low intensity prescribed fire to reduce fuel loading between burned piles. This treatment should simulate fire burning under a natural fire regime.

Effects of burning in ROGs would be similar to effects in DOGs.

Effects of Other Proposed Actions on ROGs

Only ROG 02012 has other activities proposed in or adjacent to it. The other ROGs would not be affected by other proposed activities because such activities would not occur in or near them. Permanent road closures in ROG 02012 would reduce road-associated influences on this ROG, benefiting this ROG in the long-term. No additional activities will occur in this ROG.

Cumulative Effects of the Action Alternatives

These ROG areas currently have no special land designation and have been affected by many forms of past management (including activities such as road construction and use, timber harvest, and fire suppression). Following their designation, they would be managed as replacement old growth (MA 13, Forest Plan IV-105-107). Maintenance burning may be planned in these areas; burning would help retain lower fuel levels, thus reducing future fire hazards. Future burning would be less likely to kill large trees or remove snags because of reduced fine fuels around tree bases.

These alternatives allow for future options in managing DOGs in the watershed. With vegetation management of replacement old growth, changes in existing mid and late-seral habitat should create high quality old-growth habitat in the long-term (20-40 years).

By providing old-growth replacement acreage, possible damage or probable deterioration of existing DOG can be mitigated by manipulating DOG boundaries. This would allow for long-term perpetuation of habitat that supports wildlife species that are associated with mature forest conditions.

These proposed actions would provide for more ecosystem diversity. Active management of DOGs should contribute to a network of other managed DOGs in other watersheds and across the landscape. With management of these areas and proper management of connective habitat, old-growth species viability may be stabilized or improved.

Effects on Late and Old Structure (LOS), Connectivity, and Fragmentation

Structural retention can enhance the movement of organisms within a managed landscape (Rochelle et al. 1999, Franklin 1993). Conditions in the dominant patch type are the most important factor controlling connectivity in that landscape, including dispersion and migration of most organisms (Franklin 1993). The Regional Forester's Forest Plan Amendment (RFA) #2 requires that blocks of LOS habitat have a high degree of connectivity between them. Standards require that we maintain connectivity between LOS and DOGs by linking them in at least two different directions (see Map #28). Conditions of the connecting stands must be those in which medium diameter or larger trees are common, canopy closures are within the top 1/3 of the site potential, and stand widths are 400 feet wide at their narrowest point.

The fragmentation process is the breaking apart of a given area of habitat into smaller, simpler pieces. It can be defined as a product of forested vegetation being removed through natural means (wildfires, windthrow, or landslides) or human means (timber harvest). Historically, Northwest forests were naturally fragmented by disturbances such as fire and disease. Past fire suppression in dry eastside forests, has "de-fragmented" the natural landscape and contributed to fuel distribution patterns that increase the potential for large wildfires (Rochelle et al. 1999).

Fragmentation usually co-occurs with habitat loss. The response of vertebrate populations differs, however, and for most species, the effects of habitat loss are greater than the effects of changes in habitat patterns.

Effects of Alternative One – No Action

This alternative would not directly affect any late seral stage habitat (late and old forest) that exists within the planning area or connective habitat between LOS habitat blocks because no treatment would occur. It would not directly create fragmentation of habitat within the project area. Unless a stand-replacing event occurs in these stands, LOS would continue to provide habitat for LOS associated species for the next 20 to 30 years.

Similar to the effects of No Action on old growth (see section titled "Effects on Dedicated Old Growth and Replacement Old Growth"), the expected outcome within the foreseeable future in LOS is removal of old-forest characteristics due a stand-replacing event. The probability of stand-replacing fires or other events in LOS blocks and connectivity corridors would continue to increase without the removal or treatment of accumulated fuels and trees. Wildfire or other stand-replacing events would increase the habitat fragmentation in the project area.

Until a stand-replacing event occurs, effects of No Action on Warm-Dry LOS are expected to be similar to effects on DOGs in terms of increasing tree densities, tree species conversion, competition for water, and resultant decreased vigor and increased mortality of trees. The effects of No Action to Warm-Dry LOS snag levels and canopy cover would be similar to the effects in DOGs. Much of the existing LOS and connective habitat would continue to deteriorate into a poorer condition. LOS associated snag-dependent species would likely benefit in the first 30 years from the increase in snags, but would may not be maintained into the future because of reduced snag and large green tree levels.

Cumulative Effects of Alternative One – No Action

Almost 15,000 acres of forested habitat was harvested in the project area after 1982. Harvest ranged from selection cuts and commercial thins to clearcuts; harvest occurred in a variety of structures (not all was LOS). Of this, 168 acres of LOS that was harvested retained LOS structure.

High fuel levels were left after most of these treatments (Fuels Specialist Report). On the 168 acres of LOS and many of the remaining treated acres, the immediate hazard of stand-replacing fire is elevated, because a fire start would be more likely to spread, less easy to control, and be hotter than in an area with less fuels. With no treatment, these LOS and other stands would have extremely high fuel loads and be at highest risk of stand-removal by fire.

All treated acres would continue to move toward older structures until a stand replacement event occurs. With no other past, present, or reasonably foreseeable actions in LOS, the no-action alternative does not contribute to additional cumulative effects.

Effects Common to All Action Alternatives

Under Alternatives Two, Four, Five, Seven and Seven-A, existing LOS habitat would be entered with the goal of restoring environmental processes associated with healthy, structurally complex LOS within site potential. Structural elements would be retained to achieve the management objective of providing structural habitat.

Under these alternatives, between 2,699 and 3,651 acres (29-39%) of available LOS would be treated through thinning to maintain uneven-aged structure without promoting regeneration, commercial thinning, and precommercial thinning to reduce ladder fuels (see Table 4-34). Prescribed burning would occur on about 65% of the LOS. Between 2,256 and 3,155 acres would receive both vegetation management treatments and prescribed burning.

Under Alternative Three, 3,420 acres (37%) and under Alternative Six, 2,485 acres (27%) of total LOS available in the watershed would be treated with precommercial thinning. Treatment focuses on precommercial thinning to reduce ladder fuels. Prescribed burning would occur on about 65% of the LOS present. Approximately 2,923 acres (Alternative Three) or 2,485 acres (Alternative Six) would receive both vegetation management treatments and landscape-level prescribed burning.

Under all action alternatives, the remaining LOS would receive no treatments. Much of this acreage is located within the Myrtle-Silvies Roadless Area. These areas would continue to be influenced by stocking induced tree mortality and the exclusion of fire.

Table 4-32 summarizes the proposed treatments in LOS stands.

Table 4-32. Treatment in LOS by Alternative*.

Treatment Type	Alt. Two Treatment Acres	Alt. Three Treatment Acres	Alts Four, Seven and Seven-A Treatment Acres	Alt. Five Treatment Acres	Alt. Six Treatment Acres
Intermediate treatment	1,703	0	1,901	962	0
Commercial thin	345	0	426	305	0
Precommercial thin	837	3,420	1,325	1,432	2,485
Total Harvest	2,885	3,420	3,651	2,699	2,485
Prescribed burning	6,033	6,033	6,033	6,033	5,894

*There are approximately 9,255 acres of LOS in the entire Silvies Canyon project area.

Under all action alternatives, modified commercial thinning, precommercial thinning, and prescribed burning would remove a limited number of trees and thus a limited amount of canopy cover and hiding cover in connectivity corridors. The tree density and fuel levels remaining would be higher in corridors than in surrounding treated stands. Remaining basal area would average 70-80 ft^2 in corridors, corresponding to about 21-31% canopy cover, compared to an average of 50-60 ft^2 (13-22% canopy cover) in other treated stands.

Mitigation measures (Chapter 2 of the EIS) would ensure adequate retention of canopy cover and hiding cover to meet Forest Plan standards in connectivity corridors. Due to modified treatment in the corridors, canopy closure in the corridors should meet the Forest Plan standard of remaining in the top 1/3 of site potential after treatment. Connectivity corridors and adjacent stands would have higher amounts of interspersed hiding cover than surrounding treated stands (see Mitigation Measures). Because connectivity standards would be met by all action alternatives, all action alternatives would provide adequate habitat connectivity. Reduced commercial thinning and increased ladder fuels/small trees would make these stands more susceptible to stand-replacing fire and density-induced stress than fully-treated stands; however, treatment should provide 10 to 15 years of protection from fire and density-induced stress. Commercial thinning (in Alternatives Two, Four, Five, Seven and Seven-A) would remove some understory trees and precommercial thinning would remove 50% of the small trees in corridors, leaving patches of hiding cover but still reducing ladder fuels and stress. Additionally, treatment of surrounding stands would make it less likely that a fire would spread into these stands.

