CHAPTER 4.0—ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

Chapter 4.0: Environmental Consequences and Chapter 3.0 Affected Environment (page 111) form the *scientific and analytic basis* for the summary comparison presented in Chapter 2.0 of this document beginning on page 38. Chapter 4.0 presents the predicted effects of all alternatives, presenting the predicted attainment, or non-attainment of the project objectives and the effects on the quality of the human environment. Additionally, predicted effects of how environmental impacts effect significant issues (see 1.4 Issues Studied in Detail, page 30) and the consequences of recommended action, alternative action and no action would result from future implementation.

This Chapter focuses on the following eight types of effects where applicable:

- Direct, indirect, and cumulative effects
- Adverse effects that cannot be avoided
- Relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity
- Irreversible and irretrievable commitment of resources that would be involved if each of the alternatives were implemented.

This Chapter has the following four major sections:

- **4.2—Predicted Attainment of Recommended Objectives, page 239.**
- **4.3—Predicted Effects on Relevant Resources of All Alternatives—by Significant Issue, page 327.**
- **4.4—Socio-Economic Effects, page 429.**

In determining the effects outlined in this chapter, there were a number of assumptions and current trends that were highlighted by the team in setting the situation at which time these effects were analyzed. This list is not necessarily complete but does give one the foundation of how and where anticipated effects and what predicted outcomes or results were derived.

ASSUMPTIONS—HARVEST

- Values for the percentage of activity areas detrimentally disturbed by yarding systems are based on commonly accepted estimates: up to 20% for tractor yarding and 10-12% for cable yarding, and 3-5% for helicopter logging
- Tractor and skyline estimates include road segments adjacent to activity areas and since these road segments are included in the discussions about effects of roads, detrimental disturbance are probably overestimated by about 3%.

ASSUMPTIONS—ROADS

- The need for a basic transportation system will continue to exist;
- Available maintenance dollars will remain static or increase only marginally in the foreseeable future;
- Roads can adversely affect water quality and riparian habitat;
- Road conditions can present a hazard to users, and a liability to the Forest;
- Users include recreational, administrative, fire protection, permittee, contractors, special uses, miners, etc.;
- Benchmarks are at 5, 10, 25, 50, 100, and 125 years (after signed decision notice or date of first timber sale) and use of these benchmarks will vary among the resources.
- Recreational use and associated vehicle traffic will increase moderately in the foreseeable future.

ASSUMPTIONS—VEGETATION

- The climate will be within the current range of variation.
- The Forest Vegetation Simulation (FVS) model can be used to compare between alternative treatments.
- The Desired Condition is approximated by the Historic Range of Variation.
- To compare alternatives with a common measure, all treatments are assumed to occur in the same year.
- Current insects and diseases will continue to inhabit the forest and populations will fluctuate depending on stand conditions.
- Current human values will continue to be the same in the future.
- Some of the current trends in forest stand composition, structure, and density, assuming no further management would occur, are as follows:
  - Structural stages do not reflect the HRV, due to stand conditions natural disturbances are expected to continue to reduce the amount of old forest structure.
  - Young forest multi-strata structural stage is expected to decrease due to lack of resistance to natural disturbances.
  - Growth is currently slow, and growth rates will continue to decline due to overstocking and because of overstocking the development of a large tree component as present during historical conditions will take a long time.
  - Species composition is skewed towards late-seral species on many sites, and will not change until a major disturbance recycles the forest stands back to the stand initiation stage.
  - The resiliency and sustainability of the forest is declining at the present time, and will continue until there is a stand replacing disturbance.
- Long-term projections become estimates at best, however, results do show trends compared to where the resources are today.
- Once a forest stand is treated, low intensity fire will safely be applied to the landscape periodically.

4.2—Predicted Attainment of Recommended Objectives

This portion this document presents the predicted effects of all alternatives, presenting the predicted attainment, or non-attainment of the project objectives (desired conditions) as they are applied to1.2.2 , on page 21, and the effects on the quality of the human environment.

4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows

Across the landscape, peak and near peak stream flows in early spring are prolonged reducing water availability for late season flows. See ***1.2.2.1 Desired Condition: Lower Peak*** Flows*, page 21.*

Table 118 Peak Flows

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists within the project area to capture and hold water for longer periods of time, making water available in late summer/early fall to improve fish and wildlife habitat.	By implementing aquatic, vegetation, and infrastructure projects, cool water is held for longer periods of time across the project area and is available in late summer/early fall for fish and wildlife species.

4.2.1.1—Alternative 1—Early Season Near and peak flows—No Action

The watershed risk associated with multiple small soil and hydrologic disturbances dispersed across the planning area would continue. Under these conditions a high intensity, short duration storm such as a 5 yr. event (0.5 in./hr rainfall for about 15 min.) is likely to cause several of these disturbances to become connected, further concentrating surface flows and accelerating run-off and increasing probability of additional mass movement.

High elevation meadows where sheep grazed historically causing resource damage, would show little change in soil accumulation and development, which occurs over geologic time. Vegetation would remain relatively unchanged. Erosion risk would remain elevated. With more time and little change in conditions occurring, there is increased probability that another debris torrent or similar event would occur in one of drainages identified in Chapter 3.0 - Affected Environment.

Exposed mineral soil associated with mine tailings would continue to show little change in soil accumulation and development, which occurs over geologic time. There would be little dead or alive ground cover. Overland flows would be concentrated and erosion risk locally and in connection with other disturbance would remain elevated.

With time these risks would increase or decrease depending on the type of disturbance. For instance, the 5000 acres of previous harvest where compaction is the primary disturbance would continue to heal until, about 50 years after harvest occurred, the soils would no longer be considered detrimentally compacted. Soil texture, while not fully restored, would no longer be measurably limiting plant growth or contributing to the concentration of overland flow.

Headward expansion and scouring of intermittent channels, ephemeral draws, and rills and gullies would generally continue.

Roads would continue to concentrate flows and sediment to stream channels as described in the Affected Environment. Erosion paths associated with roads, either as direct sources or as conduits, would be likely

to increase downward and headward, extending the drainage network and capturing and concentrating a larger percentage of overland flow. The percentage increase would depend on the additional ground eroded which would be dependent on both snow melt and the occurrence of high intensity localized, short duration storms. Roads would continue to intercept subsurface flows for the lifetime of the roads. There would be some increase in the number of small slope movements due to the continuation through time of saturated soil conditions, proportional to the percentage of at risk soils compared to the Forest level. An average of one event a year would continue to occur on these soils.

Stream-road crossings would remain in their current condition and numbers, contributing sediment and concentrating surface flows to streams, with the stream channels remaining vulnerable to detrimental interactions of water, sediment and wood. Current culvert placement is also holding the channels in degraded, or down cut elevations of stream reaches, thereby keeping flood planes disconnected.

ATV use of the Davis Creek Trail stream-trail crossings would continue increasing risks similar to those described for stream-road crossings. Cross-country ATV travel would continue at the current or an increased level; effects at stream crossings would be similar to those described except that more stream banks would be detrimentally impacted.

Use at the 5 dispersed camp sites known to be impacting riparian areas would continue, probably with detrimental impacts increasing in area or becoming more concentrated in smaller areas.

Coarse woody material and riparian hardwood shrubs would continue to occur in low numbers. Coarse woody debris numbers would be expected to increase after year 50 in Dry Forest and fewer in Moist Forests as riparian stands aged. Riparian hardwood shrubs would contribute little to bank stability because their numbers are expected to remain low and existing plants to be low in vigor given current browsing levels by large ungulates (cattle deer and elk) and disconnected flood planes.

Water absorption and storage is expected to remain about the same throughout the project area with some areas recovering naturally following coarse woody material recruitment and some areas developing accelerate erosion. Stream channels would generally remain disconnected from associated floodplains for the next 10-50 years, including large meadows along the Middle Fork at Caribou Creek and along Vincent Creek. As coarse woody material gradually increases from year 50 to year 125 and increases more rapidly following year 125, water absorption, storage and release would move toward potential. Similar recovery rates are expected along Granite Boulder, Butte and Davis creeks and along some segments of Vinegar Creek. Other segments of Vinegar Creek would continue to adjust, moving toward potential over the next 50 or more years.

The conditions described above would continue to contribute to the chronic disturbance of the project area. Generally chronic disturbance rates would be expected to decline gradually over the next 50 years, if no other ground disturbing activities were recommended . Recovery would continue after year 50 to year 125 and beyond as coarse woody material was recruited into stream channels and they began to move toward channel potential. Roads would continue to intercept groundwater and channel flow for their lifetime. During the period of time that chronic disturbance remained elevated, the risk of debris torrents or other mass movements would remain elevated proportionally.

4.2.1.2—Early Season Near and peak flows—Alternative 2

Overland and in-channel flow is expected to be slowed and captured by soil and riparian areas on 1,492 acres beginning about one year after implementation. Similar changes would occur along about 113 miles of stream and in areas associated with the 115 in-stream fish structures (see Map 8—Stream and Riparian Rehabilitation for Action Alternatives). Coarse woody material placed on sparsely vegetated or eroded hillslopes, particularly in Vincent and Vinegar subwatersheds, is expected to slow overland flow and capture sediment, improving infiltration and reducing run-off. Fencing or coarse woody material placed around

degraded riparian meadows and seep/springs throughout the project area is expected to promote the recovery of these areas and increase the water storage capacity associated with them. Placement of in-channel coarse woody debris expected to trap sediment, creating in-channel storage (hyporheic) zones in the moderate and steeper gradient streams. Channel/flood plain rehabilitation would create about 15 acres of wetland or moist riparian storage area along lower Vincent and Caribou Creeks and along the Middle Fork of the John Day River using several levels of treatment. Channels would be reconnected to floodplains by developing increased channel meander and reconnecting side channels. Straightened channels would be re-routed and in-stream structures would promote channel meander. Stream channel rehabilitation in Vincent Creek would include reconnecting multiple side channels, decommissioning a valley bottom road and modifying existing structures intended to maintain the current location. Sediment inputs are expected to increase at the time of installation and in the first year following implementation and return to pre-activity levels by about year 3.

Increased capture of overland flows, including peak and near peak flows, would begin in the first year after implementation and would continue to become effective over 10-50 years or over 125 or more years, depending on the location. Because more water would be stored on the hill slopes, in riparian areas, and behind in-channel features, more water would be available for late season base flows. Water availability would increase in proportion to the rate of recovery of storage areas and their size. Less water is expected to leave the project areas during spring melt and storm events.

Thinning prescriptions are expected to have no measurable effect on water yield. Most of the treatment prescriptions would result in thinned stands in which changes in interception of precipitation, and in snow sublimation, accumulation and melting are generally not measurable. Water quantity and timing are unlikely to be affected by these prescriptions as the remaining vegetation is expected to use the resources formerly going to support additional trees by year 5.

About 1,690 acres of openings created by shelterwood harvests, may alter interception of precipitation and snow sublimation, accumulation and melting. Studies from the Blue Mountains are inconclusive a to the actual extent of the effect on water yield. The amount of recommended harvest is too small (3% of the project area) to have measurable effects across the project area. Overland flow and subsurface flows from these areas may contribute to increased peak and near peak flows at immeasurable, declining levels until the forest stand or other vegetation occupies the site. Interception and snow processes are expected to begin recovery in these areas immediately following planting. Salvage would have no effect since the trees are already blown down.

Harvest in tractor and cable units and the development of landings under all harvest systems (about 1,383 acres of detrimental soil disturbance) is expected to influence water absorption, storage and release, probably at levels that are difficult to observe. Even with common mitigation, skid trails, cable corridors (to a lesser extent) and landings subtly alter the landscape's ability to process water, reducing the amount that infiltrates and flows through the soils below the surface, altering the rates of subsurface flow, and bringing subsurface flow to the surface. These processes are affected first by the scale or total amount of disturbance recommended ; under Alternative 2 (see Table 119) the amount of disturbance is second highest among the action alternatives. Second the risk that concentrated surface flows would develop is increased proportionately to the concentration of disturbance with units yarded by ground-based systems receiving the most concentrated disturbance followed by units yarded by skyline and then units yarded by helicopter. Under Alternative 2, about 50% of the harvest area or 5,090 acres are recommended for ground-based yarding and nearly 25% of the harvest area, or 2,110 acres for cable yarding. Although helicopter units tend to have little to no disturbance in the units themselves, landings tend to be larger, potentially concentrating proportionately greater amounts of surface flow from landings.

Watershed processes are, also, affected by the types of soils on which the various yarding systems occur since soils higher in clay or sand, for instance, absorb, store and transport water differently. These conditions are worsened by logging-related disturbance. The effects on watershed processes are also

proportional to the amount of sensitive soils impacted. Alternative 2 has the second highest amount (735 acres) of sensitive soils detrimentally disturbed by yarding activities and, along with Alternative 5 the highest amount of sensitive soils detrimentally disturbed by tractor yarding (467 acres). Also, under Alternative 2, 383 acres of tractor detrimental disturbance is on clayey soils and 118 acres of cable on serpentine, granitic, and miscellaneous soils. The disturbance recommended under Alternative 2 is expected to contribute to higher peak and near peak flows that are longer in duration. The effects of these activities are expected to be second in magnitude among the action alternatives, although the magnitude is unknown. As a greater proportion of water is removed earlier in the year, less water is expected to be available for late season base flows.

Table 119 Harvest Area and Estimated Area of Detrimental Disturbance (Acres)

SOIL TYPE	LOGGING SYSTEM	**ALT. 2** HARVEST AREA♠	**ALT. 2** EST. DIST. ♠
Inclusions, clayey-non-forested	T	972	195
	S	144	15
	H	187	9
Clayey, forested soils	T	538	108
	S	0	0
	H	15	1
Ash over clayey soils	T	407	81
	S	171	17
	H	1,260	64
Residual serpentine	T	19	2
	S	37	4
	H	4	1
Ash over serpentine	T	143	29
	S	197	20
	H	119	6
Ash over granitics	T	73	14
	S	263	27
	H	32	3
Miscellaneous soils	T	203	40
	S	346	35
	H	148	8
Other soils	T	2,861	573
	S	823	83
	H	1,038	51
TOTAL		**10002**	**1,384**

NOTES: ALT. = Alternative **T =** Tractor Skidding **S =** Skyline Yarding **H =**Helicopter Yarding
EST. DIST. = Estimated Disturbance♠ based on acres calculated in 2000.

Post-Sale activities expected to have negligible effects on hydrologic function include hand piling and burning on 1,850 acres, competing vegetation control on 900 acres, pocket gopher control on 1,690 acres, noxious weed treatment on 1.3 acres because these activities do not directly influence soil water movement or overland flow.

Prescribed fire on 11,370 acres outside mechanically treated units and 12,380 acres within mechanically treated units, as mitigated, is not expected to result in measurable changes in overland flow or soil water movement. The capacity of soils to absorb water (infiltration) is not altered by prescribed fire. Leaving a layer of organic material on the soil (forest floor) ½" deep is expected to prevent the concentration of overland flows and to maintain water absorption rates. Similarly, it is expected that overland flows would not be concentrated and water absorption rates would be maintained in RHCAs when prescribed fire enters these areas.

Planting on 1,930 acres is not expected to accelerate the recovery of precipitation interception and snow processes in the openings associated with regeneration harvests by decreasing the time until a forest stand occupies the site. Planting is expected to move water yields and timing toward the natural conditions faster, although not at a rate that is measurable due to the small area affected by this prescription.

Post-harvest activities which are likely to affect soil water movement or water absorption are subsoiling on 190 acres, and the construction of either hand (37.6 miles) or machine fire-line (11.6 miles). Subsoiling is expected to increase infiltration rates and reduce overland flow concentrations on 190 acres where yarding is expected to have caused these processes and soil conditions to have been altered detrimentally.

Subsoiling is expected to contribute to the reduction of peak and near peak flows at undetectable levels, compared to post-yarding conditions. The increase in overland flows and reduction in absorption are not expected to be measurable but are expected to contribute to increased peak and near peak flows and reduced base flows.

The construction of both machine and hand fire-line is expected to accelerate and concentrate overland flows and reduce water absorption, especially on sensitive soils and subsoils with high or very high erosion potential, naturally low ground cover, and slow absorption rates. Although these effects are likely to be immeasurable, they contribute to increased soil disturbance and affect hydrologic function.

The aspen restoration projects including the use of fire are expected to influence soil water movement and overland flow in ways similar to those described for planting and prescribed fire.

Roads and trails influence water quantity and timing by intercepting surface and subsurface flows, altering flow paths, and accelerating the removal of water from the landscape as described in the Chapter 3.0—Affected Environment. Generally, these effects are proportional to the dimensions of the road segment and to the location of the road on the landscape.

Recommended decommissioning of 67 miles of road is expected to promote the recovery of hydrologic function (capture, storage and safe release of precipitation) beginning in the first year after implementation, with the recovery process continuing beyond year 50. Fifty-five miles would be decommissioned on the sensitive soils, proportionately decreasing the risk further. Recommended decommissioning of 205 stream-road crossings is expected to reduce risk of detrimental interactions among water, sediment and woody debris at engineered crossings which result in further acceleration of run-off and loss of in-stream storage areas and storage areas adjacent to channels following the year of implementation. In year 1, removing culverts may introduce up to 0.5 cubic yards of sediment to stream channels at each location. Capture, storage, and release of precipitation at near normal rates is expected to occur in some areas, depending on local conditions, as soon as year 50 and in other areas after year 125.

Decommissioning of 3 stream-ATV trail crossings and 3 dispersed campsites in RHCAs (see Alternative Comparison Table 68 Chapter 2.0, page 103) are expected to have effects similar to those described for road decommissioning, but smaller in scale. Capture, storage, and release of precipitation at near normal rates is expected to occur in some areas, depending on local conditions, as soon as year 10 and in other areas after year 50. Construction of two stream-ATV crossings and of three dispersed sites would move ground disturbance from fish-bearing perennial streams to intermittent streams and from within RHCAs to hill slopes. These new crossings and campsites are expected to be designed and constructed to a standard that reduces local disturbance compared to former sites. In addition, the relocation of dispersed sites is expected to diffuse the direct effects of the ground disturbance associated with these recreational sites on RHCAs since the sites would be removed from RHCAs. The relocation of ATV crossings from perennial to intermittent streams is not expected to alter measurably risk or size of detrimental interactions between water, sediment and woody debris. Reconstruction of 9 bridges and 6 fords (stream crossings) and improvements at 2 dispersed camp sites in RHCAs are expected to reduce risks of detrimental water, sediment, and woody debris interactions at the crossings and to reduce the concentration of flows from the campsites and crossings.

The recommended construction of 4 new crossings across ephemeral draws and 0.12 miles of road in RHCAs will contribute to an increased risk of detrimental interactions between water, sediment and woody debris, that would result in accelerated run-off. The net decrease in road crossings is 205crossings. The net decrease in roads is 46 miles of road, 22 miles of which are located in RHCAs.

Roads also intercept subsurface water flows, which contribute to late season flows and route this water off hill slopes more rapidly than undisturbed soils. The overall net effect of the recommended activities is to reduce subsurface water interception along 49 miles of road. This assumes that 67 miles of road would be decommissioned and that 18 miles of new road with similar effects on the interception of subsurface flow would be constructed.

Aquatic projects, road decommissioning, road relocation away from streams and RHCAs, and road reconstruction are expected to decrease chronic disturbance and move the project area toward hydrologic potential. Some projects such as the cutting of commercial and pre-commercial timber or sub-soiling are expected to be neutral or to move the project area slightly towards hydrologic potential. Other activities, such as yarding, landing development, and fire line construction introduce soil and hydrologic disturbance that adds to the chronic disturbance and moves the project away from hydrologic potential, although the disturbance declines over about 50 years during which the project area is moving toward potential.

Impacts from decommissioning and reconstructing roads, such as those associated with culvert removal or replacement and sub-soiling are expected to begin decreasing after one year and to be unobservable after about 5 years. Soil recovery in the road prism is expected to begin immediately following implementation. Water movement through the former road prism is expected to approach natural potential by about year 50.

When changes in water absorption and storage capacity result in large enough changes in peak and near peak flows and, conversely, summer base flows, flows alter the geomorphology of stream channels. It is expected that the alteration in water absorption, storage and concentration described for the aquatic recommended actions, road decommissioning, road relocation, and road reconstruction, especially in the headwaters, would reduce the risk of debris torrents, similar mass movements, or other sediment, water, wood interactions at road crossings. It is expected that this reduction in risk would be countered by an increase in risk caused by the increased disturbance described for some of the activities included in the vegetation and infrastructure projects, much of which, with the exception of new roads, is expected to recover in about 50 years. The net change in disturbance is expected to decrease chronic disturbance and to move the project area toward hydrological potential over about 125 years or longer.

Prescribed fire on 11,370 acres outside mechanically treated units and 12,380 acres within mechanically treated units and connected recommended treatments are expected to reduce wildfire hazard as described in the 2.5.4 VEGETATION section (See Implementation Tool—Mechanical Treatment, page 59; and 2.5.4.2 Implementation Tool—Fire Treatment page 70). Reduction in fire hazard decreases potential for uncharacteristically severe wildfire and the extent of soil damage from such wildfire. Reduction in soil damage is expected to result, post-wildfire, in more areas where water absorption and storage capacity are maintained and in fewer areas of concentrated overland flow. The change in post-fire water quantity and timing would be smaller than under the No Action Alternative.

The rehabilitation projects recommended for eroding hill slopes, riparian areas, and stream channels work together to capture, store, and slowly release water from the landscape.

4.2.1.3—Early Season Near and peak flows—Alternative 3

Hill slope and stream channel conditions would be treated by the watershed and fish habitat projects (see Appendix E, Map 8—Stream and Riparian Rehabilitation for Action Alternatives). Overland and in-channel flow is expected to be slowed and captured by soil and riparian areas on 1492 acres, along about 110 miles of stream, and in association with the 36 existing in-stream fish habitat structures recommended for modification. Effects of these projects would be the same as those described for Alternative 2. Channel/floodplain rehabilitation projects and placement of large woody material for in-stream fish habitat, requiring the use of heavy equipment, would not be implemented. Water absorption and storage capacity in-channel, in the 15 acres of valley bottoms in Vincent and Caribou drainages influenced by these channels, and in the riparian areas associated with the in-stream fish structures would remain at the current level, which is estimated to be less than half of potential.

Effects of thinning and salvage prescriptions are expected to have no measurable effect on water yield as discussed for Alternative 2. The effects of shelterwood harvest are the same as described for Alternative 2.

Timber yarding in tractor and cable units and the development of landings under all harvest systems (about 1,156 acres of detrimental soil disturbance) is expected to negatively influence water absorption, storage and release, probably at levels that are difficult to observe. Even with common mitigation, skid trails, cable corridors (to a lesser extent) and landings subtly alter the landscape's ability to process water, reducing the amount that infiltrates and flows through the soils below the surface, altering the rates of subsurface flow, and bringing subsurface flow to the surface. These processes are affected first by the scale or total amount of disturbance recommended ; under Alternative 3 (see Table 120) the amount of disturbance is lowest among the action alternatives which include commercial harvest. Second the risk that concentrated surface flows would develop is increased proportionately to the concentration of disturbance with units yarded by ground-based systems receiving the most concentrated disturbance followed by units yarded by skyline and then units yarded by helicopter. Under Alternative 3, 55% or 4580 acres are recommended for ground-based yarding and 20% or 1720 acres for cable yarding. Although helicopter units tend to have little to no disturbance in the units themselves, landings tend to be larger, potentially concentrating proportionately greater amounts of surface flow. Watershed processes are, also, affected by the types of soils on which the various yarding systems occur since soils higher in clay or sand, for instance, absorb, store and transport water differently. The clayier soils, especially those with clayey subsoils tend to absorb, store, and release less water, causing more surface flow to concentrate and increasing the risk that concentrated flows would cause erosion or reach stream channels earlier. These conditions are worsened by logging-related disturbance. The effects on watershed processes are also proportional to the amount of sensitive soils impacted. Alternative 3, of the action alternatives with commercial harvest, has the lowest amount (587 acres) of sensitive soils detrimentally disturbed by yarding activities. Also, under Alternative 3, 383 acres of tractor disturbance is on clayey soils and 148 acres of cable on serpentine, granitic, miscellaneous, and clayey soils. Tractor yarding would not occur on 28 acres of ash over serpentine soil and skyline yarding would be reduced on about 21 acres of sensitive soil (miscellaneous, clayey, and granitic) (see Table 120). The disturbance recommended under Alternative 3 is expected to contribute to higher peak and near peak flows that are longer in duration to a lesser extent than under Alternatives 2 and 5. As a larger proportion of water is removed earlier in the year, less water is expected to be available for late season base flows.

Table 120 Harvest Area and Estimated Area of Detrimental Disturbance (Acres)

SOIL TYPE	LOGGING SYSTEM	**ALT. 3** HARVEST ACRES	**ALT. 3** EST. DIST.
Inclusions, clayey-nonforested	T	942	188
	S	108	11
	H	133	6
Clayey, forested soils	T	537	108
	S	0	0
	H	13	1
Ash over clayey soils	T	407	81
	S	131	13
	H	90	5
Residual serpentine	T	19	2
	S	37	4
	H	4	1
Ash over serpentine	T	115	23
	S	192	20
	H	119	6
Ash over granitics	T	66	14
	S	216	22
	H	32	3
Miscellaneous soils	T	201	40
	S	269	27
	H	112	6
Other soils	T	2,284	457
	S	771	78
	H	617	30
TOTAL		**7418**	**1,156**

NOTES: ALT. = Alternative **T =** Tractor Skidding **S =** Skyline Skidding
H =Helicopter Yarding **EST. DIST. =** Estimated Disturbance

As described for Alternative 2, post-sale activities such as hand piling and burning on 840 acres and noxious weed treatment on 1.3 acres are expected to have negligible effects on hydrologic function.

Prescribed fire on 10,640 acres outside mechanically treated units and 10,610 acres within mechanically treated units, as mitigated, is not expected to result in measurable changes in overland flow or soil water movement as described for Alternative 2. The capacity of soils to absorb water (infiltration) is not altered by prescribed fire. Leaving a layer of organic material on the soil (forest floor) ½" deep is expected to prevent the concentration of overland flows and to maintain water absorption rates. Similarly, it is expected that overland flows would not be concentrated and water absorption rates would be maintained in RHCAs when prescribed fire enters these areas.

Planting on 1,450 acres is expected to accelerate the recovery of precipitation interception and snow processes in the openings associated with regeneration harvests by decreasing the time until a forest stand occupies the site.

Post-harvest activities, which are likely to affect soil water movement or water absorption include subsoiling on 190 acres, yarding tops attached on 4,730 acres and the construction of either hand (28 miles) or machine fire line (8.5 miles). The effects are similar to those described for Alternative 2.

The construction of both machine and hand fire line is expected to accelerate and concentrate overland flows and reduce water absorption. Risks are higher on sensitive soils.

The aspen restoration projects including the use of fire are expected to influence soil water movement and overland flow in ways similar to those described for planting and prescribed fire.

The effects are the same as those described for Alternative 2 except slightly smaller. About one half mile (0.5 miles of reconstruction of roads in RHCAs) less as well as 1 mile of new construction less than Alternative 2 is recommended . By foregoing reconstruction of these road segments, it is expected, that the current interception of subsurface flows and concentration of flows in the roadway to be maintained. Interception of flows along the newly constructed roads would be slightly less than under Alternative 2.

Chronic disturbance would not be alleviated on 3 miles of stream, in the 15 acres of valley bottom associated with these channel segments, and in the areas where 79 new, in-stream fish habitat structures are recommended . These areas would continue to contribute to the departure from hydrologic potential. The remaining aquatic projects, road decommissioning, road relocation away from streams and RHCAs, and road reconstruction is expected to decrease the chronic disturbance and move the project area toward hydrologic potential. Some projects such as the cutting of commercial and pre-commercial trees or sub-soiling are expected to be neutral or to move the project area slightly toward hydrologic potential. As under Alternative 2, other activities, such as yarding, landing development, and fire line construction would introduce a smaller amount of soil and hydrologic disturbance. The total increase in disturbance associated with Alternative 3 is less than that associated with Alternative 2, however the long term benefits will also be less than those associated with Alternative 2. As under Alternative 2, much of the disturbance declines over about 50 years during this time the project area is moving toward natural potential. New roads add to the chronic disturbance and departure from potential for the lifetime of the road and are expected to be the same as for Alternative 2.

As under Alternative 2, it is expected that the alteration in water absorption, storage, and concentration due to the recommended actions of road decommissioning, road relocation, and road reconstruction, especially in the headwaters, would reduce the risk of debris torrents or other similar soil movements. Drainage, road crossings interaction concerns would also be reduced but to a lesser extent than for Alternative 2 since a smaller area is being treated. As under Alternative 2, it is expected that this reduction in risk would be countered by the increase in risk caused by the increased disturbance described for some of the activities included in the vegetation and infrastructure projects. This increase in disturbance is expected to be smaller than that for Alternative 2 since harvest is recommended for a smaller area. Much of which, with the exception of new roads, is expected to recover in about 50 years. The net change in disturbance is expected to decrease chronic disturbance, at about the same level as Alternative 2. The difference between Alternatives 2 and 3 is that the remaining chronic disturbance would be different. Under Alternative 3, current aquatic and riparian conditions, which contribute to increased peak and near peak flows and to smaller summer base flows in Granite Boulder, Vinegar, Butte, Davis, and Vincent creeks and along the Middle Fork at the Caribou confluence, would remain. A smaller amount of new disturbance (related to timber harvest) would be added to the chronic disturbance. It is not expected that the chronic conditions along most of the streams listed above would improve naturally until about year 125, because natural large woody recruitment is expected to be low based on the relatively young age of riparian stands adjacent to these streams and the health of the trees.

Prescribed fire on 10,640 acres outside mechanically treated units and 10,610 acres within and connected recommended treatments are expected to reduce wildfire hazard as described in the 2.5.4 VEGETATION section (see Implementation Tool—Mechanical Treatment, Page 59; And 2.5.4.2 Implementation Tool—Fire Treatment page 70).

4.2.1.4—Early Season Near and peak flows—Alternative 4

Hillslope and stream channel conditions would be treated by the watershed and fish habitat projects (see Appendix E, Map 8—Stream and Riparian Rehabilitation for Action Alternatives). Overland and in-channel flow is expected to be slowed and captured by soil and riparian areas on 1,492 acres, along about 110 miles of stream, and in association with the 36 existing in-stream fish habitat structures recommended for

modification. Effects of these projects would be the same as those described for Alternative 2. Channel/floodplain rehabilitation projects and placement of large woody material for in-stream fish habitat, requiring the use of heavy equipment, would not be implemented.

Pre-commercial thinning is expected to have no measurable effect on water yield as discussed for Alternative 2. The aspen restoration projects including the use of fire are expected to influence soil water movement and overland flow in ways similar to those described for planting and prescribed fire. No other mechanical treatment of forest vegetation is recommended .

No harvest is recommended or landing development is recommended . There would be no increase in chronic disturbance on sensitive or other soils attributed to yarding of timber or to post-harvest activities.

Road decommissioning and reconstruction effects would be the same as those described for Alternatives 2 and 3. The effects of relocating a 3 segments of road and includes 2.2 miles of new road construction, while decommissioning about 67 miles of road, including about 24 miles of road in RHCAs and 205 stream-road crossings are the same as described for Alternative 2.

As described for Alternative 2 the recommended activities either increase or decrease chronic disturbance and departure from hydrologic potential of the project area. As described for Alternative 3 chronic disturbance on 3 miles of stream, in the 15 acres of valley bottom associated with these channels segments, and in the areas where 79 new, in-stream fish habitat structures are recommended would not be alleviated. The remaining aquatic projects, road decommissioning, road relocation away from streams and RHCAs, and road reconstruction are expected to decrease chronic disturbance and move the project area toward hydrologic potential as described for Alternative 2. Cutting pre-commercial trees is expected to be neutral or to move the project area slightly towards hydrologic potential. The increase in disturbance, under Alternative 4, compared to Alternative 2 and 3, is expected to be smaller as most activities recommended under Alternative 4 move the project area toward hydrologic potential after the first two years. Only the construction of hand line and the construction of new road (which replaces road segments causing greater hydrologic disturbance) move the project away from hydrologic potential in a declining trend for about 50 years or for the lifetime of the road. The net reduction in road milage under this Alternative is 67 miles, the greatest under the action alternatives.

As under Alternative 2, it is expected that the alteration in water absorption, storage, and concentration described for the aquatic recommended actions would reduce the risk of debris torrents, similar mass movements, or other sediment, water, wood interactions at road crossings but to a lesser extent than for Alternative 2 since a smaller area is being treated. Unlike the other action alternatives, this reduction in risk is countered by a relatively small amount of new disturbance as described above. The net reduction in disturbance and movement toward hydrologic potential is represented by the improvement expected on 1,492 acres and 110 miles of stream with increased risk occurring on 2.2 miles of road, which because of its location and reconstruction would be lower than the risk associated with the current road segments. Also, some of the current, chronic disturbance would not improve naturally for about 125 years (as described under Alternative 3), compared to Alternative 2.

Prescribed fire on 17,230 acres outside precommercial thinning units and 1,930 acres within precommercial thinning units and connected recommended treatments are expected to reduce wildfire hazard as described in the 2.5.4 VEGETATION section (see Implementation Tool—Mechanical Treatment, Page 59; and 2.5.4.2 Implementation Tool—Fire Treatment page 70).

4.2.1.5—Early Season Near and peak flows—Alternative 5

Effects of the aquatic projects are the same as those described for Alternative 2.

The effects of thinning prescriptions are expected to be the same as described for Alternative 2 except that they would occur over a larger area as shown in Table 121.

The effects of shelterwood harvests are expected to be the same as those described for Alternative 2.

Timber yarding in tractor and cable units and the development of landings under all harvest systems (about 1494 acres of detrimental soil disturbance or about 30%) is expected to negatively influence water absorption, storage and release, probably at levels that are difficult to observe but there will be more impact from this alternative than any other. Even with common mitigation, skid trails, cable corridors (to a lesser extent) and landings subtly alter the landscape's ability to process water, reducing the amount that infiltrates and flows through the soils below the surface, altering the rates of subsurface flow, and bringing subsurface flow to the surface. These processes are affected first by the scale or total amount of disturbance recommended ; under Alternative 5 (see Table 121.) the amount of disturbance is highest among the action alternatives. Second the risk that concentrated surface flows would develop is increased proportionately to the concentration of disturbance with units yarded by ground-based systems receiving the most concentrated disturbance followed by units yarded by skyline and then units yarded by helicopter. Under Alternative 5, 55% or 6,320 acres are recommended for ground-based yarding and 15% or 2,610 acres for cable yarding. Although helicopter units tend to have little to no disturbance in the units themselves, landings tend to be larger, potentially concentrating proportionately greater amounts of surface flow. Watershed processes are, also, affected by the types of soils on which the various yarding systems occur since soils higher in clay or sand, for instance, absorb, store and transport water differently. The clayier soils, especially those with clayey subsoils tend to absorb, store and release less water, causing more surface flow to concentrate and increasing the risk that concentrated flows would cause erosion or reach stream channels earlier. These conditions are worsened by logging-related disturbance. The effects on watershed processes are also proportional to the amount of sensitive soils impacted. Alternative 5 has the highest amount (733 acres) of sensitive soils disturbed by yarding activities and, along with Alternative 2 the highest amount of sensitive soils disturbed by tractor yarding (467 acres). Also, under Alternative 5, 383 acres of tractor disturbance is on clayey soils and 154 acres of cable on miscellaneous, clayey, serpentine, and granite soils. The disturbance recommended under Alternative 5 is expected to contribute to higher peak and near peak flows that are longer in duration. The effects of these activities are expected to be first in magnitude among the action alternatives. As a greater proportion of water is removed earlier in the year, less water is expected to be available for late season base flows.

As under Alternative 2, post-sale activities which are expected to have negligible effects on hydrologic function include hand piling and burning on 1,970 acres, competing vegetation control on 1,320 acres, pocket gopher control on 2,600 acres, noxious weed treatment on 1.3 acres because these activities do not directly influence soil water movement or overland flow.

Prescribed fire on 10,780 acres outside of mechanically treated units and 13,990 acres within mechanically treated units, as mitigated, is not expected to effect peak and near peak flows as described under Alternative 2. Effects of planting are expected to be similar to those described for Alternative 2. Effects of the aspen restoration projects are similar to those described for Alternative 2.

As under Alternative 2 some post-harvest activities are likely to affect soil water movement or water absorption as described for Alternative 2, expect that a greater area would be disturbed as shown in Table 121 and contributing to reduced water absorption and storage and increased concentration of surface flows.

The construction of both machine (20.6 miles) and hand (57.1 miles) fireline is expected to have effects similar to those described for Alternative 2.

As described for Alternative 2, generally, the effects of infrastructure projects are proportional to the dimensions of the road segment and to the location of the road on the landscape.

Recommended decommissioning of 64 miles of road and of 252 stream-road crossings is expected to have effects similar to those described for Alternative 2. Effects are also proportional to the amount of decommissioning occurring on sensitive soils, which is 3 miles fewer than under Alternative 2. It is expected that pulling culverts would result in up to 0.5 cu. Yd. of sediment entering streams at each location.

Table 121 Harvest Area and Estimated Area of Detrimental Disturbance (Acres)

SOIL TYPE	LOGGING SYSTEM	ALT. 5 HARVEST ACRES	ALT. 5 EST. DIST.
Inclusions, clayey-nonforested	T	1,003	201
	S	171	18
	H	183	9
Clayey, forested soils	T	538	108
	S	0	0
	H	15	1
Ash over clayey soils	T	407	81
	S	401	40
	H	849	43
Residual serpentine	T	19	2
	S	37	4
	H	4	1
Ash over serpentine	T	143	29
	S	197	20
	H	119	6
Ash over granitics	T	73	14
	S	266	27
	H	32	3
Miscellaneous soils	T	201	40
	S	443	45
	H	200	11
Other soils	T	3,341	669
	S	771	78
	H	1166	58
TOTAL		**10584**	**1,503**

NOTES: ALT. = Alternative **T =** Tractor Skidding **S =** Skyline Skidding
H =Helicopter Yarding **EST. DIST. =** Estimated Disturbance

Decommissioning of 3 stream-ATV trail crossings and 3 dispersed campsites in RHCAs are expected to have effects similar to those described for Alternative 2. The construction of 6.1 miles of new ATV trail is expected to detrimentally, but in an unquantifiable manner affect capture, storage, and release of precipitation along its length for the lifetime of the trail.

The recommended construction of 10 new crossings and 1.4 miles of road in RHCAs will contribute to an increased risk of detrimental interactions between water, sediment and woody debris, that would result in accelerated run-off. Since 2.5 times more locations are recommended than under Alternative 2, the risk is likely to be similarly increased. Also, the construction of new stream crossings and new roads is expected to result in the production of a pulse of sediment in the first year, which would decline to a stable amount over the first 5 years. The net reduction in road crossings is 248 and the reduction of road miles in RHCAs is 26 miles.

Under Alternative 5 the balance of these activities is different from that described for Alternative 2. First, the aquatic projects and road reconstruction reduce chronic disturbance and move the area toward hydrologic potential after the first 1-3 years the same as or similar to the reduction described for Alternative 2. Activities with neutral effects are similar to those described for Alternative 2.

Additions to chronic disturbance under Alternative 5, which moves the area away from hydrologic potential to a greater extent than Alternative 2, include six fewer miles of road decommissioning, four more miles of new road construction, 10 more miles of open and closed roads (combined), and more area in skid trails or cable corridors, landings, and fire line. This includes six new stream crossings and 0.5 miles of new road

construction in RHCAs. The activities, except for new road construction and stream-road crossings, generally recover over 50 years. New roads add to the chronic disturbance and departure from potential for the lifetime of the road or the crossing.

It is expected that the alteration in water absorption, storage, and concentration described for the aquatic recommended actions, road decommissioning, road relocation, and road reconstruction, especially in the headwaters, would reduce the risk of debris torrents, similar mass movements, or other sediment, water, wood interactions at road crossings nearly to the same extent as Alternative 2 does. It is expected that this reduction in risk would be countered by an increase in risk caused by the increased disturbance described for some of the activities included in the vegetation and infrastructure projects, much of which, with the exception of new roads, is expected to recover in about 50 years. The net change in disturbance is expected to decrease chronic disturbance and to move the project area toward hydrological potential over about 125 years or longer.

Prescribed fire on 10,780 acres outside of mechanically treated units and 13,990 acres within mechanically treated units and connected recommended treatments are expected to reduce wildfire hazard as described in the 2.5.4 VEGETATION section (see Implementation Tool—Mechanical Treatment, page 59; and 2.5.4.2 Implementation Tool—Fire Treatment page 70).

4.2.2 TREATMENT OBJECTIVES FOR HIGH STREAM TEMPERATURES

A number of streams do not meet Federal Clean Water Act standards and are on the 303(d) List of Water Quality Limited Waterbodies (1998). See ***1.2.2.2 Desired Condition: Lower Stream*** Temperatures*, page 22.*

Table 122 Water Temperatures

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists to lower stream temperatures that are on the State of Oregon *303(d) List of Water Quality Limited Waterbodies (1998)* to comply with *Federal Clean Water Act* and State standards.	With the implementation of aquatic, vegetation, and infrastructure projects, improved habitat conditions that lower and maintain stream temperatures are in a condition that sustains viable populations of fish.

Many of the same impacts discussed in section 4.2.1 Undesired Condition: High Peak Flows has the same type of influence on this section of High Stream Temperatures. Therefore, an understanding of the anticipated impacts under High Peak Flows will give a good foundation for understanding of the interrelationship of these two sections. These sections could have been combined but due to the sensitivity of the 303(d) List of Water Quality Limited Waterbodies, this undesired conditions was separated.

4.2.2.1—HIGH STREAM TEMPERATURES—ALTERNATIVE 1—NO ACTION

Under this alternative the watershed conditions described in the Chapter 3.0 - Affected Environment would continue to be present.

Peak and near peak flows are expected to continue to occur early and continue longer. Late season base flows would continue to be longer in duration and a smaller in magnitude as described in the previous section. Hill slope and stream channel characteristics are expected to continue with rapid runoff. Riparian storage capacity would continue to be reduced from historic level with irrigation ditches continuing to divert water from the landscape. Shade would continue to be below potential and not meet Forest Plan standards along many drainages throughout the project area. Due to these continuing conditions, water temperatures would remain elevated.

The overall aquatic characteristic trends would continue to be degraded for the next 50 years with some slow improvements in vegetation occurring. Temperatures in Davis, Vincent, Caribou, Butte, Granite Boulder Creeks and along the MFJDR are not expected to substantially improve since water storage areas along these channels, requiring the use of heavy equipment, would not be rehabilitated. Natural recovery in these areas is expected to start at an observable level about year 50 as coarse woody material is recruited in those stream segments containing conifers and other hardwoods and is expected to become established by about year 125. The dampening of the overall trend of recovery is expected to be less than any action alternative due to projects not being implemented that would create meander, which would not accelerate the recovery process.

4.2.2.2—HIGH STREAM TEMPERATURES-ALTERNATIVE 2

Under this alternative, conditions described in Chapter 3.0 - Affected Environment would be treated. Some projects may effect stream temperatures i.e. prescribed fire reducing existing vegetation. This impact, with proper implementation, would be undetectable.

Stream temperatures are generally expected to decrease over time as a result of activities which promote shade recovery and the absorption, storage, and late season release of water through drainage and upland improvements. A slight decline in riparian habitat may occur in the first year following implementation of watershed projects, however, changes are likely to be undetectable initially. As the net storage capacity increases over the next 2 to 125 years (see previous Peak Flow discussion), as existing soil disturbance recovers over 50 years, and as shade provided by hardwood planting and protection to better maintain water temperatures recovers at 10 and later years, the greatest change is expected to occur after year 10 and before year 50.