Residual structural elements would be retained in all treated connecting habitat following the RFA #2 standards. These retained elements include large diameter trees, snags, down wood, retained (hiding) cover patches, and canopy closure. These elements should function as stepping-stones for dispersing organisms.

Both forested stands and Riparian Habitat Conservation Areas (RHCA) have been utilized for connectivity corridors. No commercial harvest activities would occur within RHCAs. Untreated forest patches, which would retain more structural diversity, would also provide additional structural and microclimatically moderate habitat that would not be provided by individual structures. This would increase the potential of the managed landscape in the Silvies Canyon Watershed to provide connectivity for many organisms.

Road closures, weed treatment, juniper reduction, and spring, cottonwood, and aspen restoration would occur in connectivity corridors on a limited basis. These activities would cause minor disturbance (for one to several days) in corridors, but would provide long-term benefits by maintaining natural diversity in corridors, providing high quality foraging habitat, and reducing road-associated influences. Fencing associated with aspen, cottonwood, and spring restoration could block the movement of larger animals such as big game, but effects are expected to be minimal since fenced areas would be small enough to walk around and no fences would completely span a corridor.

Commercial thinning, intermediate treatments, and other activities proposed under the action alternatives would not cause any additional habitat fragmentation in the project area.

Additional cumulative effects are similar to those described under LOS, Action Alternatives.

Effects of Alternative Two – Proposed Action

Silvicultural Practices

Recent research on forest ecosystems has clarified the importance of structural complexity to forest ecosystem function and the maintenance of biological diversity. Snags, woody material on the forest floor, multiple canopy layers, varying size and condition of live trees, and the presence of canopy gaps are some important structural elements that contribute to this complexity. Retention of these structures aids in the rapid reestablishment of ecosystems that have high levels of structural, functional and compositional diversity (Kohm and Franklin 1997).

Treatments proposed in this alternative would incorporate a strategy to maintain or quickly restore environmental values associated with structurally complex forests. This approach would provide for the following:

Lifeboating/Refugia Habitat - Habitat that provides structural elements, microclimatic conditions, and foraging opportunities that fulfill habitat requirements of various organisms, and provides a source for reestablishing species once the new forest stand and other suitable habitat conditions are reestablished.

Recent research suggests that removal of trees from stands of old trees can be accomplished with little risk to existing habitat and possible benefits to old tree vigor and longevity (Bull et al. 1995, Kohm and Franklin 1997, Hayes et al. 1997, Tappeiner and Latham 1999). Proposed treatments should increase stand vigor in the larger trees, improve future crown development, and decrease density dependant mortality among larger trees, while retaining existing old-growth structural components and characteristics (see Design Criteria and Mitigation Measures for snags and down logs, Chapter 2).

However, Hayes et al. (1997) caution managers about placing all available LOS under management because of a lack of knowledge of long-term response of LOS to management. This alternative would treat about 35% of the existing LOS in the project area.

Enrichment - Retention of key structures at the time of harvest can result in future stands with much higher levels of structural diversity and therefore habitat carrying capacity (Kohn and Franklin 1997).

Enhancing Connectivity - Retention of live trees and key structures would provide a matrix of forest habitat that would facilitate dispersion of organisms.

Harvest of LOS would reduce stand density, reduce canopy closure (by an estimated 20-40% – see Vegetation Specialist's Report), and simplify stand structure (see Effects of treatments on DOGs). However, a variety of individual and stand-level structural features would be conserved during harvest to enrich stand structure and maintain forest habitat matrices. They include (as referenced in Kohn and Franklin 1997):

- **Large Live Trees** - Large trees over 21" dbh would be retained during harvest. Smaller dominant and strong codominant trees of varying condition would be retained to maintain structural diversity in harvest units.

- **Snags** - Existing snags would be retained in harvest units unless they pose an unavoidable safety hazard to operations or public safety. Green replacement trees would be retained to provide snags in the future. In addition, burn piles in units would be built away from snags, which may help protect these snags during burn operations (see Design Criteria and Mitigation Measures, Chapter 2).

- **Down Wood** - Down wood would be retained at Forest Plan levels (see Chapter 2 Design Features) in treatment units. Prescribed burning could reduce this level by as much as 60 percent. Often fire creates snags, which become down wood within 5 to 10 years of burning. This would replace most down wood lost during initial burning.

- **Undisturbed Layers of the Forest Floor** - Typical harvest systems disturb limited amounts of the forest floor and most ground disturbance occurs in skid trails and landings. Ground disturbance would not exceed 20% of the area, therefore limiting the impact.

Landscape level mosaic prescribed burning typically affects only portions of the forest floor. Prescribed burn objectives are that 30 to 60% of a burn unit would not be burned during any given burn project. This would leave a mosaic of burned and unburned/undisturbed forest floor across an area.

- **Multiple Stand Layers** - Thinning from below and precommercial thinning would reduce the density of understory layers but not likely eliminate canopy layers. Wildlife cover patches would be retained throughout most units. This would provide understory forest aggregates that would provide additional structure to the remaining understory.

Fuel Treatment
Because of excessive stocking of mid-sized and smaller trees, returning fire into LOS without preparatory silvicultural treatments would either be ineffective (failing to thin to desired levels) or too destructive (causing mass tree morality). Low to moderate intensity prescribed underburn would be used as a follow-up to mechanical treatments on most acres. This treatment would reduce remaining understory vegetation densities and fuel loading to more historical levels.

Cumulative Effects of Alternative Two – The Proposed Action
Once the initial restoration treatments are completed, it should be easier to maintain the stands in a natural structure at low risk of severe wildfire or insect/disease epidemics by continuing use of prescribed burning. Follow-up burning should occur every 10-15 years to maintain stand integrity and desired habitat conditions.

Direct, Indirect, and Cumulative Effects of Alternatives Three and Six
While the treatments proposed under this alternative do not aggressively treat high priority stands in the project area, they do begin to move structure in treated stands toward HRV, and contribute to restoring ecological balance to forest habitat in the project area. Stands that were experiencing reduced vigor and stand health because of overstocking, fire exclusion, and insect and disease-related mortality would continue to be influenced by these forces, but the level of influence would be somewhat reduced for approximately 10 years.

Using precommercial thinning as a pretreatment for prescribed burning should reduce the potential for fires burning out of prescription and causing modification of LOS structure.

Precommercial thinning of trees less than 9" dbh would only slightly alter the current canopy closure and basal density of most of the stands. This treatment would not cause any additional fragmentation in the area.

Direct, Indirect, and Cumulative Effects of Alternatives Four, Seven and Seven-A
While the amount of acres treated is the greatest under these alternatives, the intensity of treatment would be similar to that described in Alternative Two. Overall, effects would be similar.

Direct, Indirect, and Cumulative Effects of Alternative Five
While the amount of acres treated is slightly decreased under this alternative, the intensity of treatment would be similar to Alternative Two. Overall, effects would be similar.

Effects on Unique and Special Habitats

Effects on Caves, Talus and Cliffs/Outcrops/Rimrock

There are no known deep caves in the project area. There is a shallow ice cave that is regularly used by recreationists. Because of high human use of this cave, most wildlife use is precluded.

There are no major areas of talus in the project area.

Other than the cliffs in Silvies and Myrtle Canyon, there are only minor rock outcrops in the planning area. Typically, they are found along major ridgelines and ridge noses. Outcrops that qualify as important geomorphic features may be identified during project implementation and would be avoided or protected through site-specific mitigation measures as per Forest Plan Standards.

Effects on Riparian Habitats

Direct and Indirect Effects of Alternative One – No Action

No restoration activities would take place in riparian habitats. Effects to riparian habitat in the project area would be as described in the section titled "Effects on Watershed/Fish Habitat (Issue 3)" in the subsection "Upland and Riparian Vegetation" under the No Action alternative.

As insects and disease continue to affect the area, habitat surrounding these sites would be degraded. This could possibly influence the wildlife use pattern of some of these microsites. Changes would be gradual because all surrounding vegetation would not be affected at one time and dead or dying trees would continue to provide some cover over the next several years. Animals using these habitats would probably experience little effect from this gradual change in surrounding cover in the short-term.

Over the next 5-10 years, changes in surrounding vegetation and structure may alter microclimate conditions within these sites. Sites such as rock outcrops and springs would receive less overall use and may not be able to provide habitat conditions that some habitat specialists use. This condition would likely persist until quality cover develops from the surviving vegetation.

Potential change in patterns of use and microsite conditions of unique and sensitive habitats represent a very minor change in use of this habitat across the area and surrounding watershed in the short-term.

There are indirect, long-term effects from insects and disease outbreaks and stand replacement events that would occur because of not addressing current forest heath issues. The magnitude and timing of these impacts are unknown, but they could drastically modify riparian habitat and microsite conditions for many years to come.