Roads, trails, and dispersed campground projects would contribute, cumulatively to the above improvements by reducing sediment sources and recovering current road locations to riparian shade habitat through road decommissioning projects. Stream temperature improvements may not be detectable for 10 to 25 years as pools developed by the newly established meandering nature of streams and shade then becomes more evident to help maintain water temperatures. The greatest improvement is expected in the 50 plus years as water is absorbed in the uplands and established pools, and shade becomes more prevalent from hardwoods and conifers.

4.2.2.3—High Stream Temperatures-Alternative 3

Under this alternative, some of the recommended activities are expected to cause disturbance possibly affecting water temperatures, however, to lesser degree due to the design of Alternative 2 reducing potential short-term impacts from recommended projects.

Shade is expected to improve over time as described in the plantings and protection of hardwoods as in Alternative 2.

Vegetation projects are expected to affect peak and near peak flows and summer base flows similarly to Alternative 2 except that the scale and magnitude of project results are expected to be less effective in Alternative 3 because no heavy equipment would be used to improve channel meander and create in-stream structures.

Effects from road, trail, and dispersed campground projects would be the same as those described for Alternative 2 (see previous Peak Flows descriptions).

4.2.2.4—High Stream Temperatures-Alternative 4

Shade is expected to be improved over time as described for Alternative 2 and 3.

Vegetation projects are expected to have a neutral effect on peak and near peak flows, and summer base flows due to only prescribed fire and pre-commercial thins being implemented. No harvest would occur as in Alternatives 2 or 3, therefore, effects would be less.

In-stream project effects would generally be the same as those described for Alternative 2 and 3 except that fewer new roads would be constructed, reducing the amount of subsurface flow interception. The decommissioning of roads would result in the same impacts and benefits as in Alternatives 2 and 3.

The overall trend development is expected to be similar to that described for Alternative 2 except that the decline in temperatures in Davis, Vincent, Caribou, Butte, Granite Boulder Creeks and along the MFJDR is not expected to be as great since water storage areas along these channels, requiring the use of heavy equipment, would not be rehabilitated. Natural recovery in these areas is expected to start at an observable level about year 50 as coarse woody material is recruited and to become clearly established by about year 125 as more coarse woody material falls into the streams, based on the age of the riparian stands.

4.2.2.5—High Stream Temperatures-Alternative 5

Shade is expected to be improved over time as described for Alternative 2.

The effects of vegetation projects are expected to affect peak and near peak flows and summer base flows similarly to Alternative 2 except that the scale would generally be greater as described for Alternative 5 under Peak Flows.

Effects would generally be the same as those described for Alternative 2 except that more soil and hydrological disturbance is expected to occur due to additional tractor skidded acres and less helicopter yarded acres.

The introduction of a greater amount of soil and hydrological disturbance associated with some of the recommended actions, as compared to Alternative 2, is expected to dampen recovery trends for the first 25 years, and to, possibly, dampen it for a longer period than under Alternative 2 due to the increase in ground disturbing activities

4.2.3 Treatment Objectives for Aquatic Habitat

Some stream segment conditions are outside an expected range for fish species. *See* ***1.2.2.3 Desired Condition: Functioning Aquatic*** Habitat*, page 22*

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists to recover aquatic habitat with emphasis on channel meander and riparian shade to improve aquatic and terrestrial habitat.	By implementing aquatic and infrastructure projects, riparian conditions of channel meander and diverse vegetation will be improved providing riparian habitat needed for dependent fish and wildlife.

Area Access Plan

A major influence on the aquatic habitat is that of the transportation system. For today's resource management agenda, roads are an intricate part for the caring of the land and providing access to the land for multiple uses (cf. Appendix G Roads Analysis).

Since 1995, the majority of the watershed has had a comprehensive Access and Travel Management (ATM) Plan analyzed and implemented. In 1994, the Lower Middle Fork ATM Plan was implemented. This ATM plan covered the north side of the Middle Fork John Day River from the Forest boundary east to Granite Boulder Creek. In 1995, the Upper Middle Fork ATM Plan was implemented. This was also on the north side of the Middle Fork John Day River and covered the area from Granite Boulder Creek east to the Forest boundary with the Wallowa-Whitman National Forest. In 1996, the Northside Middle Fork ATM Plan was implemented. This covered the area south of the Middle Fork John Day River from Highway 7 west across Dixie Butte, along the Dixie/Wickiup spring divide, south along West Fork Lick Creek and Camp Creek to the Middle Fork John Day River. The Summit Fire Recovery Project EIS updated the Lower Middle Fork ATM Plan. Based on several issues related to watershed health, sediment reduction, and impacts to fish and wildlife habitat, 125 miles of roads were identified for decommissioning (removal from the transportation system). A common objective of all ATM plans in the watershed was to decommission native surface roads within RHCAs that were not identified to be brought up to a higher standard or were not needed for future management activities.

The results of implementing several different alternative proposals on the Access and Travel Management Plan for the *Analysis Area (Galena WA, Supplement—2002)*are displayed on the following table.

Table 123 Access and Travel Management Plan inside Project Area♠

	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Total Miles	267	219	218	202	228
Total Road Density (miles per square mile)	3.45	2.83	2.82	2.61	2.95
Open Road Miles♣	132	91	91	89	164
Open Road Miles with RHCAs	33	24	24	24	32
Closed Road Miles♣	135	128	127	113	64
Closed Road Miles within RHCAs	27	12	12	12	4
Open Road Density (miles per square mile) ♣	1.71	1.18	1.18	1.15	2.12
Decommissioned Road Miles	0	67	67	67	62
New Construct Road Miles	0	18	17	2	22
Reconstruct Miles – Minor/Major	0	128/37	128/37	128/37	130/41

NOTE: ALT. = Alternative **RHCA =** Riparian Conservation Areas **TS =** Timber Sale

♠ For all of the action alternatives, about 25 miles of road maintenance or reconstruction work is planned for roads or road segments outside the project area that are needed to access areas inside the project area. These miles are not included anywhere on this table.

♣There are about 12.5 miles of roads recommended for Seasonal Closure (December through March) under alternatives 2, 3, and 4. These road miles are included as closed miles in the table, and not as open miles. There are no seasonal closures recommended under alternative 5.

4.2.3.1—Alternative 1

Under this alternative, the undesired aquatic habitat conditions described in Chapter 1.0 would continue. Shade would continue to be below potential and not meet Forest Plan standards on many stream segments. As a result water, temperatures would continue to be elevated and not meet standards.

Peak flows and near peak flows are expected to continue to occur earlier and are expected to be larger. Consequently, late season flows are expected to be lower and longer in duration. Hill slope and stream channel characteristics are expected to promote rapid runoff. Riparian storage capacity would continue to be reduced. Irrigation diversions would remain, and 267 total miles of roads would continue to intercept subsurface flows. Consequently, peak and near peak flows would remain larger and longer in duration; summer base flows would remain low and longer in duration, and stream temperatures are likely to remain elevated. Risk of large-scale erosion events occurring would remain elevated. These events tend to widen channels and expose more stream flow to radiant heat.

4.2.3.1(ATM)—Alternative 1—Access Travel Management

Use would continue on most or all of the roads that remain open. A few roads may close naturally as a result of encroaching vegetation and very little use. It is not likely that maintenance funding will be sufficient to maintain all of the roads. Overall, road conditions, including those located within RHCAs would have a continued downward trend. Road surface and drainage conditions would continue to degrade, resulting in increased adverse impacts to water quality and riparian habitat. Average Daily Traffic (ADT) numbers on open roads will gradually increase over time, as a result of a predicted moderate increase in the amount of recreational use.

4.2.3.2—Alternative 2

Under this alternative, conditions affecting stream shade and water yield described in the Chapter 3.0 - Affected Environment would be treated—except irrigation diversions would remain (in all of the action alternatives). At the same time, some of the recommended activities are expected to cause disturbances that would result in reduced shade or altered water yields and elevated water temperatures.

Shade is expected to improve over time as both planted (and protected) and naturally occurring hardwood shrubs grow. No measurable change would be evident for about 10 years after implementation. Stream shade along about 20% of the planted streams is expected to meet Forest Plan standards before year 50, and along the rest of the stream lengths, to be closer to meeting the standards. As summer base flows increase in size and low flows decrease in duration, stream temperatures are less likely to be reduced.

Vegetation projects affect peak and near peak flows and summer base flows as described in Section 4.2.1. As aquatic projects are implemented, expected results include an increase in summer base flows and shorter duration of low flow conditions. As this occurs, it is expected that stream temperatures are less likely to be elevated, primarily as a result of increased retention of water across the landscape.

Removal or improvement of culverts restricting fish passage on fish bearing streams and decommissioning of over 24 miles of road in RHCAs would promote the recovery of shade along the adjacent stream segments by year 50. Decommissioning of six ATV trail stream-crossings, and relocation of three dispersed camp sites are expected to have similar effects.

The recommended construction of one perennial crossing would contribute to the loss of shade in the immediate area when implemented. Approximately of 18 miles of new roads are needed for management. However, 5.5 miles of these roads are needed to replace (relocate) roads that are currently impacting aquatic habitat. Further aquatic enhancement would occur as the result of decommissioning over 24 miles of existing roads in RHCA areas.

Cumulatively, aquatic habitat would improve as a result of these projects, particularly in 50 plus years. Stream temperatures are expected to decrease over time, as a result of activities that promote shade recovery and the absorption, storage and late season release of water. The temperature decline is expected to start in the first year following implementation of watershed projects, although changes are likely to be gradual and initially undetectable. Storage capacity is expected to increase over the next 2 to 125 years (see Peak Flow discussion), because of soil disturbance recovery in the next 50 plus years, and as shade recovers at 10 plus years. The greatest change is expected to occur after year 10 and before year 50.

4.2.3.2 (ATM) & 4.2.3.3 (ATM)—Alternatives 2&3—Access Travel Management

In implementing the recommended access plan for both Alternatives 2 and 3, the following roadwork inside the planning area would be accomplished during the first five-year period:

- The new road construction (approximately 18 miles for Alternative 2, 17 miles for Alternative 3), including relocated roads, would be essentially complete;
- The reconstruction work associated with harvest activities (approximately 106 miles for both Alternatives 2, and 3) would also be essentially complete;
- The reconstruction work not connected with harvest activities (approximately 59 miles for Alternative 2, and 3) is expected to be about 20% complete;
- The decommissioning work (approximately 67 miles for both of these alternatives) is 50% complete, including a major portion of the road miles located within RHCAs;
- Road closures to be completed with harvest activities are about 20% complete, and road closures not associated with harvest activities are about 50% complete.

There is about 25 miles of road maintenance and reconstruction recommended outside of the planning area in order to access areas inside of the planning area. This work is all associated with recommended timber harvest, and would occur concurrently with the reconstruction work recommended inside the planning area.

Use would continue on all of the open roads. Because many newly constructed and reconstructed roads require only minimal maintenance, and decommissioning of many other roads is already underway, available maintenance funding would probably be sufficient to maintain most of the remaining roads.

Overall road conditions would be significantly improved. Road surface and drainage conditions would have been improved on many roads, resulting in a reduction of road related impacts to water quality and riparian habitat. ADT numbers on roads that remain open are higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

The following work would be accomplished within approximately 10 years following the beginning of implementation:

- All of the new road construction, including relocated roads is complete;
- The reconstruction work associated with harvest activities is completed;
- The reconstruction work not connected with harvest activities is about 80% complete.
- The decommissioning work is 100% complete, including all of the miles located within RHCAs;
- Road closures to be completed with harvest activities and those not associated with harvest activities are essentially 100% completed.

Use continues on all of the existing open roads. Because many system roads have been decommissioned, and most of the remaining system roads are either newly constructed or reconstructed and require only minimal maintenance, available maintenance funding would probably be sufficient to maintain virtually all of the roads for at least an additional five year period.

Overall open and closed road conditions have a substantial upward improvement trend. Road surface and drainage conditions have been improved on most roads, resulting in a substantial reduction of road related impacts to water quality and riparian habitat. ADT(Average Daily Traffic) numbers on roads that remain open are higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

4.2.3.3—Alternative 3

Under this alternative conditions described in the Affected Environment would be treated. At the same time some of the recommended activities are expected to cause disturbance that would contribute to elevated water temperatures.

Shade is expected to improve over time as described for Alternative 2.

The vegetation projects are expected to affect peak and near peak flows and summer base flows similarly to Alternative 2 except that the scale would generally be smaller as described for Alternative 3 in under Peak Flows.

4.2.3.4—Alternative 4

Under this alternative conditions described in the Affected Environment would be treated. At the same time some of the recommended activities are expected to cause disturbance that would contribute to elevated water temperatures.

Shade is expected to improve over time as described for Alternative 2.

Generally these projects are expected to have a neutral effect on peak and near peak flows and summer base flows as described for Alternative 3 under Peak Flows.

Effects would generally be the same as those described for Alternative 2 except that fewer new roads would be constructed, reducing the amount of subsurface flow interception compared to Alternatives 2 and 3.

The overall trend development is expected to be similar to that described for Alternative 2 except that the decline in temperatures in Davis, Vincent, Caribou, Butte, Granite Boulder creeks and along the MFJDR is not expected to be as great, since enhancement of water storage areas along these channels (which would require the use of heavy equipment) is not recommended in this alternative. Natural recovery in these areas, based on the age of the riparian stands, is expected to start at an observable level about year 50 as coarse woody material is recruited, and to become clearly established by about year 125 as more coarse woody material falls into the streams. Very little dampening of the overall trend of recovery is expected since very little new soil and hydrological disturbance would result from the recommended activities.

4.2.3.4 (ATM)—Alternative 4—Access Travel Management

In implementing the recommended access plan for Alternative 4, the following work would be accomplished during the first five-year period:

- The road relocations (approximately 2.2 miles) are complete;
- The road reconstruction work (approximately 165 miles) is approximately 10% to 20% complete;
- The decommissioning work (approximately 67 miles) is approximately 50% complete, including most or all of the miles located within RHCAs;

Road closures are about 50% complete.

Use would continue on most or all of the roads that remain open. A few roads may close naturally as a result of encroaching vegetation and very little use. Available maintenance funding would probably not be sufficient to maintain a major portion of the roads because only 10 to 20% of the needed reconstruction work will have been accomplished.

Overall open and closed road conditions would have a downward trend. Road surface and drainage conditions on many roads would have degraded and result in increased adverse impacts to water quality and riparian habitat. ADT numbers on roads that remain open are higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

The following work would be accomplished within approximately 10 years following the beginning of implementation:

- The reconstruction work is approximately 50% complete;
- The decommissioning work and road closures are 100% complete, including all of the miles located within RHCAs.

Use would continue on most or all of the roads that remain open. A few roads may close naturally as a result of encroaching vegetation and very little use. Available maintenance funding will probably not be sufficient to maintain all of the roads, because half of the needed reconstruction work would not yet be done.

Overall open road conditions would probably have at least a slight downward trend. While conditions on the roads that have been reconstructed would be improved, on many of the other roads, road surface and drainage conditions would have degraded. For these roads, the results would be increased adverse impacts to water quality and riparian habitat. ADT numbers on roads that remain open are higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

4.2.3.5—Alternative 5

Shade is expected to improve over time as described for Alternative 2.

The vegetation projects are expected to affect peak and near peak flows and summer base flows similarly to Alternative 2 except that the scale would generally be greater as described for Alternative 5 under Peak Flows.

Effects would generally be the same as those described for Alternative 2 except that more soil and hydrological disturbance is expected to occur as described for Alternative 5 under Peak Flows. The introduction of a greater amount of soil and hydrological disturbance associated with some of the recommended actions i.e. additional tractor skidding, as compared to Alternative 2, is expected to dampen improvement trends as compared to Alternative 2 in the first 25 years and possibly longer.

4.2.3.5 (ATM)—Alternative 5—Access Travel Management

In implementing the recommended access plan for Alternative 4, the following work would be accomplished during the first five-year period:

- The new road construction including relocated roads (approximately 22 miles) is essentially complete;
- The reconstruction work associated with harvest activities (approximately 109 miles) is also essentially complete;
- The reconstruction work not connected with harvest activities (approximately 62 miles) is approximately 20% complete;
- The decommissioning work (approximately 62 miles) is 50% completed including about most of miles located within RHCAs;
- Road closures to be completed with harvest activities are about 20% complete, and road closures not associated with harvest activities are about 50% complete.

There is about 25 miles of road maintenance and reconstruction recommended outside of the planning area in order to access areas inside of the planning area. This work is all associated with recommended timber harvest, and would occur concurrently with the reconstruction work recommended inside the planning area.

Use continues on all of the open roads. Because many newly constructed and reconstructed roads would require only minimal maintenance, and decommissioning of many roads is already underway, for the short-term available maintenance funding will probably be sufficient to maintain almost all of the roads.

Overall open and closed road conditions would be significantly improved. Road surface and drainage conditions would have been improved and result in a reduction of road related impacts to water quality and riparian habitat. ADT numbers on roads that remain open are slightly lower despite a predicted moderate increase in the amount of recreational use, because the miles of open roads have increased.

The following work would be accomplished within approximately 10 years following the beginning of implementation:

- All of the new road construction including relocated roads is complete;
- The reconstruction work associated with harvest activities is complete;
- The reconstruction work not connected with harvest activities is approximately 80% completed;
- The decommissioning work is 100% complete including all of the miles of roads located within RHCAs;
- All recommended road closures are complete.

Use continues on all of the existing open roads. Because many newly constructed and reconstructed roads will require only minimal maintenance, and decommissioning of many roads is completed, for the about the

next five years available maintenance funding would probably be sufficient to maintain virtually all of the roads. Because of an increase in miles of open roads, the maintenance funding needed beyond that five-year period is higher than the other action alternatives, and will probably not be sufficient to maintain all of the open and closed roads.

4.2.4 TREATMENT OBJECTIVES FOR VEGETATION OUTSIDE HRV

Vegetation conditions are outside the HRV for the current climatic period. See1.2.2.4 Desired Condition: Forest Stands Moving Toward Resilient Conditions, page 24.

AND

4.2.5 TREATMENT OBJECTIVES FOR HIGH WILDFIRE HAZARDS

Uncharacteristically severe wildfires are likely to occur. See 1.2.2.5 Desired Condition: Reduced Risk of Severe Wildfire, page 25

Table 124 HRV

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists to alter deteriorating forest stands within the project area toward historical forest stand structures, composition, and density to create resilient forest stands that can safely tolerate natural disturbance factors such as infections, infestations, and wildfire.	By implementing vegetation and infrastructure projects, resilient plant life dominates the project area that now has the ability to withstand endemic disturbance regimes of insect infestation, disease infections, and wildfire.

Table 125 Fire Hazard

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists to change stand structure, landscape vegetation patterns, and species composition to replicate historic vegetation conditions and reduce the likelihood of uncharacteristically severe wildfire destroying multiple resources and opportunities for human use.	By implementing vegetation and infrastructure projects, fire adapted forest stands once again dominate the landscape in a mosaic pattern where wildfires normally burn with low intensity over most of the area in Dry and Moist Forest types.

Dry Forests were once forested by open park-like stands of large early seral tree species (ponderosa pine and western larch). Lightning and Native Americans ignited fires that burned frequently; consuming ground fuel, reducing the amount of shade tolerant understory trees, and scorching the lower branches. With little fuel on the ground, the fire intensity was low, and since the height of the bottom of the live crown was high enough to keep the ground fire from reaching the crowns, crown fire occurred infrequently. The thick bark on the trees insulated the cambium from the heat of the frequent, low intensity ground fires that occurred. The low stand densities allowed the trees to grow with good vigor and to withstand bark beetle attacks and to outgrow mistletoe infections. The relative lack of shade tolerant late seral species (Douglas-fir and grand fir) reduced the amount of host species for tussock moth and spruce budworm, maintaining these damaging insects at low levels.

Moist forests were historically a mixture of open park-like stands and denser forests that included both early-seral and late-seral tree species, reflecting the variability caused by a mixture of fire regimes and other disturbances. Fires would burn patches up to 2000 acres in size, of which 80% would be an underburn, and 20% would be stand replacement intensity. The patchwork of structural stages and the higher proportion of early-seral species reduced the amount and distribution of host species (Douglas-fir and grand fir) for spruce budworm and Douglas-fir tussock moth, restricting the size and intensity of

defoliating insect outbreaks. These are the same host species that are susceptible to the more damaging root and stem diseases. The result was that the stands were able to withstand periodic disturbances from fire, insects, and disease; exhibiting good resiliency and long-term sustainability.

Species conversion will reduce the amount and distribution of late-seral species in the planning area. That will reduce the severity and extent of insect outbreaks, and reduce the incidence and spread of disease. Thinning will reduce the stocking levels in the overstory and understory, improving tree vigor, which will improve forest resiliency. Prescribed fire will reduce the amount of natural in-growth, reduce dead fuel loading, and scorch the lower live limbs, reducing the torching potential and crown fire potential, which will reduce fire severity and size.

Prescribed burning will be done to stands that are stocked with a majority of species including ponderosa pine, western larch, and Douglas-fir and which may contain understories of grand fir or western juniper that have become established as a result of fire exclusion. A low intensity ground fire is planned to meet the objectives of fuel reduction, vegetation treatment and resource protection. Burn intensities should be varied on a site specific basis depending on weather, fuel, topographic, and tree characteristics that would result in no more than 30 percent crown scorch of the dominant and co-dominant trees. The scorching of the lower live branches up to 20 feet above the ground is desirable because this reduces ladder fuels into trees. By reducing ladder fuels in this manner the chance of a future wildfire would be reduced. Mosaic burning including some unburned areas is desirable in order to have diversity in ground vegetation stages and retain desirable tree regeneration.

4.2.4.1 & 4.2.5.1—Treatment objectives for HRV and High Wildfire Hazards—Alternative 1

This alternative does not treat any stands by commercial harvest, pre-commercial thinning, or prescribed fire.