Cumulative Effects of Alternative One – No Action

Past management has affected riparian habitats (see Hydrology and Fisheries Specialists' Reports). The effects of grazing and cottonwood planting and protection would likely continue. No other reasonably foreseeable actions or cumulative effects are expected.

Effects Common to All Action Alternatives

In order to maintain options for species conservation in the future, protective buffers that have been amended to the current Forest Plan standards would be used to provide protection of seeps, springs, and other types of wetland not incorporated into stream/RHCA buffers. A no-cut buffer of 100' slope distance from the outer edge of the wetland would be established for all sites associated with harvest units.

Through avoidance, there would be no direct effect on upland springs. Although all riparian habitats would be avoided or buffered during stand treatments, the altering of surrounding habitat may change use patterns of animals sensitive to changes in habitat. In addition, microsite environmental conditions may be slightly influenced by edge effect created by partially opening up adjacent blocks of habitat. This may also change the levels of use and/or species using these microsites.

In 5-10 years, surrounding understory vegetation should recover from harvest activities and use of these sites by wildlife highly sensitive to changes in habitat structure could return to pre-treatment levels. As the surrounding treated habitat becomes more vigorous, microsite environmental conditions should become more sustainable.

As insects and disease continue to affect the habitat within buffer areas, habitat conditions could be degraded. This could possibly influence wildlife use patterns of some of these sites. Changes would be gradual because surrounding vegetation would not all be affected at one time and dead or dying trees would continue to provide some cover. Animals using these habitats would probably experience little effect from these gradual changes in surrounding cover.

The 100-foot buffers around 46 springs (44 springs in Alternative Seven-A) would receive non-commercial restoration treatments to enhance wildlife habitat on a total of about 50 acres. Thinned trees left jackstrawed may provide habitat for spring/riparian-associated species such as small mammals and amphibians. Increased water, increased light, and reduced grazing may lead to increased riparian vegetation, including deciduous trees, which would improve conditions for riparian dependent species.

Noncommercial restoration treatments would occur in two cottonwood stands. Maintenance or expansion of cottonwood would improve conditions for riparian dependent species.

The proposed natural fuels reduction is not expected to consume large woody material, snags, or riparian shrubs in the RHCAs. The likelihood of direct adverse effects to seeps, springs and other wetlands is low since fire intensity is expected to be very low once it reaches the riparian zone. Most riparian vegetation has a positive fire response. Any burned riparian vegetation should regenerate quickly and improve the riparian condition.

Effects on Aspen

Effects of the alternatives on aspen are described in the Silviculture, Fisheries and Wildlife Specialists' Reports and the section titled "Effects on Vegetation Condition." The effects on wildlife are briefly summarized here; the effects of aspen treatments on wildlife are more fully described in each of the species' effects sections.

Direct and Indirect Effects of Alternative One – No Action

Aspen would not be directly affected by this alternative. Mature aspen trees would continue to decline and regeneration would be low or nonexistent. Several of the smaller, older and more decadent aspens sites could disappear from the project area. The variety of wildlife species that use aspen, including red-naped sapsucker, Williamson's sapsucker, downy woodpecker, Swainson's thrush, and various bat species, would likely be adversely affected by its decline.

Cumulative Effects of Alternative One

Since 1990, aspen restoration projects across the Forest, including removal of encroaching conifers, restoration of fire, and protection of regeneration to reduce browsing, are beginning to slow or reverse the decline of this species. Selection of the No Action alternative under this proposal would likely only lead to the disappearance of aspen from the project area.

Effects of the Action Alternatives

Removal of encroaching conifers from aspen may simplify vertical structural diversity of the stand. Ramble (2000) determined that conifers within aspen stands do not contribute to avian species richness or diversity of birds and in most cases speed up successional processes by providing seed sources for new conifers. He recommends removal of all conifers from aspen if the objective is to manage for aspen. Removal could include commercial and non-commercial removal, cut and leave, and/or creation of snags from resident conifers.

Aspen stands would be released from competition with conifer trees, leading to an increase in aspen vigor and numbers. Suckering/regeneration would be stimulated. Protection from grazing by cattle, deer, and elk would increase the number of aspen suckers that are able to grow into mature trees, increasing the size of aspen patches. All aspens stands are likely to benefit from fencing regardless of the kind of fence constructed. Once new regeneration grows sufficiently tall to withstand browsing pressure, fences would be removed or no longer be maintained. The variety of wildlife species that use aspen would likely benefit from expansion of aspen.

Cumulative Effects of the Action Alternatives

Along with past, present and future Forest-wide aspen restoration, these alternatives would benefit aspen and aspen-associated species across the Forest.

Effects on Dead and Defective Tree Habitat (Snags) and Dead and Down Wood Habitat

Direct and Indirect Effects Alternative One – No Action

Based on available data and ocular estimation, past forestry practices and low site productivity has resulted in an overall snag (trees likely to die within five years) density that does not meet Forest Plan standards and corresponds to the 30-50% tolerance level for white-headed woodpecker according to DecAID (Mellen et al. 2003). The project area is well below the 50% tolerance level for snag density for pileated woodpecker. However, information from Gunderson (A.G. Gunderson [USDA Forest Service] pers. comm. 2003) suggests that the drier parts of this project area (south and west exposures, moderate to steeper slopes) would have only provided snag and down wood habitat at the 30% tolerance level historically while the rest of the area may have provided habitat at the 50% to 80% tolerance level historically.

The No Action alternative would maintain existing snag or defective tree habitat in the planning area. If environmental stresses such as drought, high levels of competition in overstocked stands, and/or insects and disease continue at predicted levels, high levels of tree mortality should be expected in the near future (see the section titled "Effects on Dedicated Old Growth and Replacement Old Growth"). This would result in an increase in the availability of dead tree habitat and a greater population density of species associated with or dependent on this habitat.

Over the next 20 years, many large live trees would die and would provide snags in the short-term. Younger trees are not expected to grow into large trees in this timeframe to become large snags. As these snags fall down (most would be down in about 30 years), the area would generally decline in the availability of large snag habitat, and increase in down wood habitat.

After about 30 years, this reduced number and recruitment of large snags would likely cause a decline in population levels of some primary and secondary cavity users. Depending on the rate of decay, down wood habitat would follow this trend with a lag time of 10 to 20 years.

Within 50 years, stand-replacement events are expected to occur (see the section titled "Effects on Dedicated Old Growth and Replacement Old Growth"). A stand-replacing fire would consume most of the existing dead and defective tree habitat and habitat that supports many forest species would be drastically altered. Newly created fire-killed snags would provide abundant habitat for a variety of wildlife (Smith 2000). Cavity excavators would increase during the first few years with other cavity users following a few years later.

This benefit would be short-term, as fire created snags fall and are not replaced (Martin and Finch 1995). Monitoring of recent large-scale wildfires on the Emigrant Creek Ranger District indicates that residency time (time snags remain standing) of most fire-killed snags is 10 to 12 years. About 70 - 90% of the fire-killed snags observed have broken off or have fallen over. Some snags would remain up to 30 years. Populations of cavity excavators are still predicted to be high but would decline over time.

Within the foreseeable future, stand-replacing fire or insect kill would create areas of increased snag density for up to 30 years. After snags fell, large snag habitat would not recover for 120 or more years as trees grow into larger size classes.

Cumulative Effects of Alternative One – No Action

The current low level of snags in the project area is due in part to low site-potential as well as past forestry practices. The No Action alternative would not contribute to additional cumulative effects on snags, down wood, or MIS species, though No Action would lead to an alternating pattern of high snag densities followed by low snag densities until forests recover from stand-replacing events. MIS populations dependent on snags would likely follow the same pattern.

Direct and Indirect Effects Common to All Action Alternatives

Silvicultural Treatments

To maintain future options and increase the probability of maintaining viable populations of PCE, all snags would be retained in harvest units and the area would be managed with the goal of providing snags at the Forest Plan standard. These alternatives attempt to follow RFA # 2 by retaining as many snags as possible.

Sufficient live green replacement trees of varying vigor and age class would be retained to meet forest green tree retention guidelines. On average, the number of green replacement trees retained in harvested areas would be about 2 ½ times the number required by the standard (about 45 trees retained versus 18 required); in some areas to be harvested, almost four times the required number of green tree replacements would be retained.