- 0 acres of commercial thin
- 0 acres of modified commercial thin
- 0 acres on understory removals
- 0 acres of shelterwood/commercial thin
- 0 acres of salvage harvest
- 0 acres of pre-commercial thin associated with harvest
- 0 acres of modified pre-commercial thin associated with harvest
- 0 acres of pre-commercial thin outside harvest
- 0 acres of modified pre-commercial thin
- 0 acres of burn/fuel treatment associated with harvest
- 0 acres of prescribed fire outside harvest units

Desired Condition

Since there would be no treatment to reduce overstocking or to shift the species composition, the stands would continue to become more overstocked, growth would continue to slow, and the trees would become increasingly susceptible to disturbance from insects, disease, and fire. The more crowded and dense the timber stands become over time increases the likelihood and potential severity of catastrophic disturbance events such as uncharacteristically severe wildfire. The overall resiliency to withstand natural disturbances would continue to decrease.

The slowing of tree growth would cause the development of old forest structural stages to be slowed, increasing the time until trees develop into the large size classes. Stands at increased risk to disturbance

could be "reset" to earlier structural stages by disturbances, further reducing the amount of medium sized tree stands available to grow into large trees. Disturbances would continue to be at a larger scale than historically occurred, with "out of scale" adverse effects to water, fish, wildlife, vegetation, and other resources.

Stands would not be within the Historical Range of Variability (HRV) for stand structure.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. Due to the slow growth rates, development of old forest stand structures will take approximately 110 years in the existing ponderosa pine stands, and over 60 years in the existing mixed conifer stands. There is an increasing risk of large-scale, stand-replacing fires that would set back structural stage development, resulting in large areas of young trees and longer time spans (150-200 years) to develop old forest structures.

Table 126 Existing Structural Stages in Percent

FOREST TYPE	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
Dry HRV	5-15	5-25	5-10	5-10	5-15	30-55	5-15
Existing	5	42	3	7	30	1	12
Moist HRV	10-30	5-10	10-20	10-20	10-20	5-15	15-40
Existing	7	6	4	5	39	5	34
Lodgepole HRV	5-30	5-10	5-50	5-15	5-15	5-10	5-15
Existing	0	2	13	42	31	0	12
Cold HRV	20-25	5-10	5-20	5-10	20-30	5-10	15-25
Existing	0	16	9	0	57	0	18

Aspen

Quaking aspen stands will continue to be encroached on by conifers, leading to decline in vigor and numbers. Lack of protection from grazing by cattle and wildlife will reduce the numbers of suckers that are able to grow into trees, in many cases almost eliminating reproduction. The few stands presently remaining will continue to decline and eventually disappear.

Understory Vegetation

Mountain mahogany will continue to be encroached on by conifers, leading to decline in vigor and numbers. Other shrubs, which were adapted to sprout after frequent fires and need sunlight, will continue to decline as the stands become more closed. Pine grass, and other ground vegetation, will continue to decrease in vigor and forage quality with increasing shade and lack of nutrient cycling provided by burning.

Resiliency and Sustainability

Overstocked forest stands will continue to slow in growth and decrease in vigor as stand density continues to increase. Late seral species will continue to increase occupancy in mixed conifer stands. The quantity and vigor of grasses and shrubs in the understory will continue to decline due to the shading and competition for nutrients and water.

Insect Risk

Risk of attack by bark beetles will increase as the trees lose vigor and are less able to pitch out the beetles. As more attacks become successful, the population increases to outbreak levels, killing and damaging

larger pockets of trees. Risk of outbreaks of defoliating insects would continue to increase as the stand composition continues to shift to more late seral species. Large scale applications of insecticides are felt to be ineffective since the habitat for the insect remains and the natural populations are available to periodically reach outbreak levels (Mason 1998, Powell 1994). Widespread defoliation and mortality would increase the fuel loads greatly. The dense, slow growing stands would remain a high risk for fir engraver attacks; further increasing mortality and fuel loading.

Disease Risk

Dwarf mistletoe infections can be expected to increase as trees slow in height growth and the crowns grow closer together. Stem and root diseases would continue to spread in the host fir trees, causing increasing mortality.

Fire Hazard and Risk

The primary stand attributes that control fire behavior are surface fuel condition, crown bulk density, and crown base height (Graham 1999).

The amount, type, and arrangement of ground fuels are classified using fuel models developed by the National Forest Fire Laboratory. The primary Fuel Models present are Fuel Model 9 (Timber With Loosely Compacted Litter) for the Dry Forest and Fuel Model 10 (Timber With Heavy Litter) in the Moist Forest. Prior to fire exclusion, the area with these fuel models was mostly Fuel Model 2 (timber with grass under story) due to low conifer stocking levels. The result of the change from the period before fire exclusion is that now slower spreading wildfires, but wildfires with a longer duration, which burn with higher severities due to the accumulation of fuels greater than 3 inches in diameter. The no action alternative will result in little change in the amount of fuel models 9 and 10 that are currently present and a decrease in Fuel Model 11 (Activity Created Slash From Previous Management Activities) due to decomposition over a time period of between 10 and 20 years. Fuel Model 13, which represents the blow down of timber in Vincent Creek, will continue to exist as an area that would burn with extreme severity during a wildfire but the rates of spread would decrease after the material 3 inches and less decompose over the next 20 years.

The increase in stand density in ponderosa pine stands will increase the likelihood of crown fire by increasing the stand crown-bulk density. Insect and disease mortality will increase the standing and down fuel loadings, increasing fire intensity and severity. Stands with an understory or live crowns that are currently close to the ground will continue to have a hazard of ground fires moving up into the crowns along the fuel ladder. These stands will continue to be susceptible to torching from wildfire, increasing the hazard of crown fire. Stands with no fuel treatments burn at a higher severity and with more crown scorch than similar stands that have been treated to reduce stand densities and fuel loads (Pollet 1999).

In stands with a high proportion of fir trees, there would continue to be a high hazard for uncharacteristically severe wildfire due to the high flammability of late seral species stands. The increase in stand density will increase the likelihood of crown fire by increasing the stand crown density. Insect and disease mortality will increase the standing and down fuel loadings, increasing fire intensity and severity. Stands with an understory will continue to have a hazard of ground fires moving up into the crowns along the fuel ladder created by these smaller trees.

The crown fire hazard remains at 66 percent of the Dry Forest type and at 60 percent for the Moist Forest type. The species mix does not change towards less flammable species, the density is not reduced, and the ladder fuels are not reduced. The area remains at the current high hazard for uncharacteristically severe wildfire. As trees grow and biomass increases, the crown fire hazard will continue to increase. In 50 years, almost all stands will be at a high crown fire hazard without periodic under burning. Only with periodic under burning and mechanical treatment, that could reduce stand densities and reduce fire sensitive species, or with the advent of wildfires that may likely cause uncharacteristically severe wildfire—can stocking be maintained where it is appropriate.

Table 127 Percentage of Crown Fire Hazard by Forest Type

CROWN FIRE HAZARD	DRY FOREST	MOIST FOREST	LODGEPOLE FOREST	COLD FOREST
High	66%	60%	98%	84%
Low-Moderate	34%	40%	2%	16%

Wildfire Hazards at the Watershed Scale

Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effect will be to maintain a center of insect and disease activity that could spread outside the Southeast Galena project area. If the fire risk were not reduced, fires starting in the Southeast Galena area would be more likely to escape initial attack and become large, uncharacteristically severe wildfires.

The Forest Types (see page 139) covers about 86 percent of the Galena Watershed. About 53 percent of the Forest Types contain high crown fire hazards with ladder fuels and many patches of moderate to heavy ground fuels. This is after stand replacement fires of 1994 and 1996 burned approximately 30 percent of the watershed. The North Fork John Day River Watershed, on the north side of the Galena Watershed, also has similar dense stands with ladder fuels throughout much of the area. This adjacent watershed, had about 24 percent of the area burned in 1996 Tower Fire. To the south of the Galena Watershed the Camp Creek Watershed has higher proportion of dense tree stocking than the above two watersheds this is because in this area there has been no stand replacing fires since fire exclusion began. The cumulative effect is that all of these watersheds have large areas with fuel conditions that are excessively outside the Historical Range of Variability (see page 6). Because of these existing conditions, large uncharacteristically severe wildfires can spread into the adjacent watersheds from the project area, or from these adjacent watersheds into the project area and create large areas with damaged resource conditions that are unlike historic wildfire fire behavior patterns in either extent or magnitude.

Public Safety and Property

If the high fire hazard area south of the Middle Fork is not treated and the roads that are in poor condition in the same area are not improved to provide adequate access for fire fighting equipment—loss to privately owned lands and structures in Bates, Austin, and Austin Junction areas may occur.

The high fire hazard area located in the upper Vinegar Creek drainage that was the result of the 1998 blow down consists of several hundred acres of down timber which has been wind thrown due to this event. This area would not be treated by this Alternative 1. A fire burning into or starting from these fuel conditions would be difficult and dangerous to control and could easily become a large conflagration threatening private property and structures particularly in the vicinity of the town of Greenhorn.

Air Quality

The no action alternative would have the least immediate impact on air quality, as there is no prescribed burning. However, all biomass remains available for consumption by wildfires and it will continue to accumulate, increasing the potential for large amounts of smoke during the summer months, when diurnal inversions can concentrate smoke at low elevations when wind cannot effectively transport and disperse this smoke. These smoke concentrations can have high particulate levels that can cause health problems, or violate summertime Class I air quality visibility standards for Wilderness areas should uncharacteristically severe wildfire occur.

4.2.4.2 & 4.2.5.2—Treatment objectives for HRV and High Wildfire Risk—Alternative 2

This alternative includes:

- 5,720 acres of commercial thin
- 1,230 acres of commercial thin in connectivity corridors
- 880 acres on understory removals
- 1,690 acres of shelterwood
- 250 acres of salvage harvest
- 1,480 acres of precommercial thin associated with harvest
- 750 acres of precommercial thin in connectivity corridors associated with harvest
- 680 acres of precommercial thin outside harvest areas
- 200 acres of precommercial thin in connectivity corridors outside harvest areas
- 2,590 acres of burn/fuel treatment associated with harvest
- 12,380 acres of prescribed fire within mechanically treated units
- 11,370 acres of prescribed fire outside mechanically treated units

The overstocked stands that are thinned will respond over several years, adding more crown area and increasing individual tree growth. The thinning will also shift the species composition, as it will give preference to the early seral species. The shelterwood harvest and the understory removal treatment are designed to remove many of the grand fir and Douglas-fir. Ponderosa pine, western larch, and western white pine that are in the stand are to be retained, thinning out any overstocked clumps.

The stands selected for treatment are 50% of the total area identified that is in need of treatment. The stands not treated would have the same effects as discussed for the No Action alternative.

Desired Condition

Commercial thinning in overstocked stands would enable the remaining trees to respond by increasing their crowns and roots, increasing their ability to utilize nutrients, sunlight, and water. Growth would increase and the trees would grow into old forest structural stages sooner. The increased vigor of the trees would decrease their susceptibility to disturbance from insects and disease; and lessen the likelihood and potential severity of bark beetle outbreaks and mistletoe infestation. The decreased stand density, the increase in size, and the increase in the height to the bottom of the live crown will reduce the chances of torching and the potential for catastrophic crown fires. The overall resiliency to natural disturbances would be increased.

The increased tree growth would cause the development of old forest structural stages to accelerate, decreasing the time until the trees grew into the large size classes by 40 to 60 years. Stands would be resilient to disturbance and would not be “reset” to earlier structural stages by disturbances, enabling them to continue to grow into large trees. Disturbances would be closer to the historic scale of small patches and clumps of trees removed.

Stands dominated by late seral species trees are planned for shelterwood treatments. The shelterwood treatments would remove many of the late-seral species trees from stands, retaining the early-seral species that are there, and reforesting openings with early-seral species. This will shift the species composition closer to the historic composition. The result would range in appearance from a commercial thin to a shelterwood harvest, depending on the existing stand species composition. Treated stands would be more adapted to the natural disturbances that exist, increasing the overall resiliency to natural disturbances. Resilient stands would decrease the risk that disturbance would “reset” the stands to earlier

structural stages, enabling them to continue to grow into large trees. Disturbances would be closer to the historic scale of 200 to 2,000 acres.

The stands that resemble commercial thinning would respond by increasing their crowns and roots, increasing an ability to utilize nutrients and water. Growth would increase and the trees would grow into old forest structural stages sooner. The increased vigor of the trees would decrease their susceptibility to disturbance from bark beetles and mistletoe. The decreased density, increase in tree size and height of the live crown, and reduction in fuel loading will lessen the chances of stand replacing fire. The increased tree growth would cause the development of old forest structural stages to accelerate, decreasing the time until the trees grew into the large size classes by 40 to 50 years. Stands would be resilient to disturbance and would not be "reset" to earlier structural stages by disturbances, enabling them to continue to grow into large trees. Future disturbances would be closer to the historic scale.

The stands that resemble shelterwood treatments would be replanted to early-seral species seedlings. The shelterwood trees left in the stand would be retained as legacy trees to provide a degree of vertical structure. With the reduced competition they would grow well and be resistant to disturbance from insects, disease, and fire. The seedlings would grow rapidly, and with proper spacing control, would develop into large trees in approximately 125 years. They would be resistant to insects and disease, but susceptible to fire until they are about 30 years old.

Removing the understory from selected old forest multi strata stands would create old forest single stratum stands, with no net loss of old forest structure. This will reduce competition to the larger trees in the stands; improve the stand resiliency by reducing susceptibility to insects, disease, and wildfire; and allow for future stand maintenance by underburning.

Salvage of wind thrown trees in the Vinegar Creek drainage would reduce the fire hazard in that area and to the Greenhorn town site located to the northeast (down wind of the prevailing wind direction). It would also clear the site for reforestation by planting and may reduce the breeding sites for spruce and Douglas-fir bark beetles.

The thinning treatments in connectivity corridors will improve stand conditions somewhat, but not to the degree as the standard thinning and thinning/shelterwood treatments. It is anticipated that an additional thinning will be necessary to maintain the stands in good condition, and to remove additional late-seral trees. If not thinned again in the future, growth will slow and it would take an additional 20 to 40 years to reach the old forest structural stage.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. Development of old forest stand structures in the thinned stands, with the increased growth rates, will take about 50 years. The modified thinning will take an additional 20 to 40 years to develop old growth characteristics. This compares with the 110 years that a stand without treatment is expected to take to develop old growth characteristics.

Shelterwood treatments are expected to result in old forest structural stages in 20 years, compared with 60 years with not treatment. More importantly, there is a decreased risk of large-scale disturbances such as insect defoliators or stand-replacing fires that would set back structural stage development, both for the treated stands and surrounding stands.

Stands treated would be, or would be growing towards, the Historical Range of Variability (HRV) for stand structure.

Table 128 Effects of Alt. 2 Treatments on Dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
Existing	5%	42%	3%	7%	30%	1%	12%
10	5%	43%	2%	13%	24%	4%	9%
50	5%	24%	2%	7%	24%	24%	14%
75	5%	20%	2%	7%	24%	28%	14%
125	5%	20%	2%	7%	24%	34%	9%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Table 129 Effects of Alt. 2 Treatments on Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	10-30%	5-10%	10-20%	10-20%	10-20%	5-15%	15-40%
Existing	6%	6%	4%	6%	39%	5%	34%
10	6%	6%	4%	10%	35%	5%	34%
50	6%	4%	4%	6%	35%	7%	37%
75	6%	3%	4%	6%	35%	8%	37%
125	6%	3%	4%	6%	35%	11%	34%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Aspen

Quaking aspen stands will be released from competition by conifers, leading to an increase in vigor and numbers. Protection from grazing by cattle and wildlife will increase the numbers of suckers that are able to grow into trees, increasing the size of aspen patches.

- At year 5 of this project, most aspen stands will be fenced, and suckers will be growing without being browsed. Some may be up to 1 inch diameter and 8 to 12 feet tall. The genetic diversity of aspen clones across the landscape will be maintained.
- At 10 years regeneration will be well established, and many stems will be large enough to resist ungulate browsing as fences deteriorate. If the stand is regenerating vigorously, there may be hundreds to thousands of stems present.
- At 25 years, stems will have self-thinned, and the survivors should exhibit rapid growth. By this stage, the large trees are relatively immune to ungulate damage, and have probably contributed enough energy to the root system to sustain vigorous re-growth of suckers if the overstory stems are destroyed by fire or windstorms.
- Any stands that did not regenerate initially will probably have been lost from the landscape.
- At 50 years the initial "new" growth is approaching maturity at 30 to 60 foot height and maximum crown cover. The root system will have expanded, providing the opportunity for the whole stand to expand, if the suckers are not vulnerable to browsing.
- At 100 years the project-initiated stems will be decadent and in decline if there have been no regeneration events, such as fire, in the meantime. Suckers and young stems will be growing up to replace the older stems, especially if stimulated by low intensity fire.

Understory Vegetation

Thinning would reduce the conifers encroaching on mountain mahogany, increasing the shrub vigor and numbers. Other shrubs, which were adapted to sprout after frequent fires and needing sunlight, will increase as the stands become more open. Pine grass, and other ground vegetation, will increase in vigor and forage quality with decreasing shade and increased nutrient cycling provided by burning.

Resiliency and Sustainability

Approximately 51% of the area diagnosed for treatment is recommended for thinning and regeneration. Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. Species composition changes in mixed conifer stands will be towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires.

Insect Risk

The additional light and warmth in thinned stands is inhospitable for bark beetles, providing an immediate degree of protection to the trees. As the trees respond over the next several after the thinning, their increased vigor will allow them to withstand attempted beetle attacks by successfully pitching out the invading insects. As fewer attacks are successful, the population outbreaks will decrease to low levels, reducing the amount or size of pockets of mortality. The reduction in the proportion of late-seral species will reduce the extent of defoliation by spruce budworm and Douglas-fir tussock moth (Mason 1998, Powell 1994).

Disease Risk

The increased height growth rates will allow the remaining trees to outgrow dwarf mistletoe infections, gradually decreasing the amount of crown infected. The increased spacing will reduce the lateral spread of mistletoe. The removal of late seral species during the thinning operations will reduce the amount of trees susceptible to root diseases. Eventually allowing the disease to fade to a minor role in the forest.

Fire Hazard and Risk

The primary stand attributes that control fire behavior are surface fuel condition, crown bulk density, and crown base height (Graham 1999).

The primary fuel models present are fuel model 9 (timber with loosely compacted litter) for the Dry Forest and fuel model 10 (timber with heavy litter) in the Moist Forest. The amount of area with fuel model 9 increases by 5% from the no action alternative due to the prescribed burning of areas with older activity created slash. The area in fuel model 10 decreases by 5% with a corresponding increase in fuel model 5 (short shrub), which has a much lower spread rate and intensity. There is only a 2% increase in fuel model 2 as a result of the under story removal treatments which leave large trees with a light under story more typical of conditions that existed prior to fire exclusion. The other stand treatments in the Dry Forest do not reduce tree-stocking levels enough to result in fuel model 2. Fuel model 11 (activity slash) is temporarily increased to 14 % until prescribed burning reduces it to 3%. Fuel model 13, which represents the blow down of timber in Vincent Creek, is eliminated through treatment.

The risk of severe wildfire will be diminished, as thinning from below will reduce the number of smaller trees in the stand, and will remove many of the late seral species in the understory, reducing the ladder fuels that allow ground fire to climb into the crowns. Thinning and associated slash treatment will significantly lower crown bulk densities and redistribute fuel loads, decreasing fire intensities (Agee 1993, Alexander 1988, Alexander and Yancik 1977) and reducing the crown fire potential (Coulter 1980, Dennis 1983, Rothermel 1991, Schmidt and Wakimoto 1988). Thinning will also eventually increase the diameter and bark thickness, which will reduce the amount of fire damage and mortality. The reduction in insect and disease mortality will reduce the amount of standing and down fuel created, decreasing fire intensity and severity. Live crowns will be higher off the ground as a result of thinning from below and scorching from prescribed burning, reducing the risk of torching and crown fires. Mechanical fuel treatment is the most important component for reducing fire hazard. Sites with mechanical fuel treatment appear to have drastically reduced fire severity during wildfires compared to sites treated only with prescribed fire only (Pollet 1999).

Shelterwood treatments in stands with a high proportion of fir trees will decrease the risk of large scale, high severity fires since the proportion of late-seral species, which are highly flammable, will be reduced. Grand fir and other shade tolerant species tend to have long and heavy crowns, creating stands with high crown

bulk densities (Brown 1978, Rothermel 1983). After treatment, it would take extreme weather conditions to sustain a crown fire in western white pine and western larch dominated stands due to their much lower crown bulk densities (Graham 1999). The risk of torching and crown fires due to presence of a fir understory with live crowns close to the ground will be greatly reduced by removing most of the fir understory.

Stands would be dominated by western larch, with lesser amounts of ponderosa pine and western white pine, depending on the site. In stands that resemble shelterwood regenerations, the primary species to be planted are western larch, ponderosa pine, and western white pine. These stands will be quite open with low crown bulk densities that are not likely to support crown fires while the regeneration is short (Graham 1999). As the stand grows, pre-commercial thinning the understory in the future will reduce the potential for crown fire by lowering the understory crown bulk densities.

The reduction in the amount of thin barked late seral species will reduce the amount of mortality due to bole scorch. The reduction in insect and disease mortality will reduce the amount of standing and down fuel created, decreasing fire intensity and severity.

Crown fire hazard would be reduced by 22 percent, for the Dry Forest and by five percent for the Moist Forest. The treatment areas are large enough to provide conditions where crown fires in untreated areas can become ground fires soon after entering the treated areas. This is because tree crowns are not dense enough to carry fire from crown to crown unless under extreme weather conditions, and ladder fuels are removed from treatment areas through mechanical treatment and prescribed fire. Torching of individuals and groups of trees would still be possible due to species attributes, tree size or ground fuel conditions. With the increased opportunity for the wildfires to remain on the ground, or return to the ground if a crown fire, there would be increased safety for fire fighters due to less fire intensity and better opportunities for safety zones. For stands thinned to 60 basal area per acre, high crown fire hazard would be reached again within 50 years. Forest stands thinned to 80 square feet of basal area per acre (such as the recommended modified commercial thin) and the pre-commercial thin outside of harvest units, high crown fire hazard would be reached again within 25 years. The units with the combination shelterwood/commercial thin prescriptions would reach high crown fire hazard within 50 years assuming a follow-up pre-commercial thin in 25 years.