Under normal conditions, some snags could be cut as management activities (harvest, burning, hazard tree removal, and permitted firewood cutting) occur. Snags could be felled during harvest and post-harvest activities if they pose a hazard to operations or public safety. In Alternatives Four, Seven and Seven-A, about 16,000 acres of commercial harvest would occur, providing more potential for the felling of snags than in Alternatives Two and Five (which commercially harvest about 14,000, and 10,000 acres, respectively). Felling snags for safety could potentially reduce snag densities below current levels, but snag felling in these alternatives would result in a minor increase in down wood due to a mitigation measure that requires that cut snags be left to provide down wood. Snags would not likely be felled due to silvicultural practices in Alternatives Three and Six, since no commercial harvest would occur. Snags and down wood could be removed for firewood in all action alternatives, potentially reducing snag densities and down wood levels. All action alternatives would retain green replacement trees above Forest Plan standards to provide for management of future snag levels at or above Forest Plan standards. The proposed level of green tree replacements in all action alternatives would allow for management of snags and down wood at the 50% to 80% tolerance level or higher for white-headed woodpecker and closer to the 50% tolerance level for pileated woodpecker (Mellen et al. 2003).

Loss of snags (through hazard tree removal and firewood cutting) could indirectly affect primary cavity excavator species by removing some snags that may be used for nesting, courtship, or foraging. The overall change in habitat availability and primary cavity excavator populations should be slight because the level of probable snag reduction is expected to be low. Most Malheur National Forest MIS woodpeckers are moderately adaptive and not overly vulnerable to habitat manipulation (Thomas et al. 1976) and should be able to adjust to minor changes in the availability of snags and changes to their habitats. In the short term, the project area should continue to provide habitat at the 30-50% tolerance level for white-headed woodpecker. The project area would remain below the 50% tolerance level for snag density for pileated woodpecker (Mellen et al. 2003).

Minor changes in the availability of dead and defective tree habitat from existing levels to post-treatment/managed levels would have little affect on secondary cavity excavators and cavity dwellers. Species such as the northern flying squirrel (*Glaucomys sabrinus)*, chickadee (*Tamiasciurus hudsonicus*), pygmy nuthatch (*Sitta pygmaea*), flammulated owl (*Otus flammeolus*), mountain bluebird (*Sialia currucoide*s), and many other species may be affected by changes in snag availability, but little effect is expected.

Fuels Treatments

Prescribed fire can alter or remove vertical and horizontal stand structure including snags and down wood (Tiedemann et al. 2000). Studies by Hardy and Reinhardt (1998), document loss of existing snags during prescribed burning and recruitment of new snags through fire-caused mortality. The level of loss and replacement is dependent on fire intensity, time of year, local weather conditions, and fuel load.

While prescribed burning is generally of low intensity, it often contributes to a reduction in the availability of existing down wood (both hard and soft logs) and snags and may cause localized single or clumped tree mortality.

Some large trees may be killed by prescribed burning regardless of the timing of the underburn or other conditions. Tree mortality of 21" dbh or larger trees is not expected to be over 5% (Burn objectives, Fuels Specialist Report), which would cause minimal negative effects to stand structure. Tree mortality at or below 5% could contribute up to one snag for every two acres in many stands within five years after treatment. This induced mortality could help to offset snags lost during harvest and post-harvest burning. More burning would occur in Alternatives Two, Three, Four and Seven than in the other action alternatives, so more snags would be created in these alternatives than in the remaining alternatives.

Many soft snags and class 3 logs could be partially or completely consumed during prescribed burning (Block and Finch 1997). This decrease may be alleviated in subsequent years as fire-killed trees die and snags fall. While fire does not provide down wood similar to that burned (lacks decay in sapwood) it provides hiding cover and thermal cover. As the log decays over time, it would provide sites for feeding and reproduction. Post-treatment monitoring of snag densities would be done in the project area to determine the need for snag/down wood creation as described in the Mitigation Measures (Chapter 2) and for future treatments to recruit snags or down wood.

Many species tend to have no adverse response to burning or do not tend to avoid burned areas (Smith 2000). Miller, Rose and Svejcar (1998) found that prescribed fire does not affect the abundance of birds using burned areas, but burning did alter species composition. Some species, including black-backed and Lewis' woodpeckers may increase their use of areas after burning. This influx is a response to increased forage and nesting opportunities created by fire killed or stressed trees and changes in accumulations of ground litter and ladder fuels, senescent shrubs and dense regeneration.

Other Proposed Activities

See the section titled "Effects of Roads on Wildlife and Habitat" for a discussion of how road activities affect snag and down wood levels. Weed treatment would have no effect on snags and down wood. Snags and down wood would be created through spring, aspen, and cottonwood restoration, as well as in ROG areas. It's predicted that most of these snags would be less than 21" dbh because of the lack of live 21" dbh trees in these areas. Though creation of snags smaller than 21" would not move the area toward Forest Plan standards, snags of this size would benefit species such as hairy woodpecker by making more snags available for foraging and nesting (see discussion on hairy woodpecker in the section titled "Effects on Indicators of Dead and Defective Tree Habitat"). Some 21" dbh or larger snags would be created in the project area, helping to move some areas towards Forest Plan standards. Down wood would likely meet Forest Plan standards after restoration treatments in most areas, benefiting woodpeckers and other down wood-related species. Some snags may be created through juniper reduction (and subsequent burning); these snags would generally be smaller diameter juniper.

Cumulative Effects Common to All Alternatives

The application of the RFA #2 should result in the retention of dead and defective tree and down wood habitat at higher levels than those retained prior to this Forest Plan amendment. Overall snag and down wood levels are not expected to change due to the proposed activities. Proposed actions in the alternatives should not contribute to cumulative effects on snags and down wood.

Vegetation management and occasional fires, (natural and prescribed) can improve habitat for certain wildlife, slow the spread of tree diseases, recycle nutrients and stimulate growth of many fire adapted plants. Implementation of stand manipulation and prescribed burning would likely accomplish this and help restore sustainable forest conditions.

Effects on Other Habitats

Elk wallows, animal dens, and other unique or special habitats may be identified during management activities and would be protected through the development of site-specific mitigation measures as needed. Protection of these sites should ensure continued use of these habitat features.

Consistency with Direction and Regulations

All action alternatives would require one or more non-significant, site-specific Forest Plan amendments to be consistent with the Malheur National Forest Land and Resource Management Plan as amended. All action alternatives would require an amendment that would allow Dedicated Old Growth areas to be reconfigured. Alternatives Two, Four, Five, Seven and Seven-A would require two additional amendments. These alternatives are not consistent with the Forest Plan as amended because they would harvest trees within goshawk 30-acre nest core areas. These alternatives would also reduce big game cover, habitat effectiveness index (HEI), and/or components of HEI below Forest Plan standards or below existing conditions that do not meet standards. Other than these exceptions, proposed activities comply with Forest Plan standards for wildlife.

Effects on Recreation

The principle method for analyzing environmental consequences on recreation in the project area is based on the desire or expectation of forest visitors for specific types of experiences and settings. These settings and experience opportunities can be described using the Recreation Opportunity Spectrum (ROS) guidelines. The effects on the recreational resource can be assessed by analyzing the change in the acres of each ROS class that would result under each alternative. A change in ROS class would reflect a change in the available recreation opportunities. Small acre shifts from one opportunity class to another would not individually have much effect on the recreation resources; however, large acre shifts from the non-motorized to the motorized would potentially limit opportunities for solitude and activities associated with unmodified settings. Evaluation of the effects of the alternatives is based on: changes in the ROS; harvest in currently important recreation places, changes in access to dispersed recreation sites, and other activities.

Recreation Opportunity Spectrum (ROS)

The project area is managed as semi-primitive non-motorized, semi-primitive motorized, roaded natural, and roaded modified as stated in the Forest Plan. Recreation opportunities are divided between the motorized (53,676 acres) and non-motorized (9,882 acres) categories. The project area has motorized opportunities from previous timber harvesting activities; however, past Access Management Plans have reduced these roaded opportunities over the last few years.

Under all alternatives, the project area would continue to provide a wide range of recreation opportunities, activities, settings, and experiences; however, the roaded settings clearly dominate. All action alternatives generally result in no change, or a small decrease in roaded settings.

Timber harvest and associated activities could temporarily and permanently change the ROS settings. Road closures could reduce opportunities for roaded recreation and at the same time increase opportunities for solitude. Timber harvest activities could change the visual quality of recreation places in the short term, if activities can be seen or heard by recreationists.

All action alternatives include approximately 36 acres of semi-primitive motorized setting within MA-10 and the Myrtle-Silvies Roadless Area. No activities are proposed within the 36 acres of semi-primitive motorized setting. Since no activities are proposed in this setting there would be no effect. Recreation user experiences would not change within this setting under any of the alternatives.

Direct, Indirect and Cumulative Effects From Alternative One - No Action

Under the No Action Alternative, there would be no planned activities. The roaded modified and roaded natural settings would retain their current attraction for those individuals seeking opportunities.