All sub watersheds, except for Granite Boulder, have treatments that reduce the crown fire hazard in large enough areas to help prevent crown fires and to allow crown fires from adjacent untreated areas to drop back to the ground. Additional thinning will be needed in the future to maintain the effects of reduced crown fire hazard.

Table 130 Percentage of Crown Fire Hazard by Forest Type

CROWN FIRE HAZARD	DRY FOREST	MOIST FOREST	LODGEPOLE FOREST	COLD FOREST
High Existing	66%	60%	98%	84%
High Alternative 2	44%	55%	2%	84%

Wildfire Risk at the Watershed Scale

Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area, those that started outside the area would find conditions less hospitable in the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

This alternative reduces high crown, fuel ladder and ground fuel hazards on about 8 percent of the watershed through mechanical treatment and reduces ground fuels and ladder fuels through prescribed burning on an additional 9 percent of the watershed. If the recommended future Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced by a total of about 7 percent through mechanical treatment and another 7 percent of the watershed would have reduced ground fuel and fuel ladders through prescribed burning. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of 31 percent of the watershed of which about 15 percent would be lowering of the crown fire hazard. The distribution of the treated areas would break up the continuity of the high hazard fuels. This will result in fires being lighter in severity over the treated areas, safer to suppress, and more likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within the historic range of variation. This will reduce the need to use mechanical treatment in the future for fuels reduction.

Public Safety and Property

The high fire hazard area south of the Middle Fork is treated with a combination of treatments and the poor roads in the same area are improved to provide adequate access for fire fighting equipment. This greatly reduces the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

The high fire hazard area located in the upper Vinegar Creek drainage that was the result of the 1998 blow down consists of several hundred acres of down timber. This alternative would treat the area by salvaging the wind thrown timber. The high hazard of a catastrophic fire destroying the private property and structures in the vicinity of the town site of Greenhorn would be greatly reduced.

Air Quality

Slash produced by commercial thinning on tractor and skyline yarded units will be brought to landings and can be made available for chipping for fiber or as fuel for cogeneration plants. Both options have a positive effect on air quality as the smoke from burning slash on site is greater than in a clean burning power plant or when used as fiber. Slash resulting from harvesting on other units is planned to be either broadcast burned or piled and burned and the burning will be under weather conditions that will meet air quality standards. Prescribed burning will be done in areas not harvested to reduce existing natural fuels, and will also be done in weather conditions that allow air quality standards to be met.

This alternative will reduce the total fuels in the planning area, reducing the amount available for consumption in future wildland fires. This would reduce the amount and duration of pollutants produced by a wildland fire; as well as reducing the fire intensity, allowing for faster control. The amount of smoke produced during the summer months and during inversion periods would be reduced, improving visibility and reducing health problems. The summertime Class I air quality visibility standards for Wilderness areas are more likely to be met.

4.2.4.3 & 4.2.5.3—Treatment objectives for HRV and High Wildfire Risk—Alternative 3

This alternative includes:

- 4,390 acres of commercial thin
- 900 acres of commercial thin in connectivity corridors
- 550 acres on understory removals
- 1,240 acres of shelterwood

- 250 acres of salvage harvest
- 1,150 acres of precommercial thin associated with harvest
- 620 acres of precommercial thin in connectivity corridors associated with harvest
- 680 acres of precommercial thin outside harvest areas
- 200 acres of precommercial thin in connectivity corridors outside harvest areas
- 10,610 acres of burn/fuel treatment within mechanically treated units
- 10,640 acres of prescribed fire outside mechanically treated units

The stands selected for treatment are 38% of the total area identified that is in need of treatment, compared to the Recommended Action which treats 50% of the same area. Alternative 3 would treat approximately 75% of the stands that the Recommended Action treats. Stands that are not treated would be subject to the same effects as discussed for the No Action Alternative.

Prescribed burning will not take place in the Little Butte and a portion of the Deerhorn drainages due to lack of stand mechanical treatment and access.

Desired Condition

Alternative 3 would have about 1660 acres less commercial thinning, about 450 acres less shelterwood, about 330 acres less understory removal, and about 460 acres less precommercial thinning than the recommended action. The effects of this alternative would correspond to treating about 75% of the Recommended Action.

Structural Stages

Approximately 75% of the stands will be treated compared to stands treated by Alternative 2. Development of old forest stand structures in the commercially thinned stands will be the same as in Alternative 2. There is also a proportionate increased risk of uncharacteristically severe wildfire that would set back structural stage development, both for the treated stands and surrounding stands, compared to Alternative 2.

Table 131—Effects of Alt. 3 Treatments on Dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
Existing	5%	42%	3%	7%	30%	1%	12%
10	5%	42%	3%	11%	26%	2%	11%
50	5%	28%	3%	7%	26%	17%	14%
75	5%	25%	3%	7%	26%	20%	14%
125	5%	25%	3%	7%	26%	23%	11%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Table 132—Effects of Alt. 3 Treatments on Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	10-30%	5-10%	10-20%	10-20%	10-20%	5-15%	15-40%
Existing	6%	6%	4%	6%	39%	5%	34%
10	6%	6%	4%	9%	36%	5%	34%
50	6%	5%	4%	6%	36%	6%	36%
75	6%	5%	4%	6%	36%	6%	36%
125	6%	5%	4%	6%	36%	8%	34%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Aspen

The effects of this alternative would be similar to the Recommended Action, since both alternatives would treat the aspen stands to the same degree (see page, 269).

Understory Vegetation

The effects on the understory will reduced from the Recommended Action, since Alternative 3 only treats 75% of the area. In Alternative 3 there will be no benefit in the Little Butte and Deerhorn drainages that will not be burned.

Resiliency and Sustainability

Approximately 36% of the area diagnosed for treatment is recommended for thinning and regeneration to improve resiliency and sustainability. Alternative 3 treats about 25% less of the area compared with the Recommended Action (Alt. 2). Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. Species composition changes in mixed conifer stands will be towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires.

Insect Risk

The effects of this alternative would correspond to approximately 25% less acres than the Recommended Action.

Disease Risk

The effects of this alternative would correspond to approximately 25% less acres than the Recommended Action.

Fire Hazard and Risk

The risk of uncharacteristically severe wildfire would be reduced on about 25% less acres than the Recommended Action. In addition, the inability to use prescribed fire south of the Middle Fork in the Little Butte and Deerhorn drainages would leave fire hazards rather than a reduction of fuels when compared with the Recommended Action.

The primary fuel models present are Fuel Model 9 (timber with loosely compacted litter) for the Dry Forest and Fuel Model 10 (timber with heavy litter) in the Moist Forest. The amount of area with Fuel Model 9 increases by 5% from the no action alternative due to the prescribed burning of areas with older activity created slash. The area in Fuel Model 10 decreases by 2% with a corresponding increase in Fuel Model 5 (short shrub) which has a much lower spread rate (fires spread rate) and intensity. There is only a 1% increase in Fuel Model 2 as a result of the under story removal treatments which leave large trees with a light under story, a condition that is more typical of conditions which existed prior to fire exclusion. The other stand treatments in the Dry Forest do not reduce tree-stocking levels enough to result in Fuel Model 2. . Fuel Model 11 (activity slash) is temporarily increased to 11 %, until prescribed burning reduces it to 3%. Fuel Model 13, which represents the blow down of timber in Vincent Creek, is eliminated through treatment.

The crown fire hazard would be reduced by 16 percent and that is six percent less effective than Alternative 2 for the Dry Forest. For the Moist Forest, the crown fire hazard would be reduced by 4 percent and that is one percent less effective than Alternative 2. Otherwise, the effects are the same as described for Alternative 2, except for the Little Butte Creek portion of the Tincup/Little Butte Creek subwatershed, which would not be effective for reducing crown fire potential next to the large, high crown fire hazard area of the Dixie Butte Roadless Area.

Table 133—Percentage of Crown Fire Hazard by Forest Type

CROWN FIRE HAZARD	DRY FOREST	MOIST FOREST	LODGEPOLE FOREST	COLD FOREST
High Existing	66%	60%	98%	84%
High Alternative 3	50%	56%	2%	84%

Wildfire Risk at the Watershed Scale

The effects of Alternative 3 would be to a lesser degree than Alternative 2 since it doesn't treat as many acres. Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated somewhat more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 7 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 5 percent. Prescribed burning treatments outside mechanically treated units would be about the same as with alternative 2. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of about 30 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 3 would have 3 percent more of the watershed, or 3800 acres, with a high crown fire hazard so it is less effective in reducing the threat of large fires. However, fires would be lighter in severity and safer to suppress over the treated areas. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. This will reduce the need to use mechanical treatment in the future for fuels reduction.

Public Safety and Property

Alternative 3 provides most of the hazard reduction that Alternative 2 does in the area south of the Middle Fork, reducing the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

Alternative 3 provides the same degree of fire hazard reduction as Alternative 2 does in the upper Vinegar Creek area.

Air Quality

The effects are similar to Alternative 2, except the amount of area treated is approximately 75% of that treated by Alternative 2. Therefore, the air quality benefit of Alternative 3 is expected to be only 75% of that provided by Alternative 2.

4.2.4.4 & 4.2.5.4—Treatment objectives for HRV and High Wildfire Risk—Alternative 4

This alternative includes:

- 0 acres of commercial thin
- 0 acres of commercial thin in connectivity corridors
- 0 acres on understory removals
- 0 acres of shelterwood
- 0 acres of salvage harvest
- 0 acres of precommercial thin associated with harvest
- 0 acres of precommercial thin in connectivity corridors associated with harvest
- 2,090 acres of precommercial thin outside harvest areas
- 640 acres of precommercial thin in connectivity corridors outside harvest areas
- 1,930 acres of burn/fuel treatment associated with precommercial thinning
- 17,230 acres of prescribed fire outside harvest units

The stands selected for treatment are 13% of the total area identified that is in need of treatment, compared to the Recommended Action that treats 50%. Alternative 4 would treat only about 25% of the stands that the Recommended Action treats, and only the understory would be treated, not the overstory. The benefits of just thinning the understory would be much less. The stands not thinned would have the same effects as discussed for the No Action alternative.

Prescribed burning will not take place in the Little Butte and Deerhorn drainages due to lack of stand mechanical treatment and access.

Desired Condition

Alternative 4 would do no commercial harvesting. The stands selected for treatment are 13% of the total area identified with a need of treatment, with the treatment being less effective than those that harvest larger trees. The stands not precommercial thinned would have the same effects as discussed for the No Action alternative.

The precommercial thinning is about 300 acres less than the Recommended Action. The effects for this alternative would be significantly less than the Recommended Action.

The modified precommercial thinning treatment will improve stand conditions somewhat, but not to the degree as the standard thinning treatments. It is anticipated that the next thinning will need to be done at an earlier time to maintain the stands in good condition.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. Only a small portion of the stands treated by the Recommended Action are treated by this alternative, and those that are treated will be only precommercial thinned rather than treating the medium sized trees. Development of old forest stand structures in the thinned stands, with the slight increase in growth rates over a short time only, will take about 100 years. This compares with the Recommended Action that can develop old forest stand structure in approximately 50 years. The time to develop old forest structure in the mixed conifer stands is comparable to the No Action alternative. There is a slightly decreasing risk of uncharacteristically severe wildfire that would set back structural stage development, but it is essentially the same as the No Action alternative.

Table 134—Effects of Alt. 4 Treatments on Dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
Existing	5%	42%	3%	7%	30%	1%	12%
10	5%	42%	3%	9%	28%	1%	12%
50	5%	42%	3%	9%	28%	1%	12%
75	5%	42%	3%	7%	28%	3%	12%
125	5%	42%	3%	7%	28%	3%	12%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Table 135—Effects of Alt. 4 Treatments on Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	10-30%	5-10%	10-20%	10-20%	10-20%	5-15%	15-40%
Existing	6%	6%	4%	6%	39%	5%	34%
10	6%	6%	4%	7%	38%	5%	34%
50	6%	6%	4%	7%	38%	5%	34%
75	6%	6%	4%	6%	38%	6%	34%
125	6%	6%	4%	6%	38%	6%	34%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Aspen

Quaking aspen stands will be released from competition by small conifers, leading to a minor increase in vigor and numbers. The medium sized trees would still suppress the aspen. Protection from grazing by cattle and wildlife will increase the numbers of suckers that are able to grow into trees, increasing the size of aspen patches. Effects would be the same as the recommended action (see page, 269).

Understory Vegetation

Precommercial thinning would reduce the number of smaller conifers encroaching on mountain mahogany, slightly increasing the shrub vigor and numbers. Other shrubs, which were adapted to sprout after frequent fires and needing sunlight, will increase as the stands are burned and become more open. Pinegrass, and other ground vegetation, will slightly increase in vigor and forage quality with decreasing shade and increased nutrient cycling provided by burning. There will be no benefit in the Little Butte and Deerhorn drainages that will not be burned.

Resiliency and Sustainability

Approximately 13% of the area diagnosed for treatment is recommended for thinning to improve resiliency and sustainability. Alternative 4 treats only about 25% of the area compared with the Recommended Action (Alt. 2) and precommercial thinning is not near as effective in changing undesirable conditions as the more intensive treatments in Alt. 2. Ponderosa pine stands will increase slightly in growth and vigor as the understory stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water.

Insect Risk

There would be a slight improvement in the resistance to bark beetles in the precommercial thinned stands, but the increase would be small compared to the other action alternatives. Experience has shown that when late seral species make up less than 25% of the stand composition, defoliation is very light with little effect to tree growth or survival. This alternative will not reach that amount in most mixed conifer stands; therefore, defoliation will not be reduced very much. The incidence of fir engraver would be reduced in

proportion to the amount of fir that is reduced, and the remaining fir trees would be slightly healthier and less susceptible to attacks.

Disease Risk

There would be little improvement, related to the amount of late seral species removed during the precommercial thinning. Stem and root diseases may be actually increased, as the cut stumps can serve as infection pathways to the remaining fir trees in the stand. Dwarf mistletoe will not be reduced to any great degree by the precommercial thinning. The burning could show gradual improvement over time, as infected overstory trees are more susceptible to torching. Regardless, infected overstory trees will remain to infect the understory trees and nearby overstory trees.

Fire Hazard and Risk

The risk of fire hazard will be slightly diminished, as thinning from below will reduce the number of smaller trees in the stand, and will remove many of the late seral species in the understory, reducing the ladder fuels that allow ground fire to climb into the crowns. The reduction in the amount of thin barked late seral species will also reduce the amount of mortality due to bole scorch. The reduced amount of burning, especially south of the Middle Fork, will result in a higher hazard for large stand replacement fires.

The primary fuel models present are fuel model 9 (timber with loosely compacted litter) for the Dry Forest and fuel model 10 (timber with heavy litter) in the Moist Forest. The amount of area with fuel model 9 increases by 5% from the no action alternative due to the prescribed burning of areas with older activity created slash. The area in fuel model 10 is not changed. There is no change in fuel model 2. Fuel model 13, which represents the blow down of timber in Vincent Creek drainage is not treated.

Alternative 4 reduces the crown fire hazard the least of any action alternative by retaining 70 percent of the area in a moderate to high crown fire hazard.

The crown fire hazard would be reduced by five percent and that is 17 percent less effective than Alternative 2 for the Dry Forest. For the Moist Forest, the crown fire hazard would be reduced by one percent and that is 4 percent less effective than Alternative 2. The crown fire hazard would reach high crown fire hazard within 25 years for all treatment units. Fires would be lighter in severity and safer to suppress over the treated area but not as likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds as with Alternative 2.

Table 136—Percentage of Crown Fire Hazard by Forest Type

CROWN FIRE HAZARD	DRY FOREST	MOIST FOREST	LODGEPOLE FOREST	COLD FOREST
High Existing	66%	60%	98%	84%
High Alternative 4	61%	59%	2%	84%

Wildfire Risk at the Watershed Scale

The effects of Alternative 4 would be to a much lesser degree than Alternative 2 since it doesn't include any commercial harvest. Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effect will be to maintain a center of insect and disease activity that could spread outside the Southeast Galena project area. If the fire risk were not reduced, fires starting in the Southeast Galena area would be more likely to escape initial attack and become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 2 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 5 percent. Prescribed burning treatments outside mechanically treated unit would be about 20 percent of the watershed when combined with Northwest Galena which is more than alternative 2 because there is less mechanical treatment. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction

projects would be a treatment of a total of about 27 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 4 would have 11 percent more of the watershed, or about 14,000 acres, with a high crown fire hazard so it is less effective in reducing the threat of large fires. However, fires would be lighter in severity and safer to suppress over the treated area but not as likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds as with alternative 2. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to help maintain treated areas within HRV. This will reduce the need to use mechanical treatment in the future for fuels reduction but less than all the other action alternatives. This is because prescribed fire without mechanical treatment will not reduce stand densities enough to move the stands towards the historical range of variation or to reduce the crown fire hazard, other than reduce the opportunity for the fire to jump up into the crowns.

Public Safety and Property

Alternative 4 provides only a small portion of the hazard reduction that Alternative 2 does in the area south of the Middle Fork. There is no thinning of larger trees and the access is not improved. The high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas is only slightly reduced compared to No Action.

Alternative 4 provides no fire hazard reduction in the upper Vinegar Creek area, which was the result of the 1998 blow down. The hazard of an uncharacteristically severe fire destroying the private property and structures in the vicinity of the town site of Greenhorn is not reduced by this alternative, which would be identical to the effects of the No Action alternative.

Air Quality

The amount of fuels reduced through mechanical treatment and burning is the least of all the action alternatives. Only about 25% of the area treated by Alternative 2 is thinned by this alternative, and only smaller, noncommercial sized trees are cut. Prescribed burning is reduced to 84% of that planned for Alternative 2. Therefore, the air quality benefit of Alternative 4 is expected to be only 25% of that provided by Alternative 2.

4.2.4.5 & 4.2.5.5—Treatment objectives for HRV and High Wildfire Risk—Alternative 5

This alternative includes:

- 7,060 acres of commercial thin
- 220 acres of commercial thin in connectivity corridors
- 1,220 acres on understory removals
- 2,600 acres of shelterwood
- 250 acres of salvage harvest
- 2,200 acres of pre-commercial thin associated with harvest
- 40 acres of pre-commercial thin in connectivity corridors associated with harvest
- 880 acres of pre-commercial thin outside harvest areas
- 0 acres of pre-commercial thin in connectivity corridors outside harvest areas
- 13,990 acres of burn/fuel treatment within mechanically treated units
- 10,780 acres of prescribed fire outside mechanically treated units
- The overstocked stands that are thinned will respond over several years, adding more crown area and increasing individual tree growth.

This alternative treats more of the stands identified as needing treatment to meet the desired condition than the other alternatives. The stands selected for treatment are 57% of the total area identified that is in need of treatment. This is an increase over Alternative 2, which treats about 50% of the stands in need of treatment. The stands not treated would have the same effects as discussed for the No Action alternative.

Desired Condition

Alternative 5 would mechanically treat about 15% more acres than Alternative 2. In addition, the amount of thinning in connectivity corridors is greatly reduced from the recommended action, with the effect that growth will be increased, and time to grow to the next structural stage will be shorter with this alternative. The effects of the increase in the amount of understory removal will be increased over that of the recommended action.

This alternative thins about the same amount as Alternative 2. Thinned stands would respond by increasing their crowns and roots, increasing their ability to utilize nutrients and water. Growth would increase and the trees would grow into old forest structural stages sooner. The increased vigor of the trees would decrease their susceptibility to disturbance from insects, disease, and fire; and lessen the likelihood and potential severity of catastrophic disturbance events. The overall resiliency to natural disturbances would be increased.

The increased tree growth would cause the development of old forest structural stages to accelerate, decreasing the time until the trees grew into the large size classes. Stands would be resilient to disturbance and would not be "reset" to earlier structural stages by disturbances, enabling them to continue to grow into large trees. Disturbances would be closer to the historic scale.

Alternative 5 would increase the thinning/shelterwood treatment by approximately 910 acres, and increase understory removal on an additional 340 acres. The effects for this alternative would be similar to the recommended action, with an approximate 30% increase in the benefit from the additional degree of thinning and removal of late seral species and the increased understory removal.

Removing late seral species from stands, retaining the early seral species that are there, and reforesting openings with early seral species will shift the species composition closer to the historic composition. Treated stands would be more adapted to the natural disturbances that exist, increasing the overall resiliency to natural disturbances. Resilient stands would decrease the risk that disturbance would "reset" the stands to earlier structural stages, enabling them to continue to grow into large trees. Disturbances would be closer to the historic scale.

Stands treated would be, or would be growing towards, the Historical Range of Variability (HRV) for stand structure and composition.

This alternative comes the closest to meeting the Desired Condition of all of the alternatives. It harvests the most areas in need of species conversion and thins most stands to the desired density. The few thinning treatments in connectivity corridors that are in this alternative will improve stand conditions somewhat, but not to the degree as the standard thinning treatments. It is anticipated that an additional thinning will be necessary to maintain the stands in good condition. If not thinned again in the future, growth will slow and it would take an additional 20 years to reach the old forest structural stage.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. Development of old forest stand structures in the thinned stands, with the increased growth rates will take about 50 years. There is a decreasing risk of uncharacteristically severe wildfire that would set back structural stage development, both for the treated stands and surrounding stands.

Table 137—Effects of Alt. 5 Treatments on Dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
Existing	5%	42%	3%	7%	30%	1%	12%
10	5%	43%	2%	17%	20%	5%	8%
50	5%	21%	2%	7%	20%	28%	17%
75	5%	20%	2%	7%	20%	29%	17%
125	5%	20%	2%	7%	20%	38%	8%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Table 138—Effects of Alt. 5 Treatments on Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	10-30%	5-10%	10-20%	10-20%	10-20%	5-15%	15-40%
Existing	6%	6%	4%	6%	39%	5%	34%
10	6%	6%	4%	11%	34%	6%	33%
50	6%	4%	4%	6%	34%	8%	38%
75	6%	4%	4%	6%	34%	8%	38%
125	6%	4%	4%	6%	34%	12%	34%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Aspen

The effects of this alternative would be similar to the effects described in Alternative 2 (Recommended Action, see page, 269), since both alternatives would treat the aspen stands to the same degree.

Understory Vegetation

The effects of this alternative would be similar to the Recommended Action, but to a proportionately larger degree since more stands would be treated.

Resiliency and Sustainability

Approximately 59% of the area diagnosed for treatment is recommended for thinning and regeneration. Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. This alternative treats about 20% more area than the Recommended Action. Thinned ponderosa pine stands will increase in growth and vigor as the stand density is reduced, with more stands thinned to the optimal stocking level. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. This alternative treats approximately 50% more of the mixed conifer stands with the species conversion prescription than the Recommended Action. Treated stands will be more vigorous growing due to stocking level control, and the increased percentage of early seral species will be more resistant to insects, disease, and fire damage. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water.

Insect Risk

The amount of bark beetle damage in ponderosa pine stands would be reduced by approximately 25% from the Recommended Action. This would be due to the increased use of the standard thinning rather than the

modified thinning prescription. The host tree species for spruce budworm, tussock moth, and fir engraved will be reduced more than in the Recommended Action. Experience has shown that when late seral species make up less than 25% of the stand composition, defoliation is very light with little effect to tree growth or survival. The incidence of fir engraver would also be reduced as the proportion of fir is reduced, and the remaining fir trees would be healthier and less susceptible to attacks. Stands not treated would benefit from the reduction of host species in nearby stands, which would lessen the severity and size of outbreaks.

Disease Risk

Stem and root diseases will be reduced to a greater degree than the Recommended Action since about 35% more of the area will be treated to reduce the primary host (late seral species). The removal of late seral species during the thinning operations will reduce the amount of trees susceptible to root diseases. Eventually allowing the disease to fade to a minor role in the forest. Thinning will increase height growth rates which will allow the remaining trees to outgrow dwarf mistletoe infections, gradually decreasing the amount of crown infected. The increased spacing will reduce the lateral spread of mistletoe.

Fire Hazard and Risk

The hazard of stand replacing fire will be diminished on more acres and to a greater degree, compared to the Recommended Action. The amount of mechanical treatment is increased and the amount of burning is the same as the Recommended Action.

The crown fire hazard is reduced by 26 percent and that is 4 percent more effective than Alternative 2. Otherwise, the effects are similar to those described for Alternative 2.

Alternative 5 reduces the area in high crown hazard risk from 66% to 40% for the Dry Forest. This alternative reduces the area in high crown hazard risk from 60% to 54% for the Moist Forest. A stand replacing event is least likely with this alternative because the stand conditions that reduce fire behavior are improved the most.

As shown in Table 19, the primary fuel models present are fuel model 9 (timber with loosely compacted litter) for the Dry Forest and fuel model 10 (timber with heavy litter) in the Moist Forest. The amount of area with fuel model 9 increases by 6% from the no action alternative due to the prescribed burning of areas with older activity created slash. The area in fuel model 10 decreases by 9% and an increase of 7% in fuel model 5 (short shrub) which has a much lower spread rate and intensity. There is a 3% increase in fuel model 2 as a result of the under story removal treatments which leave large trees with a light under story more typical of conditions that existed prior to fire exclusion. The other stand treatments in the Dry Forest do not reduce tree stocking levels enough to result in fuel model 2. Fuel model 11 (activity slash) is temporarily increased to 14 % until prescribed burning reduces it to 3%. Fuel model 13, which represents the blow down of timber in Vincent Creek, is eliminated through treatment.

Like Alternative 2, Alternative 5 treats all sub watersheds, except for Granite Boulder, to reduce the crown fire hazard in large enough areas to help prevent crown fires and to allow crown fires from adjacent untreated areas to drop back to the ground. Crown fire hazard would be reduced by 26 percent and that is four percent more effective than Alternative 2. Otherwise, the effects are the same as described for Alternative 2.

Table 139—Percentage of Crown Fire Hazard by Forest Type

CROWN FIRE HAZARD	DRY FOREST	MOIST FOREST	LODGEPOLE FOREST	COLD FOREST
High Existing	66%	60%	98%	84%
High Alternative 5	40%	54%	2%	84%

Wildfire Risk at the Watershed Scale

The effects of Alternative 5 would be to a greater degree than Alternative 2 since it treats more acres. Similar projects are recommended , or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated much more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 10 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 8 percent. Prescribed burning treatments outside mechanically treated units would be about 17 percent of the watershed which is about 1% less than Alternative 2 but would be more than made up by the increase of mechanical treated acres that are also to be prescribed burned. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of about 34 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 5 would have 4 percent less of the watershed, or about 5100 acres, with a high crown fire hazard so it is the most effective alternative for reducing the threat of large fires. The wildfires would be lighter in severity and safer to suppress over the treated areas. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. . This alternative will reduce the need to use mechanical treatment in the future for fuels reduction more than the other alternatives.

Public Safety and Property

Alternative 5 provides more hazard reduction than Alternative 2 does in the area south of the Middle Fork, reducing more of the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

Alternative 5 provides the same degree of fire hazard reduction as Alternative 2 does in the upper Vinegar Creek area. This alternative would treat the high fire hazard area that was the result of the 1998 blow down area by salvaging the wind thrown timber. The high hazard of a catastrophic fire destroying the private property and structures in the vicinity of the town site of Greenhorn would be greatly reduced.

Air Quality

The effects are similar to Alternative 2, except the amount of area treated is approximately 16% more than that treated by Alternative 2. Therefore, the air quality benefit of Alternative 5 is expected to be 16% more than that provided by Alternative 2.

4.2.6 TREATMENT OBJECTIVES FOR DEGRADED WILDLIFE CONDITIONS

*Terrestrial wildlife habitat is currently degraded or missing essential components because of past activities. See **1.2.2.6 Desired Condition: Wildlife Habitat**, page 27;and **3.2.6 Wildlife Habitat**165.*

Table 140 HRV;

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists to enhance and improve certain wildlife habitat components within the project area in order to provide habitat needs for viable populations of TES, MIS, and SOI.	By implementing aquatic, vegetation and infrastructure projects, needed wildlife habitat components would exist across the project area in a resilient, dispersed, and diverse condition allowing for viable populations of many TES, MIS, and SOI.

4.2.6.1—TES SPECIES, MIS AND SOI

The following section discusses effects to Threatened, Endangered and Sensitive (TES) species, Management Indicator Species(MIS), and Species of Interest (SOI). See 3.2.6 Wildlife Habitat, page 165, for habitat conditions and needs for specific wildlife species. 3.2.6.4—Habitat Summary Tables, page 193 grouped species by Forest type and structural stage (e.g., Dry Forest OFMS). This analysis assumes that Forest type/structural stage equates to habitat types. This section will disclose effects by habitat type. For species-specific detail on TES species, see the Wildlife Biological Evaluation in Appendix B.

4.2.6.1.1—ALTERNATIVE 1

Dry Forests

The no action alternative would result in little change in the existing condition of Dry Forest habitats in the short-term (0-10 years). Although stand densities would continue to increase, stand structure would remain relatively similar to that displayed in Table 107 Relationship of Dry Forests to Wildlife Habitats and Existing Condition, page 194. In the short- and mid-term (0-25 years), dead wood habitats would likely increase. Stands currently classified as OFMS growth could change to YFMS if large diameter trees succumb to insects or diseases. Other structural stages would see little change even in the mid-term.

Approximately 57% of Dry Forest stands are identified as moderate to high risk for stocking induced mortality and/or related infestation of pests or diseases. Without vegetation management and the controlled re-introduction of fire, stands that are heavily overstocked and stressed would remain highly vulnerable to insect outbreaks and disease. Increased tree mortality would be expected. Species such as the pileated woodpecker and pine marten, would benefit from the increased stand density and dead wood habitat. Northern goshawk populations would be maintained. Populations of primary cavity excavators would increase with the increased availability of dead wood habitat. Species most likely to benefit include hairy, downy and black-backed woodpeckers. Higher stand densities would delay the development of large tree structure in YFMS, SEOC, SECC and UR stands. Blue grouse winter roost habitat would continue to improve as Douglas-fir dwarf mistletoe continues to spread. Connectivity/corridor habitat would continue to improve and expand, as multi-stratum structure condition increases across this Forest type.

Improvements to the above habitats would come at a risk. With the increased stand densities and resulting accumulations of dead and diseased trees and down logs, risk of high intensity stand replacement wildfire also increases. Stand replacement wildfires do not reflect the historic fire regime of these Forest types.

The large-scale loss of forested habitat could result from such a fire, impacting the species identified above. Populations would be displaced, forced to move to other areas.

The white-headed woodpecker is heavily dependant upon the presence of open-park like mature ponderosa pine habitat. Historically, 30 to 55% of the Dry Forest types were in stands of OFSS. Today, only 1% of these forest types are classified as OFSS. This alternative would not develop OFSS habitats. OFMS stands would not be entered and converted back to OFSS structure. YFMS, SEOC, SECC and UR stands would not be entered and managed towards OFSS. Fire is an important natural disturbance that historically helped develop and shape OFSS structure. Under the no action alternative, fire would not be reintroduced into the system. Fires caused by lightning would be suppressed. This deficiency in OFSS habitat is likely adversely affecting the populations and viability of white-headed woodpeckers within the project area. Other species, such as the Lewis's woodpecker, flammulated owl and some neotropical migrant birds dependent upon these open pine habitats, would be similarly impacted.

Cumulatively, across the Middle Fork John Day subbasin, development of OFSS stand structures would likely occur as timber sale and prescribed burning activities are implemented elsewhere (See Appendix C—Projects Considered for Cumulative Effects). Harvest and burning activities in the Dry Forests types would benefit species such as the white-headed woodpecker, and contribute to overall viability of the populations. Distribution of populations would remain poor, however, as much of Southeast Galena goes untreated.

Moist Forests

The no action alternative would result in little change in the existing condition of Moist Forest habitats in the short- to mid-term (0-25 years) or long-term (25+ years). Stand structure would remain relatively similar to that displayed in Table 108 Relationship of Moist Forests to Wildlife Habitats and Existing Condition, page 196. Dead wood habitat would likely remain at current levels.

High stand densities within the OFMS and YFMS stand structures would maintain high quality habitat for the pileated woodpecker, pine marten, Canada lynx, and Pacifc fisher. Insect and disease activity will continue to replace dead wood habitat over time, maintaining nesting, denning and/or foraging habitat for these species. In particular, the OFMS structure habitats would provide excellent habitat conditions with an abundance of large trees, providing a continued supply of the dead wood habitat favored by these species. Other primary cavity excavators would benefit as well to the presence and higher densities of dead wood habitats that would be created over time. Large snag and downed wood densities likely occur at levels that provide for 100% of the potential population levels of most primary excavator species. Northern goshawk nesting habitat would remain secondary to higher quality Dry Forest habitats, but with the presence of complex stand structure and a large tree component for nest sites, these areas would likely provide alternative nesting areas that would be used. Generally, the Moist Forest types with their higher tree densities, would continue to provide good connectivity habitat.

Blue grouse winter roost habitat would continue to improve as Douglas-fir dwarf mistletoe continues to spread.

One drawback to the no action alternative would be the delay in development of large tree structure within middle- and younger-aged stands (YFMS, SECC, UR). Reduced tree growth rates would delay the development of large diameter trees, i.e., those greater than 21" dbh, and consequently reduce the number of larger trees available for snag creation. This could potentially impact the density and distribution of primary cavity excavators and pine martens, 25 years and later. Nearly 60% of the Moist Forest types are in a condition that is deficient in a large tree component.

With the increased stand densities and accumulation of dead snags and downed logs, risk of large-scale, stand replacement wildfire would remain high. For several wildlife species, such as the black-backed and three-toed woodpeckers, such a fire would result in high quality habitat for 1 to 25 years following the disturbance, then very little habitat until large trees are reestablished. Such fires would create an excessive short term abundance of snags that would be used for nesting and foraging. Research indicates both

species respond favorably with increases in population densities following such fires (Knotts 1998). Other species such as pine marten, pileated woodpecker, northern goshawk, Canada lynx and Pacific fisher, however, would be adversely affected by such a disturbance. Stand replacement wildfire would remove much of the forest cover and stand structure required by these species. This is not necessarily a negative habitat condition when disturbances are within the Historic Range of Variability, however recent fires have been much larger and with a higher percentage of stand replacement fire. These species would be required to find habitats outside the burned areas. Distribution of populations would remain poor, however, as much of Southeast Galena goes untreated.

Cumulatively, effects across the Middle Fork John Day sub basin would be similar to those expected in the Southeast Galena project area. Most management activities on the Forest are focusing on Dry Forest and riparian habitat restoration, with only a low amount of activity taking place in the Moist Forest types (see Appendix C-Projects Considered for Cumulative Effects). Habitat conditions for species associated with the Moist Forest types would remain good.

Lodgepole Pine Forests

The lodgepole type, at 1,100 acres, is poorly represented in the Southeast Galena project area. Lodgepole types would continue to contribute habitat for species such as pine marten, three-toed woodpecker, black-backed woodpecker, Canada lynx, and Pacific fisher, but the majority of the habitat needs would be met in the Moist and Cold Forest types. Habitat is probably better provided in stand mixes where lodgepole is seral to other tree species or where there is a epidemic increase in bark beetle populations that result from fires or blowdown events.

The no action alternative would result in little change in existing condition of lodgepole pine forest habitats in the mid-term (5-25 years) or long-term (25+ years). Stand structure would remain relatively similar to that displayed in Table 109 — Relationship of Lodgepole Pine Forests to Wildlife Habitats and Existing Condition, page 197. Currently 180 acres (12%) of lodgepole pine habitat is in an OFMS condition. Over time, an even flow of structural stages should be maintained as YFMS, UR and SEOC habitats mature into OFMS and existing OFMS habitats deteriorate into UR and possibly SI structures as a result of insect and disease outbreaks and possible stand replacement fire events.

Cumulatively, effects across the Middle Fork John Day subbasin would be similar to those expected in the Southeast Galena project area. Most management activities on the Forest are focusing on Dry Forest and riparian habitat restoration, with only a low amount of activity taking place in the Lodgepole Forest types (see Appendix C-Projects Considered for Cumulative Effects). Habitat conditions for species associated with the Lodgepole Forest types would remain good.

Cold Forests

Stand structure would remain relatively similar to that displayed in Table 110 Relationship of Cold Forests to Wildlife Habitats and Existing Condition, page 199. Effects would be similar to those described for the Moist Forest types. Although there are differences between these two Forest types, they do provide habitat needs for many of the same wildlife species. Possibly, the northern goshawk may be the only species that would be rarely found in the Cold Forest types.

Riparian Hardwood Shrubs and Trees

Alternative 1 forgoes the option to plant and protect riparian hardwood shrubs and trees. The quantity and vigor shrubs would continue to decline as overstory shading and competition for water and nutrients increases. Natural or accidentally induced fires would likely be suppressed and in most instances held to a few acres. Historically frequent, low intensity fires recycled nutrients and invigorated many shrub species. The continued absence of these fires would continue to contribute to the decline in species' health and

vigor. 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 watershed within 25 years. All aspen sites may be gone within 100 years. Red-naped sapsucker, Williamson's sapsucker, Lewis' woodpecker and downy woodpecker are several species likely to be adversely affected by the decline in hardwood vegetation.

Cumulatively, across the Middle Fork John Day subbasin, efforts are being taken to improve riparian habitat. Hardwood planting and protection is being implemented along many stream reaches (see Appendix C-Projects Considered for Cumulative Effects). Most wildlife species disproportionately utilize riparian areas more than any other type of habitat (Thomas 1979). Although management would be improving conditions in RHCAs across the subbasin, static or declining riparian conditions in Southeast Galena would have effects on species that depend upon these habitats.

TES Species—Alternatives 2 thru 5

Forest structure and species composition would change immediately following recommended timber harvest and prescribed burning activities. Habitat conditions would be modified accordingly. The majority or recommended treatments occur in the Dry Forest types (see Table 141), followed by the Moist Forest types. Effects to wildlife species that depend on these two Forest types are described below. No timber harvest or burning activities would be recommended in Cold Forest types or Lodgepole Forest types under any action alternative. Effects on wildlife that use these two Forest types would be as described for Alternative 1 – No action.

Table 141 Acres of harvest treatment by forest type and alternative. The table also displays % of total treatment acres in each forest type.

FOREST TYPE	TOTAL ACRES IN FOREST TYPE	# OF TREATMENT ACRES (% OF TOTAL TREATMENT ACRES)			
		ALT. 2	ALT. 3	ALT. 4	ALT. 5
Dry Forest	29,000	9,700 (91%)	7,470 (91%)	2,460 (90%)	11,120 (91%)
Moist Forest	11,500	940 (9%)	740 (9%)	270 (10%)	1,100 (9%)
Lodgepole Forest	1,100	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Cold Forest	2,000	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total Acres	43,600	10,640 (100%)	8,210 (100%)	2,730 (100%)	12,220 (100%)

Dry Forests

Table 142 Percentage of Dry Forest type treated by silvicultural prescription by alternative.

TREATMENT	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Dry Forest (29,000 acres)				
Commercial. Thinning (HTH)	14.7%	10.9%		15.8%
Comm. Thin & Pre-commercial Thin (HTH/SPC)	4.6%	3.7%		6.5%
Comm. Thin in Connectivity Corridors (HTH-1)	1.8%	1.0%		0.5%
Comm. Thin & Pre-commercial. Thin in Connectivity Corridors. (HTH-1/SPC-1)	2.6%	2.1%		.1
Understory Removal (HUR)	3.0%	0.8%		4.0%
Shelterwood (HSH)	4.8%	3.3%		9.3%
Salvage (HSV)	0.2%	0.2%		0.2%
Pre-commercial Thinning (SPC)	2.0%	2.1%	6.2%	2.4%
Pre-commercial Thin in Connectivity Corridors (SPC-1)	0.3%	0.4%	2.1%	
Total Treatment	35.0%	24.5%	8.3%	40.0%
No Treatment (HNT)	65.0%	75.5%	91.7%	60.0%

Commercial and/or Pre-commercial Thinning Treatments (HTH, HTH1, SPC, SPC1, see pages 59, 59, and 64)

Stands are recommended for OFSS development. Treatment would be in stands classified as YFMS, UR, SEOC, and SECC structural stages. Ponderosa pine, Douglas-fir and western larch would be favored for retention over grand fir and lodgepole pine. Stand densities would be reduced to decrease fire, insect and disease risk. Tree growth would be increased to reduce the time it takes to grow large diameter trees.

In the short-term (0-5 years), the most substantial change to habitat would be a reduction in canopy closure and stand densities, simplifying stand structure. In many instances, treatment would push stands back to an earlier structural stage (e.g., YFMS would be converted to SEOC).

These changes could potentially affect species that rely on dense, multi-stratum stand conditions for nesting habitat. Many of the stands in YFMS structure condition are currently in cover conditions that would be useful as nesting habitat to woodpeckers, and to a much lesser degree, northern goshawks. With the recommended treatments, crown closures would be reduced 5 to 25%. Such reductions in cover would likely reduce the effectiveness of these stands for nesting habitat.

Forage habitat for these species would be less impacted. While the reduction in canopy closure and stand densities could potentially make feeding woodpeckers more vulnerable to predators, changes in feeding behavior and use of these harvested stands would likely be minimal and difficult to detect. Conversely, goshawk feeding habitat would likely improve. More open stand conditions would create foraging habitat that would permit this raptor to detect and acquire prey more efficiently.

Dead wood habitats would be maintained near existing stand conditions. Because of the existing structure and lack of large trees, dead wood habitat is generally smaller, averaging 8-15" dbh. These habitats, however, would continue to provide foraging habitat for primary cavity excavators. The intensity of the different alternatives varies, with alternative 5 having the greatest impact on YFMS habitats followed by alternatives 2, 3 and 4 in decreasing order of impact.

Pine martens using the higher density YFMS habitats, would be adversely impacted by these treatments. Pre-commercial thinning would result in impacts to the density of ground level vegetation and its effectiveness as cover for this species. Denser understory development is important to the security of the species from predation, as well as its ability to successfully hunt and find prey (Ruggiero et al. 1994). While dead wood habitats would remain relatively unchanged, and continue to provide habitat for the marten, the loss of vegetation cover may be enough to limit or prevent use of treated habitats. Denning and foraging habitat would be degraded or likely lost.

Potential impacts are likely limited to YFMS in the *warmer* Dry Forest types, i.e., those with a high grand fir component. Stands in the *hotter* Dry Forest types and those in the UR, SEOC, and SECC structural stages probably provide minimal habitat for pileated woodpeckers or pine martens. It is important to note that even in the YFMS grand fir types, overall quality of habitat varies, and none contain the higher densities of large tree live and dead wood habitats that are preferred by pileated woodpeckers or pine martens. These conditions result in less than ideal, and possibly less likely used, habitats. The amount of nesting and denning habitat would be reduced, and could potentially affect the number of breeding pairs and territories that the project area could support.

There is the potential to create some much needed, and currently absent, habitats for several species. The treatments recommended would lay the groundwork for restoring OFSS ponderosa pine and mixed conifer stands across the landscape. OFSS was a habitat condition that was historically present and abundant within the project area. The loss of habitat has likely affected the viability of the white-headed woodpecker, a MIS that is greatly dependent upon these open, mature ponderosa pine habitats. Likewise, the Lewis' woodpecker, flammulated owl, various neotropical migrant birds, and other open habitat dependent species have been adversely affected by the loss OFSS stands. Treated stands would not be immediately converted to OFSS due to the deficiency in large diameter trees. However, thinning would accelerate development of large diameter trees. Stands currently in YFMS structure would likely develop into OFSS in

25 years. Stands currently in UR, SEOC or SECC would likely take 50 or more years to develop into OFSS. An OFSS structural stage could be reached more rapidly than under a no treatment scenario.