Direct, Indirect and Cumulative Effects Common to All Action Alternatives

Currently, the remaining unroaded settings are in the semi-primitive non-motorized class. Under all action alternatives there would be no shifts of acres from unroaded to roaded.

The appearance and recreational experience of roaded modified would change due to road closures under the Proposed Action and Alternatives Three, Four, Five, Six, Seven and Seven-A. Users seeking roaded access and a more modified environment would find fewer opportunities available to them as road closure activities take place.

Direct, Indirect and Cumulative Effects From Alternative Two - The Proposed Action

Proposed harvest and vegetation management activities would change the recreation experience in the roaded modified and the roaded natural areas; however, these changes are consistent with Forest Plan direction. Harvest activities and precommercial thinning would change roaded natural settings to roaded modified for 10 to 20 years. Proposed road closures would reduce access for roaded recreational activities. Landscape burning would change the appearance and recreational experience within the semi-primitive non-motorized setting for about five years.

Direct, Indirect and Cumulative Effects From Alternatives Three and Six

Precommercial thinning and landscape-scale prescribed burning would change the recreation experience within the semi-primitive area for five to ten years; however, these changes are consistent with Forest Plan direction. Landscape scale burning would be more natural appearing than the precommercial thinning. No commercial harvest is proposed in these two alternatives, so the recreation experience in roaded modified and roaded natural settings would remain unchanged.

Direct, Indirect and Cumulative Effects From Alternatives Four, Five, Seven, and Seven-A

Harvest and vegetation activities proposed under these alternatives would change the recreational opportunities, appearance and recreational experience the most; however, these changes are consistent with Forest Plan direction. Settings most affected are roaded natural and roaded modified. Precommercial thinning and landscape burning would alter the appearance and recreational experience within the semi-primitive non-motorized setting for five to ten years. Harvest activities and precommercial thinning would change the roaded natural setting to roaded modified for 10 to 20 years. Alternative Five proposes fewer road closures; therefore, it would provide more access for roaded recreational activities.

Table 4-33. Estimated ROS Acres by Alternative.

ROS Setting	Alt. One – No Action	Alt. Two – Proposed Action	Alt. Three	Alt. Four, Seven and Seven-A	Alt. Five	Alt. Six
Semi-Primitive Non-Motorized and Semi-Primitive Motorized	9,928	9,928	9,928	9,928	9,928	9,928
Roaded Natural	26,575	10,630	15,945	9301	14,616	26,575
Roaded Modified	27,065	43,010	37,695	44,339	39,024	27,065
Total Acres	63,568	63,568	63,568	63,568	63,568	63,568

Vegetative manipulation, i.e.. commercial and precommercial thinning activities would change Roaded Natural characteristics to Roaded Modified characteristics for approximately 10 to 20 years.

Impacts on Recreation Places

Roaded modified and roaded natural recreation places are specific areas where a wide range of recreation activities occurs. Roaded access, quality and setting of the environment around recreation places play an important role in the type of recreational activities chosen, as well as the quality of the recreation experience.

Timber harvest and associated activities could temporarily and permanently change the ROS settings within recreation places. Road closures could reduce opportunities for roaded recreation and at the same time increase opportunities for solitude. Timber harvest activities could change the visual quality of recreation places in the short term, if activities can be seen or heard by recreationists. Of these proposed activities, road closures would have the greatest affect on dispersed campsites. There are 37 known dispersed campsites within the project area.

Direct, Indirect and Cumulative Effects From Alternative One - No Action

Under the No Action alternative, there would be no direct or indirect effects on recreation places. However, motorized access to two dispersed campsites would be disallowed due to prior road closures that were either never implemented or breached. The existing characteristics of the remaining 35 recreation places within the watershed would remain the same.

Direct, Indirect and Cumulative Effects Common to All Action Alternatives

To analyze the effects of the seven alternatives, recreation places were assigned one of two categories: freshwater and land-based recreation.

Freshwater-based Recreation

Recreation along the rivers and streams includes fishing, hunting, hiking, and camping. Activities proposed within the roadless area would be apparent to recreationists in the area during implementation and could disrupt their activities. Various activities in the rest of the project area, under all action alternatives, would be apparent to recreationists as they drive to and from the roadless area. Effects would vary by alternative only by the amount and location of the activities.

Land-based Recreation

All action alternatives would have varying effects on the existing conditions of land-based recreation places. The most popular land-based recreational activities are hunting, dispersed camping, viewing scenery, hiking, firewood gathering, driving for pleasure, and snow play. Alternatives Three and Four would have the most affect on roaded access to dispersed campsites, reducing motorized access to seventeen known dispersed campsites. Alternative Two - The Proposed Action would reduce motorized access to eight known dispersed campsites and The Preferred Alternative and Alternatives Six and Seven-A would reduce motorized access to three known dispersed campsites. Under Alternative Five, the effects on dispersed campsites are the same as the no action.

Changes in Recreational Experiences within the Roadless Area

Road closures, pre-commercial thinning, spring restoration, and prescribed burning within the Myrtle-Silvies Roadless Area would change the visual quality and remote character currently found there.

Direct, Indirect and Cumulative Effects From Alternative One - No Action

Freshwater-based Recreation

Under the No Action alternative, there would be no direct effects to the resources. No new road closures would be implemented, no timber harvest would occur; the existing characteristics of the Myrtle-Silvies Roadless Area would be as described below.

Remoteness: The roadless area would continue to provide outstanding opportunities for outdoor recreation. There would be no effect on remoteness.

Solitude: Most of the roadless area would continue to provide moderate opportunities for solitude due to existing topography and vegetative screening.

Primitive Recreation Opportunities: Opportunities for achieving a primitive experience are limited by the roadless area's shape and size in relation to existing access outside the roadless boundary. This alternative would not affect existing boundaries or opportunities for experiencing a challenging, natural appearing environment within the roadless area.

Natural Integrity: Ecological processes in the roadless area have been slightly altered by grazing, recreational use, and fire suppression. This alternative would have no effect on the natural integrity of the roadless area.

Apparent Naturalness: Evidence of human use and activities are substantially unnoticeable on most of the roadless landscape. Human impacts scattered throughout the roadless area include cattle grazing, fences, hiking trails, and old jeep trails. The most visible impacts are old road tracks that have not healed over completely through portions of the roadless area. These impacts would remain unchanged.

Land Based Recreation

Remoteness, Solitude, and Primitive Recreation Opportunities: Under the No Action alternative, there would be no direct, indirect, or cumulative effects to the resources. No activities would occur; the existing characteristics of the area would remain as they presently exist.

Direct, Indirect and Cumulative Effects Common to All Action Alternatives

Freshwater-based Recreation

Remoteness, Solitude, and Primitive Recreation Opportunities: No commercial harvest activities would occur within the roadless area. Commercial harvest of stands adjacent to the roadless area, as well as spring restoration, precommercial thinning and landscape burning within the roadless area may result in direct and indirect short-term effects on remoteness within the area. Potential effects include increased sights and sounds of commercial harvest outside of the roadless area, people, and equipment adjacent to and within the roadless area. These effects would be of short duration during implementation.

Natural Integrity: Ecological processes in the roadless area have been slightly altered by grazing, recreational use, and fire suppression. Landscape scale burning, precommercial thinning and riparian habitat (spring) restoration would begin to restore the natural ecological processes; however, precommercial thinning and spring restoration would appear unnatural to some users.

Apparent Naturalness: The landscape burning, pre-commercial thinning and riparian habitat (spring) restoration proposed by these alternatives would have effects on the apparent naturalness of the roadless area. Long-term effects would be a more natural appearing landscape as fire is reintroduced to the area.

Land Based Recreation

Remoteness, Solitude, and Primitive Recreation Opportunities: The increased sights and sounds of people and equipment during vegetation management activities would result in direct, short-term effects on the qualities of remoteness and solitude.

Consistency with Direction and Regulations

All action alternatives would be consistent with applicable Forest Plan recreation standards (standards 6-12, FP IV-25).