Understory Removal (HUR, see page 62)

Stands are recommended for OFSS development. Treatment would be in stands classified as OFMS and YFMS that were historically classified as OFSS. Alternatives 2, 3, 4 and 5 respectively treat 435, 233, 20 and 457 acres of OFMS. Understory removal of smaller diameter trees, usually late seral species such as grand fir, which have grown in underneath large, early seral species trees such as ponderosa pine. The objective is to convert these stands from OFMS to OFSS or YFMS to SEOC and to create conditions where fire can be reintroduced as a natural ecosystem component.

In OFMS stands, treatment would degrade habitat for such species as pileated woodpecker and pine marten while improving it for species such as the white-headed woodpecker and flammulated owl. Again, these stands may be providing only secondary habitat for pileated woodpeckers and pine martens because of the deficiency in large snags and downed wood. Treatment may degrade or eliminate nesting habitat for pileated woodpeckers, but would still provide foraging habitat. Both denning and foraging habitat may be eliminated for pine marten. For northern goshawks, harvest would likely degrade nesting but improve foraging habitat. Without treatment these stands remain high risk to wildfire or insect outbreaks that could kill large, older trees and reduce canopy cover. White-headed woodpeckers would benefit greatly from this treatment. The large tree component is already intact, and stand structure would be restored to the open, park-like condition this species prefers. Following harvest treatment, prescribed fire could be used to replicate natural fire regimes and maintain these stands in OFSS condition.

YFMS stands are deficient in the number of large diameter trees required for old growth classification; rather then developing naturally, these stands were originally classified as OFSS and timber harvest removed a portion of the large diameter trees. Fire suppression permitted establishment of understory trees to create the multiple story structure. Conversion of these stands from YFMS to SEOC would accelerate the development of OFSS. OFSS would be expected to develop in approximately 25 years.

Shelterwood Harvest (HSH, see page 60)

Stands are recommended for regeneration and species conversion (i.e., ponderosa pine, western larch and Douglas-fir favored over grand fir). Shelterwood harvest would be applied in a mosaic within each stand. Where high proportions of grand fir exist, harvest would reduce tree stocking to 15 to 20 trees per acre and created openings would be planted with early seral species. Where high proportions of ponderosa pine exist, treatment would resemble a commercial thin and planting would be unnecessary. The objective is to convert these stands from a majority of late-seral species to a majority of early-seral species that are resilient to fire, and insect disturbances.

All stands recommended for treatment are in the SECC structural stage. Treatment would convert these stands to SEOC, UR or SI depending on the proportion of late seral versus early seral species, and the amount of planting required. If the majority of a stand is occupied by grand fir, the post-harvest structure would likely be SI. Because SECC stands are relatively young and even-aged, habitat for late and old growth-species is already fairly limited. Often the grand fir trees are of smaller diameter and highly damaged from insect, disease or suppression. Stands probably provide marginal foraging habitat for woodpecker species.

Harvest would substantially reduce canopy closure and stand density. With the woodpecker species, reduction of cover would result in reduced security from predation, primarily from raptors. Existing dead wood habitats would be maintained; however, with the reduced canopy cover and protection, overall use would decrease. Goshawks would continue to use these habitats for foraging needs, with the opening of canopies possibly benefiting this species. The more open canopy conditions may allow hunting goshawks to be more effective in finding and acquiring prey. Sufficient large diameter trees would be retained to provide a continuous supply of snags and downed wood over time. Stands would likely take 75 to 100 years to develop into OFSS.

Salvage Harvest (HSV see page 62)

Salvage harvest would remove trees blown down in a 1998 windstorm. Salvage would occur on about 60 acres. Recommended harvest units likely classified as OFMS or YFMS prior to the blowdown event; the storm converted these stands to SI. Overstory cover has been essentially eliminated. Nesting/denning habitat no longer exists for canopy dependent species like pileated woodpecker and pine marten. In portions of the blowdown area, the understory is still intact, and likely providing forage habitat. In general, the blowdown event increased foraging habitat for woodpeckers. Three-toed and black-backed woodpeckers, in particular, respond to the increased bark beetle populations associated with these kinds of disturbances. Alternatives 2, 3 and 5 implement salvage harvest; alternative 4 does not. In the salvage unit, untreated patches, 2 to 5 acres in size, would be retained to provide future denning habitat for lynx. Down log accumulations would still remain well above *Land and Resource Management Plan* standards. Salvage and planting would restore vegetation.

Prescribed fire (FBR see page70)—Underburning

Prescribed underburning can alter or remove vertical and horizontal stand structure including snags and down wood. Snags can be both lost and recruited during prescribed burning. The level of loss and replacement is dependent on fire intensity, time of year, local weather conditions, and fuel load. In Southeast Galena, effects to existing dead wood habitats would be expected to be minimal. Snag habitats are already extremely deficient/non-existent throughout most of the recommended burning areas. Past timber harvest, and to a lesser degree, firewood cutting has created this snag-deficient condition. Likewise, down wood habitats are also severely lacking.

Prescribed fires would be expected to burn relatively cool, move slowly, and burn in a mosaic of burned and unburned patches. There is a potential for existing snags to burn through and fall. For ground-based operations, mitigation would require that ignition be avoided within 100 feet of snags 15 inches to 20 inches dbh. Greater protection would be given to trees 21 inches dbh and greater. Helicopter ignitions do not allow such control; if used, sites would need to be monitored to ensure that *Land and Resource Management Plan* standards for snags are being met. Existing down wood would likely be charred. Fires will be kept at a low enough intensity to meet *Land and Resource Management Plan* Amendment 2 standards. Tree mortality directly from the implemented burns, and indirectly from subsequent insect attacks, will likely result in the creation of new snags. Fire would be expected to cause localized single or clumped tree mortality. Although burning prescriptions would permit killing as many as 10% of the dominant and co-dominant trees, recent prescribed burning on the District has not generated these mortality levels. Fire-induced mortality could help offset snags lost during harvest and post-harvest burning. This “snag exchange” may even increase local woodpecker viability if fire created snag recruitment exceeds losses.

Many species tend to have no adverse response to burning nor avoid burned areas (Smith 2000). Research found that prescribed fire does not affect the abundance of birds using the burn area, but burning did alter species composition. Some species, including black-backed, three-toed woodpeckers and Lewis' woodpeckers may increase their use of the area after burning, depending on the intensity of the burn and the resultant mortality. Black-backed and three-toed woodpeckers, in particular, have been shown to respond favorably to these small pulses in snag creation (Knotts 1998). Hairy and downy woodpeckers also show a positive correlation with burning. The influx in woodpecker species 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.

Prescribed burning activities would likely change ground level and lower canopy vegetation structures. Such activities have the potential to affect security/hiding cover for big game species (see deer and elk discussion later in section), wide-ranging carnivores, and smaller mammals. Such change could also affect nesting habitat of ground or near-ground nesting birds, including neotropical migrant species, particularly if burning is conducted during the nesting season. Burning operations could destroy nests or prevent adults from caring for their young. Corridor or connectivity habitat could be affected with loss of security cover.

Understory tree mortality would vary considerably from 10% to 85%. In the southern half of the District, two large-scale prescribed fires (the Antelope and Spion prescribed burns) were conducted within the last five years; both burns appeared to kill less than 5% of the overstory and understory trees. The actual level of impact to security and nesting cover is unknown, although a considerable number of acres would be impacted by these treatments (10,640 to 17,230 acres, depending upon the alternative). Treatments would not all occur in one year; rather they would be implemented over a 10-year period, allowing ground vegetation to recover in some areas before other areas are even burned. Prescribed burning would occur only in Dry Forest types, in areas that historically had relatively low levels of ground and low-canopy structures.

Prescribed burning in combination with harvest treatments recommended for OFSS development would enhance habitat for species which prefer open park-like stands of large diameter trees, including white-headed woodpeckers, Lewis' woodpeckers, and various neotropical migrant birds. The combination of harvest and prescribed fire would help restore historic high frequency/low intensity fire regimes to these Dry Forest types. Prescribed fire was a key feature in creating and maintaining habitat for these species.

Prescribed Fire—Harvest Unit Treatment

In HUR, HTH, HTH1, SPC and SPC1 units, either prescribed underburning or hand pile burning would be used to treat activity fuels created by the recommended harvest treatments. In HSV units, hand pile burning would be used. In HSH units, sites may be prepared for planting via a combination of diseased and damaged tree removal and broadcast burning. Effects associated with underburning were described in the preceding paragraphs. Effects for hand pile burning and broadcast burning are described below.

For hand pile burning, potential effects relate to impacts to down wood densities and impacts to small mammals that may use hand piles for denning or other habitat uses. Materials treated by hand piling activities are generally smaller in diameter, usually smaller than 12" diameter (minimum diameters required for downed wood to be considered for wildlife habitat), and are usually composed of limbs and boughs of the felled trees. In and of themselves, their usefulness as wildlife habitat is minimal. Burning occurs primarily in the winter, when the piles are lit when snow is on the ground. This prevents spread of fire beyond the pile itself. As a result, the potential for impact upon the remaining larger pieces of down wood is minimal if non-existent. Forest rodents will regularly use piles for dens and nests during the year. These "habitats" often replace the deficiencies in down wood habitats that occur throughout project area. Mitigation can be implemented to prevent these impacts, such as burning the piles as soon as possible after piling operations are complete to minimize the number of piles that are inhabited by rodents. Overall impact of burning the piles would be limited to the individuals affected and would not impact species viability across the project area.

Broadcast burning for site preparation is a more intensive treatment. Prior to burning, all undesirable diseased and damage trees are felled. Small diameter grand fir trees are usually felled regardless of their condition. Recall that the objective of shelterwood treatments is to convert stands back to seral species such as ponderosa pine, western larch and Douglas-fir. Burns are controlled to meet *Land and Resource Management Plan* standards for large down logs including charring limits. Burning would reduce most of the downed wood less than 12" dbh. These treatments typically eliminate all thermal and hiding cover. Stands are converted to the UR or SI structural stage. Habitat would be provided for wildlife species which thrive under early seral or open forest conditions. Sites would be planted with ponderosa pine, western larch and Douglas-fir following site preparation activities.

Summary—Changes in Structural Stages

The easiest way to summarize alternative effects on wildlife habitat is to review changes in structural stage distribution. Table 143 displays percentage of each structural stage for each alternative. HRV is displayed to indicate desired distribution. Alternative 1 displays the existing structural stages.

Table 143 Dry Forest Structural Stage Distribution by Alternative

ALTERNATIVE	PERCENTAGE OF FOREST TYPE (TOTAL ACRES = 29,000)						
	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV Range	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
1 – *Existing*	5%	42%	3%	7%	30%	1%	12%
2	5%	43%	2%	13%	24%	4%	9%
3	5%	42%	3%	11%	26%	2%	11%
4	5%	42%	3%	9%	28%	1%	12%
5	5%	43%	2%	17%	20%	5%	8%

YFMS is noticeably reduced, particularly in Alternatives 2 and 5. Treatment would convert most of these stands to SEOC and UR structural stages. Habitat would be degraded or lost for species that prefer high canopy cover and complex structure stands, e.g., pileated woodpecker and pine marten. There are three relatively large, contiguous blocks of YFMS that may be providing sufficient habitat to support reproducing pairs of these species. Two blocks in the Little Boulder/Deerhorn and Vinegar Creek Subwatersheds are each about 1,200 acres in size, although the block in Vinegar Creek is more fragmented. A third block of YFMS, 600 acres in size, is in the Butte Subwatershed. These YFMS blocks are not considered the highest quality habitat for these species. They are in Dry Forest types, are not OFMS, likely have reduced canopy closure, have had past harvest, and are likely deficient in dead wood habitat. The two larger blocks of habitat are on the high end of estimated range sizes for pileated woodpecker (900 acres) and pine marten (1,400 acres). Because of the reduced quality of these habitats, larger home ranges would likely be required to support reproducing pairs. Elsewhere, smaller existing YFMS blocks are found along the periphery of larger contiguous blocks of OFMS, and probably provide foraging habitat for reproducing pairs in the OFMS blocks.

Alternatives 2 and 5 essentially convert the entire Little Boulder and Butte blocks from YFMS to SEOC and UR structure, certainly making these blocks unsuitable for nesting or denning. These alternatives also convert about ½ of the Vinegar block to SEOC and UR structure. Consequently, implementation of alternatives 2 and 5 would potentially reduce the project area carrying capacity by one to three reproducing pairs each of pileated woodpeckers and pine martens. Alternative 3 and 4 would not treat vegetation as aggressively as alternatives 2 and 5. Alternative 3 converts ½ or less of each of these large blocks to SEOC and UR structure; implementation would potentially reduce the project carrying capacity by one to two reproducing pairs for each of these species. Alternative 4 fragments the Little Boulder and Vinegar blocks, but does not enter the Butte block; implementation would possibly reduce carrying capacity by one reproducing pair for each species. Although all action alternatives enter additional smaller blocks of YFMS structure, many of these habitat blocks are isolated or heavily fragmented. Where these smaller habitat blocks are adjacent to larger contiguous blocks of OFMS, they may provide additional foraging habitat for a reproducing pair, but treatment is unlikely to exclude animals from a viable home range. Estimates for reductions in reproducing pairs are simply that – an estimate. Accurate density estimates do not exist for these species, although all are known or suspected of occurring within the project area. Population viability for pileated woodpeckers and pine martens would be maintained via the old growth in the Cold and Moist Forest as well as the recommended system of Dedicated Old Growth, Replacement Old Growth, and Pileated Woodpecker Feeding Areas, as prescribed by the *Land and Resource Management Plan*.

Alternatives were specifically designed to create habitat for the white-headed woodpecker and other species that prefer open park-like stands of old growth, even at the expense of habitat for species like the pileated woodpecker and pine marten. In Table 143, conversion of OFMS to OFSS is reflected in the percentage changes in these two structural stages. Alternative 5 would convert the most acres from OFMS to OFSS – i.e., 457 acres. Most treatment blocks are smaller, although one 180+ acre block would be created. Alternatives 2 and 3 convert 435 and 233 acres, respectively. Alternative 4 converts only 20 acres, and consequently does little to enhance white-headed woodpecker habitat.

Following treatment, SEOC and UR stands would support relatively low trees stocking and canopy cover, but individual tree growth rates would be high. Harvest and under-burning would accelerate development of large diameter trees. Stands converted to the SEOC and UR stage would likely take 25 to 50 years to develop into OFSS. Habitat for the white-headed woodpecker and flammulated owl would be substantially increased.

Blue grouse winter roost habitat could potentially be affected by treatments recommended . Thinning in YFMS stands would have the greatest potential for impact, particularly in ponderosa pine/Douglas-fir mixes. Harvest would likely target many of the mistletoe-infected trees, reducing the overall availability of habitat within these stands. However all alternatives have mitigation that requires leaving clumps of mistletoe infected Douglas-fir near ridge tops, reducing the level of impact. Recommended activities will not affect the viability of this species within the project area.

Snags and downed wood would be essentially maintained at existing levels, providing habitat for primary cavity excavators.

Action alternatives, by shifting stand structure from OFMS and YFMS to simpler stand structures would reduce risk of uncharacteristically severe wildlife, insect or disease damage and restore natural disturbance regimes. The risk of losing large blocks of wildlife habitat would be reduced. Alternative 5 reduces the highest risk structural stages, i.e., OFMS, YFMS, and SECC, from 46% to 31%. Alternative 2, 3 and 4 reduces the high risk structural stages from 46% to 34%, 39% and 43%, respectively.

Moist Forests

Table 144 Percentage of Moist Forest type treated by silvicultural prescription and alternative.

TREATMENT	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Moist Forest (11,500 acres)				
Commercial. Thinning (HTH)	1.6%	.7%		1.7%
Comm. Thin & Precommercial Thin (HTH/SPC)	0.8%	0.3%		2.0%
Comm. Thin in Connectivity Corridors (HTH1)	0.3%			0.3%
Comm. Thin & Precommercial. Thin in Connectivity Corridors (HTH1/SPC1)	0.1%			
Understory Removal (HUR)				0.5%
Shelterwood (HSH)	2.7%	2.1%		2.7%
Salvage (HSV)	1.6%	1.6%		1.6%
Precommercial Thinning (SPC)	1.3%	1.3%	2.1%	1.3%
Precommercial Thin in Connectivity Corridors (SPC1)			0.1%	
Total Treatment	8.5%	6.0%	2.2%	10.1%
No Treatment (HNT)	91.5%	94.0%	97.8%	89.9%

Commercial and/or Pre-commercial Thinning Treatments (HTH, HTH1, SPC, SPC1 see pages 59, 59, and 64)

Commercial and pre-commercial thinning in Moist Forest types would have similar effects as described for the Dry Forest types. All treatments occur in YFMS, UR or SECC structured stands. Tree removal would substantially reduce canopy cover in treatment units. In YFMS stands, thinning would reduce the effectiveness of these stands as nesting habitat for pileated woodpeckers and goshawk and as denning habitat for pine marten. Snag and downed log levels would be maintained at existing levels. Treated stands would still provide foraging habitat for primary cavity excavators. Moist Forest types typically have higher dead wood habitats then Dry Forest types.

Shelterwood Harvest (HSH see page 60)

Shelterwood harvest and commercial thinning in Moist Forest types would have similar effects as described for the Dry Forest types.

All stands recommended for treatment are in the YFMS or UR structural stages. Timber harvest would convert these stands to UR or SI depending on the proportion of late seral versus early seral species. Harvest would substantially reduce canopy closure and stand density. Nesting habitat for pileated woodpeckers and goshawks would be eliminated. Because these stands are not in an OFMS condition, they were likely providing marginal nesting habitat at best. Denning habitat for pine martens would be eliminated. With the woodpecker species, reduction of cover would result in reduced security from predation, primarily from raptors. Existing dead wood habitats would be maintained; however, with the reduced canopy cover and protection, overall use would decrease. Goshawks would continue to use these habitats for foraging needs, with the opening of canopies possibly benefiting this species. The more open canopy conditions may allow hunting goshawks to be more affective in finding and acquiring prey. Sufficient large diameter trees would be retained to provide a continuous supply of snags and downed wood over time. Sufficient large diameter trees would be retained to provide a continuous supply of snags and downed wood over time. Stands would likely take 75 to 100 years to develop into OFMS or OFSS.

Understory Removal (HUR see page 62)

One stand in the Moist Forest type is recommended for conversion from OFMS to OFSS, and only in Alternative 5. The stand is 53 acres. Effects would be as discussed for HUR treatments under Dry Forests. Treatment would degrade habitat for such species as pileated woodpecker and pine marten while improving it for species such as the white-headed woodpecker and flammulated owl. Treatment may degrade or eliminate nesting habitat for pileated woodpeckers, but would still provide foraging habitat. Both denning and foraging habitat may be eliminated for pine marten. For northern goshawks, harvest would likely degrade nesting but improve foraging habitat. Without treatment this stand remains high risk to wildfire or insect outbreaks that could kill large, older trees and reduce canopy cover. White-headed woodpeckers would benefit from this treatment. The large tree component is already intact, and stand structure would be restored to the open, park-like condition this species prefers.

Salvage Harvest (HSV see page 62)

Salvage harvest would remove trees blown down in a 1998 windstorm. Salvage would occur on about 180 acres. Recommended harvest units likely classified as OFMS or YFMS prior to the blowdown event; the storm converted these stands to SI. Overstory cover has been essentially eliminated. Nesting and denning habitat no longer exists for canopy dependent species like pileated woodpecker and pine marten. In portions of the blowdown area, the understory is still intact, and likely providing forage habitat for species such as lynx. The blowdown event increased foraging habitat for woodpeckers. Three-toed and black-backed woodpeckers, in particular, respond to the increased bark beetle populations associated with these kinds of disturbances. Alternatives 2, 3 and 5 implement salvage harvest; alternative 4 does not. In the salvage units, untreated patches, 2 to 5 acres in size, would be retained to provide denning habitat for lynx. In Alternatives 2 and 5, additional blowdown would be removed from the outer ½ of RHCAs (72 acres); 50%-80% of the downed logs would be removed from these acres. In both instances, down log accumulations would still remain well above *Land and Resource Management Plan* standards. Salvage and planting would restore vegetation.

Prescribed Fire (FBR see page70) – Underburning

Prescribed underburning would be limited to treating activity fuels created by timber harvest and precommercial thinning (see below). No underburning would be conducted outside harvest units.

Prescribed Fire—Harvest Unit Treatment

Prescribed fire treatments would include underburning, hand pile burning and broadcast burning. Effects would be as described for prescribed burning in Dry Forests.

Summary—Changes in Structural Stages

The easiest way to summarize alternative effects on wildlife habitat is to review changes in structural stage distribution. Table 145 displays percentage of each structural stage for each alternative. Historical Range of Variability (HRV) is displayed to indicate desired distribution. Alternative 1 displays the existing structural stages.

Table 145 Moist Forest Structural Stage Distribution by Alternative

ALTERNATIVE	PERCENTAGE OF FOREST TYPE (TOTAL ACRES = 11,500)						
	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV Range	10-30%	5-10%	10-20%	10-20%	10-20%	5-15%	15-40%
1 – Existing	6%	6%	4%	6%	39%	5%	34%
2	6%	6%	4%	10%	35%	5%	34%
3	6%	6%	4%	9%	36%	5%	34%
4	6%	6%	4%	7%	38%	5%	34%
5	6%	6%	4%	11%	34%	6%	33%

None of the action alternatives have significant effects on Moist Forest types. Even the most aggressive alternative, i.e., alternative 5, treats only 10% of this forest type. The most noticeable effect of the action alternatives would be the conversion of YFMS stands to UR stands. Habitat would be degraded or lost for species that prefer high canopy cover and complex structure stands, e.g., pileated woodpecker and pine marten, but only on those acres where treatment would occur. Harvest treatment does not fragment any large blocks of OFMS habitat, so the highest quality habitat for pileated woodpeckers and pine martens would be maintained. Alternative 5 would convert one 53-acre stand from OFMS to OFSS, a relatively negligible amount given the size of the project area. Alternatives 2, 3 and 4 would not convert any OFMS to OFSS. The Moist Forest types historically contributed a small amount of habitat for species such as the white-headed woodpecker and flammulated owl. It is estimated that 5 to 15% of this Forest type was historically in OFSS; currently, OFSS is within HRV at 5%, but certainly at the low end of the range.