Effects on Cultural Resources

The three categories of heritage resources, prehistoric sites, historic sites and traditional cultural properties, could be affected both negatively and positively by the proposed alternatives. For example, prehistoric sites within the Silvies Canyon planning area are mostly lithic scatter sites, that is, sites containing flaked stone tools, associated debitage, and groundstone tools. The integrity of these sites would generally not be adversely impacted by precommercial thinning, or by low-intensity, short-duration prescribed burning. These sites may be directly adversely affected, however, by ground disturbing activities involving machinery such as feller-bunchers, grapplers, and skidders or by catastrophic fire events. Machinery crushes artifacts and disturbs their spatial relationships, thus compromising the site's ability to yield valid scientific data. Very hot, or long duration fires can actually melt or disfigure artifacts to the point that they become unrecognizable, or no longer can yield useful information. Several of the methods used for dating archaeological materials or settings rely on relatively stable environmental conditions, and high temperatures can effectively "reset" those chronological indicators. Historic sites in this area often involve wooden structures such as old cabins, fence lines and corrals, and could be adversely affected by fire, heavy equipment operations, or tree falling. Traditional cultural properties may be areas used in the past and the present for the gathering of plants for food, medicine, or other purposes. Ground disturbance from machinery and fires occurring before plants are dormant could severely negatively impact these sites.

The possible positive effects that could be realized from the proposed activities mainly involve a lowering of potential direct and indirect effects from catastrophic fire, through the removal of over-abundant fuels, soil stabilization, and the planting or restoration of hardwoods and forage plants. Fires that burn very hot or of long duration could destroy artifacts directly, and subsequent soil destabilization and erosion could exacerbate the situation. Therefore, the removal of these overabundant fuels may prove key to the continued existence of many sites.

Direct, Indirect and Cumulative Effects From Alternative One - No Action

This alternative would be expected to have no direct effects on heritage sites within the project area, since none of the actions proposed in the other alternatives would take place. However, in terms of indirect effects, this is probably the least attractive of the proposed alternatives from a heritage perspective. This is because under Alternative One, no fuel treatments would take place, thus exacerbating an already highly volatile fuels situation. As recent events have demonstrated, areas with high fuel loading like much of the Silvies Canyon planning area are highly susceptible to catastrophic fires, which can cause soil destabilization and severe erosion. Erosion could heavily damage or completely destroy archaeological sites. Activities related to wildland fire suppression efforts, such as digging fire line by hand or machine, could also damage sites. Additionally, under Alternative One, no riparian restoration would occur. Riparian restoration is very much supported by this heritage program.

Direct and Indirect Effects Common to All Action Alternatives

In terms of archaeological site stabilization and protection, alternatives that propose to treat the current fuel loads in the project area through thinning and prescribed burning are preferable to the No Action alternative.

Restoration of Riparian (Spring) Habitat

Provided the district archaeologist is contacted prior to the implementation of the proposed activities and appropriate mitigation occurs, the activities proposed in this project would have no direct effects on heritage properties. In general, the falling of small trees is not detrimental to sites, so long as machine piling is not allowed, or materials are not dragged through the site. In some cases, such as when sites located in riparian areas are subjected to heavy trampling by grazing animals, trees that are fallen and left laying act to mitigate, to some degree, the trampling. Historic dendroglyph (writing and pictures carved into the bark of trees) sites are often located within aspen stands. Many of the older sites are disappearing, since the trees bearing the dendroglyphs are becoming old, and the carvings are either becoming illegible or the trees are dying and the bark is falling off of them. In such cases we may consider the careful recordation of the site, including sketching and photographing the glyphs, to be mitigation. In cases where the glyphs are still readable and the host trees still vigorous, a site can still be treated with no negative effect provided that care is taken so that the felled conifers do not scrape against the aspens.

The proposed fencing around five springs should have no direct effect on heritage sites, since ground disturbance is minimal. There can be the indirect effect of trampling damage from livestock once a fence is built, since livestock often walk parallel to a fence line, adjacent to the fence. If the fence is constructed through a site, or in such as manner as it directs the livestock to walk through a site, severe damage can occur to that site through trampling. Again, the district archaeologist should be made aware of fence-building activities prior to implementation, so that proper monitoring and mitigation can be accomplished. Four springs are proposed for spring improvements, which include the installation of spring boxes, lines and troughs. Since cultural sites are often located at or near springs, a potential for adverse effect exists when spring development is undertaken. However, through careful survey, testing, planning and monitoring during implementation, these effects can be mitigated. It may be more desirable to impact a site lightly during development than to allow the site to suffer continued damage from animals coming to the spring to drink.

Aspen and Cottonwood Restoration

Possible adverse direct effects from aspen restoration activities could occur if thinning were to take place in a dendroglyph site in an aspen grove if, during the course of conifer thinning, conifers fell against aspens carrying dendroglyphs. Also, motorized vehicles, if used during thinning activities, could adversely affect lithic sites. No Effect is expected so long as heritage resources design features are followed.

Noxious Weed Treatments

Treatment to reduce or eliminate noxious weeds within the Silvies Canyon project area would have the positive effect of reducing the competition of invasive plants against native species, many of which have traditional and ongoing cultural importance to Native American groups.

Road Closures and Decommissioning

Direct deleterious effects to heritage properties could occur during road closure and decommissioning if heavy equipment is allowed to operate within sites. Following the heritage resources design features will prevent this from happening.

Juniper Reduction

Operating mechanized equipment over heritage sites located within juniper reduction areas could directly impact those sites. Following the heritage resources design features will prevent this from happening.

Road Maintenance and Temporary Access Roads

In the past some roads were built either adjacent to or through sensitive heritage sites. Additional ground disturbing activities in these locations, as from maintenance, could be detrimental. The building of temporary roads through heritage sites would seriously compromise the integrity of those sites, and building roads immediately adjacent to sites could cause serious harm if precautions aren't taken. Following the heritage resources design features will ensure no effect to heritage resources.

Post and Pole
Operation of mechanized vehicles through heritage sites would damage them. Following the design features will ensure no effect to heritage resources.

Precommercial Thinning and Associated Fuels Treatment
In general, chainsaw falling and hand piling of small trees in sites would not negatively impact those sites. The operation of grapple piling machines through sites would cause direct damage to their integrity. Burning of large piles created by machines could also damage sites. Following the design features will ensure no effect to heritage resources.

Landscape Scale Fuels Treatment
Prescribed burning normally will not compromise the integrity of lithic scatter sites, providing burn temperatures are kept low and exposure times short. Many historic structures are susceptible to damage from fire, however, as are some prehistoric features, and at times, traditional cultural properties. Following the design features will ensure no effect to heritage resources.

Direct and Indirect Effects Common To Alternatives Two, Four, Five, Seven and Seven-A
Operating mechanized equipment over heritage sites located within commercial harvest units could directly impact those sites. Further, soil compaction and the ensuing potential for erosion could cause additional deterioration of site integrity. The burning of large slash piles located over heritage sites could directly and negatively affect the integrity of those sites. Following the design features will ensure no effect to heritage resources.

Cumulative Effects From the Action Alternatives
Of primary importance in the consideration of cumulative effects on heritage resources is that archaeological sites are not renewable. Evidence destroyed or altered, without prior scientific recordation, is lost forever. Any significant disturbance to sites will effect, and often skew, data. Any activity that takes place over or near a site could potentially affect it. Continued activities in that same area could have deleterious effects to the integrity of that site, and could reduce or eliminate the scientific value of that site, unless design criteria are followed.

All the action alternatives propose treatments that would ultimately reduce fuel loading, which is desirable for the continued integrity and protection of heritage properties. All of the activities specific to the proposed action alternatives, such as commercial harvest, commercial and precommercial thinning, and controlled burning, are expected to have no effect on heritage resources, given adherence to proposed cultural resources design criteria.

Summary
Provided the specialists involved with the implementation of the activities proposed in all the alternatives coordinate with the archaeologist prior to implementation and adhere to the design features specified, it is expected that there will be no adverse effects to heritage resources within the project area.

Consistency with Direction and Regulations

National Historic Preservation Act

Intensive survey of over 50,000 acres has resulted in the discovery and recordation of 255 heritage sites, of which 176 are eligible for inclusion to the National Register of Historic Places, 14 are considered ineligible, and the eligibility of 22 remains undetermined, awaiting further investigation. All sites that have been evaluated as eligible or potentially eligible would be strictly avoided during ground-disturbing activity. Log landings or other ground-disturbing activities would not be permitted in the vicinity of eligible historic properties.

Prior to project implementation, State Historic Preservation Office consultation will be completed 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 the Oregon State Historic Preservation Officer regarding Cultural Resource Management on National Forests in the State of Oregon, dated March 10, 1995, pursuant to the stipulated Forest Archeologist review dated November 15, 1996.

Tribal Interests

The "inherently sovereign" status of federally recognized Indian tribes requires that land managing agencies consult with tribes on a government-to-government basis over planned actions that may affect tribal interests. Some examples of tribal interests include: traditional cultural practices, ethnohabitats, sacred sites, certain plant and animal resources, and socio-economic opportunities. The Malheur National Forest Land and Resource Management Plan also directs the Forest to consult with tribes about the effects of projects planned within their areas of historic interest (Malheur LRMP 1990).

Consultation with the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Burns Paiute Tribe occurred at early stages of the planning process. To date, tribal consultation efforts consist of scoping letters mailed to each potentially affected tribal council, e-mails sent to tribal resource specialists, and face-to-face meetings with resource specialists. The Burns Paiute tribe expressed a general concern regarding access management within the project area.

Effects on Scenery Management

Portions of the watershed within Management Area 14 (Viewshed Corridors) encompass those middleground areas that are seen, or potentially seen from Highway 395. The management goal for Management Area 14 is to manage corridor viewsheds with primary consideration given to their scenic quality and the growth of large diameter trees. Current Forest Plan direction for the portions of the watershed within MA 14 is to manage middlegrounds as slightly altered (partial retention visual quality objective) in Sensitivity Level 1 corridors. Under the new Scenery Management System (SMS), manage to a moderate Scenic Integrity Objective (SIO) in the middleground. Management activities may be evident, but subordinate to the characteristic landscape (FSM 2382.21(3)).

Direct, Indirect and Cumulative Effects from Alternative One - No Action

Because no additional activities would occur, there would be no change to the project area's scenic character. The visual objective of managing to a moderate scenic integrity objective in the middleground would be met. In the long term, if mortality increases, there could be a gradual change in color and texture. The green background could gradually change to a gray color until the dead trees fall down and are replaced by new trees. If a stand replacement fire were to occur, there would be a dramatic change in color and texture.

Direct and Indirect Effects from the Proposed Action

Under the Proposed Action there would be 109 acres of commercial thinning, 228 acres of precommercial thinning and 270 acres of prescribed burning within MA 14.

Direct and Indirect Effects from Alternative Three

Under Alternative Three there would be 253 acres of precommercial thinning and 270 acres of prescribed burning within MA 14.

Direct and Indirect Effects from Alternatives Four, Seven and Seven-A

Under Alternatives Four, Seven and Seven-A there would be 246 acres of commercial thinning, 92 acres of precommercial thinning and 270 acres of prescribed burning within MA 14.

Direct and Indirect Effects from Alternative Five

Under Alternative Five there would be 26 acres of commercial thinning, 229 acres of precommercial thinning and 219 acres of prescribed burning within MA 14.

Direct and Indirect Effects from Alternative Six

Under Alternative Six there would be 250 acres of precommercial thinning and 270 acres of prescribed burning within MA 14.

Direct, Indirect, and Cumulative Effects From the Action Alternatives

There would be no affect on MA 14 (Visual Corridors) from commercial or precommercial thinning because no openings would be created. The visual objective of managing to a moderate scenic integrity objective in the middleground would be met because harvest activities would not substantially alter the tree canopy densities. Travelers on Highway 395 should not notice any changes to the landscape but may see smoke during prescribed burning operations. The scenery would remain relatively unchanged for a long period of time because mortality is not likely to occur to a level that would affect the scenic characteristics of the landscape. The likelihood for any dramatic changes from a wildfire would also be greatly reduced.

The action alternatives vary in the length of time each would affect the scenic characteristics of the landscape; that is, how long the scenic characteristics could be sustained. Alternatives Four, Seven, Seven-A, Two and Five would have the longest period of time in which the scenic characteristics of the landscape would remain relatively unchanged, because they treat vegetation at the highest levels. Alternatives Ten and Three would have the shortest period of time in which the scenic characteristics of the landscape would remain relatively unchanged because they treat vegetation conditions using less intensive and extensive methods.

Prescribed burning would have a short-term affect on visual quality. Travelers on Highway 395 would be able to see smoke columns. Prescribed fire should be of low intensity with minimal scorch and should not be noticeable or would appear natural to most individuals from Highway 395.

Consistency with Direction and Regulations

Visual Quality Objectives (VQOs) are minimum objectives and can be managed to a higher level where feasible. The proposed treatments identified in all the action alternatives would meet Forest Plan standards.

Summary of Cumulative Effects

Cumulative effects of past, present, and reasonably foreseeable future actions for individual resources were discussed under each resource section in FEIS Chapter 4. This analysis will assume the selection of Alternative Seven, the Preferred Alternative. The following discussion focuses on the cumulative effects of the proposed Silvies Canyon Watershed Restoration Project in conjunction with ongoing and recently finalized projects, programs and uses in the Silvies Canyon Watershed.

During the past 100 years timber harvesting, livestock grazing, noxious weeds, stream dewatering, fire suppression, road construction on erosive soils, road density, lack of road maintenance, and general road use on public and private lands have contributed to landscape changes in overland and stream flows affecting riparian and aquatic habitat. These changes are having negative affects on water quality, and aquatic species. Fire exclusion in the 20th century resulted in dense understories that may be detrimentally affecting late season flow in streams. These factors have also changed the composition and structure of forested stands; in general, stands are denser and compositions include more late-seral species than would have been found historically. There is less acreage of old structure forest, and remnant late- and old-structure stands contain more understory than historically. Areas that were historically nonforested, such as riparian areas, shrublands and herblands, are now experiencing encroachment by juniper and other conifers; the total area of forested land within the project area is higher than the historic condition. While wildfire, insects and diseases have always been part of the watershed's ecosystem, the last 100 years of management have changed forest conditions to the point where those factors can combine to create unnaturally high risk of stand-replacing events.

Current and ongoing uses in and around the project area include permitted livestock grazing, recreation (including hunting, fishing, gathering of forest products, hiking, on- and off-road vehicle use, and camping), and firewood gathering. Recently completed environmental decisions approved closure and/or decommissioning of 63 miles of open road and manual treatment of 65 noxious weed sites. Foreseeable future actions include ongoing road maintenance, road closures, removals and/or replacements of culverts, increasing recreation levels, and additional vegetation and fuels treatments 25-30 years after the completion of this project. In the event of stand-replacing wildfire or insect/disease outbreak, it is likely that restoration projects, including timber salvage and reforestation, would occur. Risk of stand-replacing events should be reduced following project implementation.

Other Environmental Considerations

Possible Conflicts with the Plans and Policies of Others

The assessment of environmental effects of actions proposed in the alternatives developed for the Silvies Canyon Watershed Restoration Project assumes compliance with State and Federal Laws, National Policies, and Regional Standards and Guidelines. The alternatives comply with the Malheur National Forest Land and Resource Management Plan except for the following:

- The Preferred Alternative, the Proposed Action, Alternative Four, Five, and Seven-A would require a non-significant, site-specific Forest plan amendment for reducing big game cover, habitat effectiveness index (HEI), and components of HEI below the Forest Plan standards or below existing conditions that do not meet standards.
- The Preferred Alternative, the Proposed Action, Alternative Four, Five, and Seven-A would require a non-significant, site-specific Forest plan amendment to allow harvest within the 30-acre nest habitat surrounding goshawk nest trees.
- Alternative Four would require a Forest Plan amendment for cutting trees greater than 21 inches dbh within aspen stands.
- Alternatives Three and Six would require a non-significant, site-specific Forest Plan amendment for precommercial thinning trees greater than 7" dbh. This activity does not meet forest-wide standards for utilization (Standard #97).
- All Action Alternatives would require a non-significant, site-specific Forest Plan amendment for reconfiguration of DOG areas.

Unforeseen weather conditions during fuels reduction activities could result in conflicts with Department of Environmental Quality air quality standards. This would be a short-term effect.

All alternatives have been designed to meet forest worker state safety codes in accordance with the Oregon Occupational Safety and Health Code, Division 6, Forest Activities, effective January 1, 1992. Local safety hazards would be dealt with on a case-by-case basis.

The Relationship between Short-Term and Long-Term Productivity

Long-term productivity/sustainability is the inherent potential of the land (ecosystem) to produce a certain level of vegetation and associated processes, such as wildlife, water, and clean air indefinitely into the future. Fixed components influencing productivity include: local climate, topographic features, and soil type. Components affecting productivity that can be changed include: soil volume, soil porosity, soil water availability, soil chemistry, and soil biology. There is potential for direct, indirect, and cumulative effects on soil from harvest related activities. Losses of long-term productivity are expected to be mitigated by proposed measures, particularly those calling for restrictions of mechanical equipment on soils identified as having a high compaction rating, designated skid trails and landings, retention of large woody debris and green tree retention, protection of all streams and cultural resources. Effects vary by alternative with the amount of management activities and were addressed throughout Chapter 4.

Another component of sustainability related to potential long-term productivity is achievement of the potential productivity. The achievement of the potential cannot only be influenced by logging, but also by natural forces such as fire and insects. It is possible to maintain the potential productivity of an area by minimizing or avoiding activities, and then lose the attainment of the productive potential for water production, big game habitat, or visual resources through large-scale insect activity or stand replacement fire.

Proposals in this project strive to not only maintain long-term productivity but to assist in making sure conditions are maintained that are conducive to enabling the ecosystem to achieve a high level of the potential.

Proposed activities would create stand conditions that are better able to withstand catastrophic levels of insect or fire activity. This would be accomplished by activities that would modify certain areas towards a condition characterized as having fewer trees per acre, a greater percentage of ponderosa pine versus fir species, less of a multi-layered condition, lower fuel loadings, and larger diameter trees.

Irreversible and Irretrievable Commitments of Resources

An irretrievable commitment of a resource is defined as the opportunity foregone by a particular choice of resource use. A number of these irretrievable commitments are made in the alternatives.

Decommissioning roads would be considered an irretrievable commitment. Terminating the roads function by blocking the entrance, re-vegetating, removing fills and culverts, and pulling back unstable road shoulders precludes its use as a road.

Alternatives proposing harvest would also involve surfacing portions of roads with crushed rock to facilitate log transport. This rock would be produced at existing sites within the watershed. Although the overall supply of rock suitable for road surfacing in the watershed would not be significantly depleted by any of the commercial harvest proposing alternatives, the use of road rock is considered to be an irretrievable commitment of resources. These resources are retrievable to the extent that rock placed on a road can be recovered and reused on another road. The commercial harvest proposing alternatives would commit rock for use in road reconstruction and maintenance.

Irreversible commitments are decisions affecting non-renewable resources such as soils, wetlands, unroaded areas, and cultural resources. Such commitments are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or because the resource has been destroyed or removed.

Loss of cultural resource sites resulting from accidental damage or vandalism would be an irreversible commitment of resources. Extensive cultural resource field surveys and deferral of harvest in all areas where significant cultural resources were found provide reasonable assurance that there would be no irreversible loss of cultural resources.

Probable Adverse Impacts That Cannot Be Avoided

Selection of any of the Action Alternatives could result in some unavoidable environmental effects. These effects (following) should not be significant and should not affect long-term productivity:

- Short-term disturbance and/or displacement of fish and wildlife may occur.
- Decommissioning roads within RHCAs would temporarily increase fine sediment delivery to streams. This may displace fish, reduce reproduction success, and cause a reduction in pool and interstitial habitat in stream sections where proposed decommissioned roads are located. However, use of BMPs would reduce impacts to streams.
- Sediment production would exceed natural rates as long as timber is harvested and other soil and vegetation disturbing activities take place. Sediment would be produced by surface erosion and channel erosion. Best Management Practices and mitigation measures identified in Chapter 2 are designed to minimize negative impacts.
- Due to whole tree yarding operations, where 80% of created slash would be brought to the landings, estimated landing size would generally be 0.5 to 0.75 acre in size. Soil compaction and sterilization is expected, along with the potential formation of hydrophobic soil layers due to the intensity and duration of burning large slash piles. Mitigation measures identified in Chapter 2 are designed to mitigate negative impacts.
- Fire hazard and resistance to control would increase in the short-term after precommercial thinning as the result of ground level accumulations of thinning slash. Fire ignition risk would also increase as a result of more people using the areas during and after management activities. Wildfire can cause localized loss of soil, wildlife habitat, and vegetation, and further increases the potential for increased peak stream flows.
- Air quality may be reduced on a temporary, recurring basis from smoke emissions during prescribed burning of natural fuels and activity created slash. Increased traffic from logging trucks and other equipment could also reduce air quality on a temporary, recurring basis from increased exhaust emissions or dust. These would be primarily localized effects, and would not significantly affect the air sheds around the Burns/Hines communities, or the Strawberry Mountain Wilderness Area, but could affect Forest visitors.
- Noise levels may be increased in the watershed and areas near the primary haul routes. Forest visitors could be affected by increased traffic noise and equipment in the areas of operation, which would vary by harvest unit or project location.
- The natural landscape may appear altered following timber harvest, post-harvest stand treatments, fuel treatment activities, and implementation of various resource improvement projects.

Selection of the No Action Alternative could also result in some unavoidable environmental effects. These effects (following) should not be significant and should not affect long-term productivity:

- Stands of trees within and adjacent to the watershed could become more susceptible to increased infestation by insects and disease, resulting in accelerated mortality rates.

Increased numbers of dead trees would increase fuel loads within the watershed and increase the chance of large stand replacement wildfire.

- The twelve roads identified as contributing fine sediment directly into stream channels would remain open and continue to degrade aquatic habitat.

Threatened and Endangered Species and Critical Habitat

There would be no adverse impacts to any federally listed threatened or endangered species or critical habitat as a result of this project. The discussion of the effects of the alternatives on threatened, endangered, or sensitive species is presented in the section titled "Effects on Proposed, Endangered, Threatened and Sensitive Species" in Chapter 4 and the Biological Evaluation/Assessment found in Appendix C.

Natural or Depletable Resource Requirements and Conservation Potential

All alternatives considered in detail are designed to conform to applicable laws and regulations pertaining to natural or depletable resources, including minerals and energy resources. Regulations of mineral and energy activities on the National Forest, under the U.S. Mining Laws Act of 1872 and the Mineral Leasing Act of 1920, are shared with the Bureau of Land Management (BLM). The demand for access to National Forest lands for the purpose of mineral and energy exploration and development is expected to increase over time.

The Action Alternatives propose varying levels and types of road closures that would decrease opportunities for access to the National Forest within the Silvies Canyon watershed. This decreased access may result in decreased activity with regard to both known and potential mineral or energy resource occurrences. The actual potential for decreased mineral or energy resource activity in the Silvies Canyon watershed is not known, nor can an accurate estimate be made.

Urban Quality, Historic and Cultural Resources

The Silvies Canyon watershed contains no urban areas. Therefore, the only applicable concern under this topic is with historical and cultural resources. The goal of the Forest Service's Cultural Resource Management Program is to preserve significant cultural resources in their field setting and ensure they remain available in the future for research, social/cultural purposes, recreation, and education. The direct, indirect, and cumulative effects of the alternatives on cultural resources have been evaluated. The results of this evaluation are the determination that there are adequate standards, guidelines and procedures to protect cultural resources and to meet the goals of the Cultural Resource Management Program. Effects to cultural resource are disclosed in the section titled "Effects on Cultural Resources" on page 178.

Consumers, Civil Rights, Minorities and Women

There are no known direct or adverse effects on women, minority groups, or civil rights of individuals or groups. Action alternatives are governed by sale or service contracts, which contain non-discrimination requirements to prevent adverse impacts to these groups. The No Action Alternative, and Alternatives Three and Six may have some short-term adverse impacts on the local community by not contributing to the 25 percent fund.

Environmental Justice

Executive Order 12898 on environmental justice requires federal agencies to identify and address any disproportionately high and adverse human health or environmental effects on minority and low-income populations. In this assessment, elderly people, especially those on low-incomes that are fixed, were also identified with potential to be impacted by various alternatives. There is no quantifiable information on how much use the area receives from these populations other than the information shared by the Burns Paiute Tribe. None of the alternatives would prevent continuation of these traditional practices. The anticipated direct and indirect social effects to these populations are primarily due to change of motorized access from road closures and decommissionings proposed in the action alternatives. This change from road to non-road access would have its greatest effect on the young, elderly, and disabled. Those with other forms of non-motorized transportation – horses, off-highway vehicles, mountain bicycles, et cetera – would be less affected than those without these opportunities. The action alternatives change access on approximately 37 miles of road (Alternative 5), 87 miles of road (Alternatives 6, 7 & 7a), 143 miles of road (Alternative 2), and 160 miles of road (Alternatives 3 & 4). Because there are still areas in and next to the project area where road access is not changed and because tribal members and others can request a permit to use a closed road, the social effects are not anticipated to be disproportionately high or adverse to these populations.

Prime Farmland, Rangeland and Forestland

The analysis area does not contain any prime farmland or rangeland. Prime forestland does not apply to lands within the National Forest system. In all alternatives, National Forest lands would be managed with sensitivity to the effects on adjacent lands. Therefore, actions taken under any of the alternatives will have no known impact on farmland, rangeland, or forestland inside or outside the National Forest.

Energy Requirements and Conservation Potential

There are no unusual energy requirements for implementing any of the alternatives. The energy consumption associated with the alternatives, as well as the differences between the alternatives, is insignificant.

Wetlands and Floodplains

Executive Orders 11988 and 11190 require protection of wetlands and floodplains. Wetlands in the Silvies Canyon watershed are generally stream channel-associated seeps and springs. Riparian Habitat Conservation Areas as established by INFISH, protect these areas. No adverse environmental effects on floodplains and wetlands are anticipated with the implementation of any proposed alternatives.