Stand density and canopy cover in SE and UR stands would be relatively low following stand treatments, but individual tree growth rates would be high. Harvest would accelerate development of large diameter trees. It would likely take 25 to 50 years to restore old growth conditions. SI stands would take 75 to 100 years to develop back into old growth.

A continued supply of dead wood habitat would provide habitat for primary cavity excavators.

Effects to blue grouse would be similar to those described in the Dry Forest types. Because only 10% of the Moist Forests are being treated, magnitude of effects would be much lower.

Overall, the existing distribution of structural stages reflects HRV relatively well. There is an excess of YFMS structural stands and a deficiency in younger structural stages, i.e., the SI, UR, and SECC stages. In the future, it may be desirable to convert some of the YFMS stands into the younger structural stages to provide the historic range of habitats. The best approach would be to mimic the natural fire regime for the Moist Forest type, which tended to convert large blocks of habitat, 200 to 2000 acres in size, into the SI stage in a single event.

Population viability for pileated woodpeckers and pine martens would be maintained via old growth in the Cold and Moist Forest types as well as the recommended system of Dedicated Old Growth, Replacement Old Growth, and Pileated Woodpecker Feeding Areas as prescribed by the *Land and Resource Management Plan*.

Prescribed burning would not be used in the Moist Forest types except in harvest units to reduce activity fuels. Stands would remain at risk for stand replacement wildfires; as this type of fire would remove much of the forest cover and stand structure required by species such as the pileated woodpecker and pine marten. This is not necessarily a negative habitat condition when disturbances are within the Historic Range of Variability. These species would be required to find habitats outside the burned areas. Given the

low level of activity within the Moist Forest types, particularly in Alternative 4, effects would be low and somewhat similar to those described in the no action alternative.

Riparian Hardwood Trees and Shrubs

All of the action alternatives place emphasis on restoring riparian habitat. Hardwoods and shrubs would be planted and/or protected from browsing. Removing encroaching conifers and fencing aspen suckers would enhance existing aspen stands, increasing their chances for survival and ability to return to their historical coverage. Red-napped sapsucker, Williamson's sapsucker, Lewis' woodpecker, and downy woodpecker are several species likely to benefit. Population viability would increase because riparian restoration is being conducted in RHCAs across much of the Middle Fork John Day Basin.

Cumulative Effects to Wildlife—Common to All Action Alternatives

Similar activities - timber harvest, prescribed burning, and hardwood planting and protection - will be going on concurrently within the Middle Fork John Day Subbasin (see Appendix C-Projects Considered for Cumulative Effects). This combination of activities has the potential to cumulatively affect various wildlife species.

The majority of the timber harvest and prescribed fire activities are being conducted in the Dry Forest types where much of the vegetation is outside HRV. Cumulatively, effects would be similar to those described in the previous sections, except they would be applied over a larger area. Treatments will convert OFMS to OFSS structure stands, where appropriate. Younger stands will be managed to develop OFSS over the next 25 to 50 years. Development of large blocks of OFSS structure stands will increase the density and distribution of the white-headed woodpecker, Lewis' woodpecker, flammulated owl, and various neotropical migrant birds dependant on this structure. Population viability for these species would be significantly improved.

Treatments will reduce canopy closures and stand densities. Species, such as the pileated woodpeckers, pine marten, and northern goshawk could be affected by these activities. However, Dry Forests, even in the YFMS condition, are not particularly productive habitats for these species. Large diameter trees and dead wood habitats are notably lacking. Canopy closures are generally lower. Stands are dominated by ponderosa pine and Douglas-fir with a smaller component of grand fir. While structural stages will change from ones that are more suitable for theses species to ones that are less suitable, the overall impact will be much less because of the poorer quality of habitat as it currently exists. Impacts will be primarily to habitats used more for foraging than nesting or denning purposes. Population viability for pileated woodpecker and pine martin would be maintained via old growth in the Moist and Cold Forest types as well as a system of Dedicated Old Growth (DOG), Replacement Old Growth (ROG), and Pileated Woodpecker Feeding Areas (PWFAs).

In the long-term, restoration of Dry Forests, i.e., restoring natural vegetation conditions and fire regimes, will make these habitats far more self-sustaining for associated wildlife species. Treatments will increase, not reduce, wildlife species diversity.

Cumulative impacts to higher quality Moist and Cold Forest habitats are low.

Cumulatively, restoration of riparian habitats across the subbasin will improve overall habitat for species such as the red-naped sapsucker, Williamson's sapsucker, Lewis' woodpecker, downy woodpecker, hermit thrush, red-eyed vireo, and olive-sided flycatcher.

4.2.6.2—Old Growth Habitat and Connectivity

4.2.6.2.1 Modifying DOG/ROG/PWFA Boundaries

4.2.6.2.1.1—Alternative 1

Alternative 1 would maintain the existing condition (see Table 146). Existing Dedicated Old Growth (DOG), Replacement Old Growth (ROG), and Pileated Woodpecker Feeding Area (PWFA) boundaries would not be adjusted. No new DOGs, ROGs or PWFAs would be designated to meet MA-13 standards. Although no new management activities would occur under this project, areas adjacent to existing DOGs/ROGs/PWFAs could be managed under other management area (MA) standards and guidelines. In MA-1 General Forest, timber harvest could still be used aggressively. The ability to manage for an adequate system of DOGs/ROGs/PWFAs could be at risk.

In the short-term (1-25 years), existing DOGs and ROGs would continue to provide habitat for old-growth dependent species. DOGs 129, 248, 33, 433, and 533 are predominantly in the Dry Forest types and are outside HRV, making them high risk for insect, disease or wildfire damage. These DOGs, in their current condition may not be sustainable in the long-term (25+) years.

DOGs 242, 243, 245, 249, 250, 252, 330, and 332 are in the Moist or Cold Forest types, representing the highest quality habitat. Vegetation in these DOGs is considered to be within or near HRV.

Without designation of ROGs and PWFAs, most DOGs provide smaller home ranges than are recommended for pileated woodpeckers and pine martens. However, adjacent habitat is suitable to support species.

Existing LRMP2 corridors would be maintained.

Old Growth Habitat and Connectivity—Alternatives 2, 3, 4 and 5

Alternatives 2, 3, 4 and 5 would result in changes and additions to pileated woodpecker DOGs, ROGs and PWFAs to meet MA-13 standards; i.e., 600 acres for pileated woodpeckers (see Table 146). Designation of suitable MA-13 old growth areas across the project area would improve the Agency's ability to manage for MIS pileated woodpecker and pine marten. As described under Alternative 1, several DOGs/ROGS are located in the Dry Forest types. Vegetation is considered outside HRV, and may be only sustainable in the short- to mid-term (1-25 years.)

Existing LRMP2 corridors would be maintained.

Table 146 Dedicated Old Growth (DOGs) and Replacement Old Growth (ROGs) Units

DOG #	HABITAT REQUIREMENTS FOR INDICATOR SPECIES	MIN. ACRES[1]	EXIST. DOG ACRES	PROP. DOG ACRES	EXIST. ROG ACRES	PROP. ROG ACRES[2]	ADD. FEEDING ACRES[2]	TOTAL PROP. ACRES
DOG 129	Pileated Woodpecker	600	397	443[4]	0	193 (46)[3]	137	773 (46)[3]
DOG 242	Pine Marten	240	249	268	47	142 (10)[3]	---	410 (10)[3]
DOG 243	Pine Marten	240	204	208 (22)[3]	0	109 (5)[3]	---	317 (27)[3]
DOG 245	Pine Marten	240	214	235	0	132	---	367
DOG 248	Pine Marten	240	149	161	0	124	---	285
DOG 249	Pine Marten	240	168	191	0	87	---	278
DOG 250	Pine Marten	240	169	170	0	97	---	267
DOG 252	Pine Marten	240	153	152	0	89	---	241
DOG 330	Woodpecker/Marten	600	340	337	0	160	173	670
DOG 332	Woodpecker/Marten	600	302	298 (6)[3]	0	171	140	609 (6)[3]
DOG 333	Woodpecker/Marten	600	366	332 (14)[3]	134	193 (8)[3]	137 (7)[3]	662 (29)[3]
DOG 433	Pileated Woodpecker	600	171	168[4]	0	146	160	474
DOG 533	Pine Marten	240	217	251	0	130 (8)[3]	---	381 (8)[3]
TOTALS		4,920	3,099	3,214 (42)[3]	181	1,773 (77)[3]	747 (7)[3]	5,734 (126)[3]

NOTES: MIN. = Minimum **EXIST. =** Existing **PROP. =** Recommended **ADD. =** Additional

1 Old-growth Management Area (MA-13) Minimum Management Requirements:

Pileated Woodpecker Areas = 300-acre DOG + 300-acre feeding area = 600 acres. ROGs = 150-acres and overlap with feeding areas.

Pine Marten = 160-acre DOG + 80-acre ROG = 240 acres

2 ROG acres also contribute towards pileated woodpecker feeding acres. "Recommended ROG Acres" and "Additional Pileated Feeding Acres" fields should total at least 300 acres for each DOG.

3 Non-forested or unsuitable inclusions (acres) are displayed in parentheses.

4 Recommended DOG 433 at 168 acres falls short of minimum size requirements for a pileated woodpecker DOG (300 acres); however DOG 129 is immediately adjacent to DOG 433 and includes 143 surplus acres. Combined, the two DOGS contain 611 acres, a sufficient number of acres to meet requirements (600 acres).

4.2.6.2.1.3—Alternative 3 only

Alternative 3 would expand DOG/ROG/PWFA areas for pileated woodpeckers to meet 900-acre home ranges recommended by Bull and Holthausen (1993) as displayed in Table 147, DOGs 129, 330, 332, 333, and 433 would be expanded. The additional 300+ acres would not be officially added to DOGs or ROGs, but rather, these acres would be mapped and harvest treatment would be deferred until the next round of Forest planning determines appropriate management strategies. The 900-acre areas would include acres designated as DOG, ROG, and feeding areas plus the additional 300 treatment-deferred acres. CONCERN 1: MODIFYING MA-13 DOGS/ROGS/PWFAS discusses the effects of increasing DOG/ROG/PWFA areas in detail. Pine marten areas would remain as described in Table 146. Existing LRMP2 corridors would be maintained.

Table 147 Expanded Pileated Woodpecker Areas

DOG #	DESIRED HOME RANGE ACRES[1]	PROP. DOG ACRES	PROP. ROG ACRES[2]	ADD. PILEATED FEEDING ACRES[2]	TOTAL PROP. ACRES – CURRENT FOREST PLAN DIRECTION	HOME RANGE ADDITIONS	NEW TOTAL ACRES
DOG 129	900	443[4]	193 (46)[3]	137	773 (46)[3]	302	1,075 (46)[3]
DOG 330	900	337	160	173	670	285	955 (6)[3]
DOG 332	900	298 (6)[3]	171	140	609 (6)[3]	303	912
DOG 333	900	332 (14)[3]	193 (8)[3]	137 (7)[3]	662 (29)[3]	306	968 (29)[3]
DOG 433	900	168[4]	146	160	474	309	783
TOTALS	4,500	1,578 (20)[3]	863 (54)[3]	747 (7)[3]	3,188 (81)[3]	1,505	4,693 (81)[3]

1 Home range size recommended by Bull and Holthausen (1993):

2 ROG acres also contribute towards pileated woodpecker feeding acres. "Recommended ROG Acres" and "Additional Pileated Feeding Acres" fields should total at least 300 acres for each DOG.

3 Non-forested or unsuitable inclusions (acres) are displayed in parentheses.

4 Recommended DOG 433 at 168 acres falls short of minimum size requirements for a pileated woodpecker DOG (300 acres); however DOG 129 is immediately adjacent to DOG 433 and includes 143 surplus acres. Combined, the two DOGS contain 611 acres, a sufficient number of acres to meet requirements (600 acres).

4.2.6.2.2 Timber Harvest/Prescribed Fire within Old Growth Habitat and Connectivity Corridors

Timber harvest and prescribed fire can be used to help restore historic stand structure and fire regimes, in particular, on Dry Forest types. *Land and Resource Management Plan* Amendment 2 and the *Galena Watershed Analysis* recommended conversion of OFMS stands back to historic conditions of OFSS, where appropriate. *Land and Resource Management Plan*, Amendment 2 directs that younger stands should be managed towards OFMS or OFSS. Action alternatives incorporate these strategies at varying levels (see Table 148). In the DOGs, timber harvest and prescribed fire would not occur in any of the alternatives. In the ROGs, PWFAs, and LRMP2 corridors action alternatives would use timber harvest and prescribed fire to varying degrees, as described below. Treatments are prescribed where current vegetation conditions do not meet historic conditions, and stands are considered at risk. All recommended management actions are consistent with *Land and Resource Management Plan* standards for maintaining DOG and ROG habitat. Mitigation measures for large diameter trees, wildlife snags, down woody debris, LRMP2 corridors, and prescribed burning are described in **2.5.6 Mitigation**, page 90.

Table 148 Summarizes treatment acres and (percentages) within old growth habitat and LRMP2 corridors by alternative.

Alternative	Harvest Acres in DOGs	Harvest Acres in ROGs	Harvest Acres in PWFAs	Harvest Acres in 300-acre Additions[1]	Harvest Acres in Old Growth Outside DOGs/ROGs	Harvest Acres in LRMP, Amendment 2 Corridors
Alternative 1	0	0	0	0	0	0
Alternative 2	0	131 (4%)	195 (7.7%)	257 (17%)	313 (4%)	171 (2%)
Alternative 3	0	0	0	0	223 (3%)	0
Alternative 4	0	0	0	0	20 (<1%)	38 (<1%)
Alternative 5	0	192 (4%)	195 (7.7%)	257 (17%)	313 (4%)	220 (3%)

1Only Alternative 3 expands pileated management areas by 300 acres. Harvest activities are deferred. Alternatives 2 and 5 treat these areas as General Forest MA-1.

4.2.6.2.2.1—Alternative 1

Management activities are limited to ongoing activities. Alternative 1 would not conduct any additional timber harvest or prescribed burning activities in old growth habitat or LRMP2 corridors. In the short term (0-25 years), cover and stand structure would improve, providing better movement and dispersal habitat. In the long term (over 25 years), connectivity habitat would be at greater risk for wildfire or insect damage.

Action Alternatives (4.2.6.2.2.)

The number of acres recommended for harvest treatment is relatively low, given the size of the Southeast Galena project area. Table 149 displays the number of acres recommended for treatment as well as the percentage treated. The following discussion describes effects only on those acres prescribed for treatment. Section 4.2.6.2.1 incorporates effects at the project level scale.

In the short- to mid-term (1-25 years), treatments may have effects to old-growth species dependent on high canopy cover and structure, such as pileated woodpecker and pine marten. For pileated woodpeckers, habitat changes would make treatment areas less suitable for nesting, but still suitable for foraging. For pine martens, denning and foraging habitat may be lost in the short- to mid-term, but only on the acres treated. Treatment would only be conducted within the ROGs and PWFAs as directed by the *Land and Resource Management Plan*; core habitat for nesting/denning would be maintained in the DOGs. Treatments are considered beneficial to related old growth dependent species in the long-term (25+ years).

OFMS would be converted back to OFSS stands. Tree species and stand structure would better mimic historic, more sustainable conditions. Younger structural stage stands (YFMS, SECC, and UR) would be thinned to accelerate development of large diameter trees and restoration of old forest structure. Specific actions and effects are described below by alternative. 4.3.11—, page 413 provides additional detail on the effects of treatments in LRMP2 corridors.

4.2.6.2.2.2—Alternative 2

Alternative 2 would not harvest within any DOG. Timber would be harvested on 131 acres within recommended ROG 433. On 122 of the 131 acres, understory removal (HUR) would be used to thin smaller, understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS. Treatment units are 704, 706, and 710. On the remaining 9 acres, commercial thinning (HTH) would reduce tree stocking in a SECC stand to increase growth on the residual trees. Tops of trees would be yarded attached to remove fuels from site. Thinning would accelerate development of large diameter trees and restoration of old forest structure. Treatment unit is 708. All units would be prescribe burned to reduce slash and other ground fuels.

Alternative 2 would harvest timber on 195 acres within PWFAs associated with DOGs 129 and 433. Treatment units are 702, 728 and 666; units classify as YFMS or SEOC. Commercial thinning (HTH) and/or pre-commercial thinning (SPC) would reduce tree stocking, increase growth rates on the residual trees, and accelerate the development of old forest structure. In units 702 and 666, tops of trees would be yarded attached and then the units prescribe burned. In unit 728, slash would be hand piled and burned.

Alternative 2 would harvest timber on 313 acres of OFMS located outside existing and recommended DOGs/ROGs. Treatment units are 17, 18, 152, 154, 178, 180, 186, 188, 346, 348, 642, 715, 838 and 840. Understory removal (HUR) would thin smaller, understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS. All units would be prescribe burned, except for unit 642 where slash would be hand piled and burned.

Alternative 2 would harvest timber on 171 acres within LRMP2 corridors. Treatment units are 47, 48, 49, 64, 600, 602, 603, 606, and 608. A modified commercial thinning (HTH1) would reduce stocking, increase growth rates on the residual trees, and accelerate development of old forest structure, while maintaining connectivity. Tops of trees would be yarded. Where understory stocking is high, a modified precommercial thinning (SPC1) would also be used to reduce stocking. Clumps of small trees would be retained to provide connectivity and horizontal diversity. In units 64 and 606, slash would be hand piled and burned.

Outside of harvest units, prescribed fire could be used in Dry Forest types located in ROGs, PWFAs, or LRMP2 corridors. Mitigation would ensure that minimum canopy closure and tree stocking requirements would be met (see Chapter 2, Section 2.5.6). Prescribed fire effects would be as described in Prescribed Fire (FBR) – Underburning.

4.2.6.2.2.3—Alternative 3

Alternative 3 would emphasize short-term habitat needs for pileated woodpecker and pine marten over long-term needs. This alternative does not harvest within any existing or recommended DOG, ROG or PWFA. Harvest would also be avoided within 300-acre additions to pileated woodpecker management areas. Existing canopy cover and structural complexity would be maintained.

Alternative 3 would harvest timber within 233 acres of old growth habitat located outside existing and recommended DOGs/ROGs. Treatment units are Units 17, 18, 152, 154, 178, 180, 186, 188, 346, 348, 838 and 840. Understory removal (HUR) would thin smaller understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS. All units would be prescribed for burning.

Alternative 3 would not harvest timber within LRMP2 corridors; prescribed fire effects would be as described for Alternative 2.

4.2.6.2.2.4—Alternative 4

Alternative 4 would not harvest within any existing or recommended DOG or ROG.

Alternative 4 would treat timber on 67 acres within the PWFA associated with DOG 129. The treatment unit is 728 would reduce tree stocking,increase growth rates on risidual trees, and accelerate the development of old forest structure. Slash would be hand piled and burned.

Alternative 4 would treat timber on 20 acres of OFMS located outside existing and recommended DOGs/ROGs. The treatment unit is Unit 642. Pre-commercial thinning (SPC) would thin smaller, understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS.

Alternative 4 would pre-commercial thin (SPC1) small, understory trees on 38 acres within LRMP2 corridors. Treatment units are 602 and 603. Clumps of small trees would be retained to provide connectivity and horizontal diversity. Prescribed fire effects would be as described for Alternative 2

4.2.6.2.2.5—Alternative 5

Alternative 5 would not harvest within any DOG. Timber would be harvested on 192 acres within recommended ROGs 248, 249 and 433. On 184 of the 192 acres, understory removal (HUR) would be used to thin smaller, understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS. Treatment units are 140, 637, 704, 706, and 710. On the remaining 9 acres, commercial thinning (HTH) would reduce tree stocking to increase growth on the residual trees. Tops of trees would be yarded attached to remove fuels from site. Thinning would accelerate development of large diameter trees and restoration of old forest structure. Treatment unit is 708. In unit 637, slash would be hand piled and burned. The remaining units would be prescribe burned to reduce slash and other ground fuels.

Alternative 5 harvests timber on 195 acres within PWFAs associated with DOGs 129 and 433. Commercial thinning (HTH) and/or small tree thinning (SPC) would reduce tree stocking, increase growth rates on the residual trees, and accelerate the development of OFMS structure. Treatment units are 702, 728 and 666.

Alternative 5 would harvest timber on 326 acres of old growth habitat located outside existing and recommended DOGs/ROGs. Treatment units are Units 17, 18, 152, 154, 178, 180, 186, 188, 190, 346, 348, 642, 715, 838 and 840. Understory removal (HUR) would thin smaller, understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS. All units would be prescribe burned, except for unit 642 where slash would be handpiled and burned. .

Alternative 5 would harvest timber on 220 acres within LRMP2 corridors. Treatment units are 43, 47, 48, 49, 64, 600, 602, 603, 606, and 608. A modified commercial thinning (HTH1) would reduce stocking, increase growth rates on the residual trees, and accelerate development of old forest structure, while maintaining connectivity. Where understory stocking is high, a modified pre-commercial thinning (SPC1) would also be used to reduce stocking. Clumps of small trees would be retained to provide connectivity and horizontal diversity. In units 64 and 606, slash would be hand piled and burned. Treatments would maintain canopy closure within the top 1/3 of site potential, but may not retain the same 180 trees per acre stocking levels prescribed in LRMP2 corridors under the other alternatives. Cover near the ground would be reduced. Although these units would still maintain *Land and Resource Management Plan* standards for connectivity but the quality of habitat for dispersal and movement would be somewhat reduced.

4.2.6.3—Big Game

The following discussion discloses the effects of alternatives to big game. Discussion also addresses how well alternatives meet the following objectives brought forward from the Galena Watershed Analysis:

- Improve forage habitat
- Provide cover that is well distributed
- Reduce potential disturbance from road traffic
- Reduce the risk of catastrophic losses of habitat

4.2.6.3.1—Alternative 1

Alternative 1 would not meet the purpose and need to improve big game habitat, specifically to improve forage habitat, reduce potential disturbance from road traffic, and reduce the risk of catastrophic disturbances that might destroy large areas of habitat.

In the short-term (within 10 years), deer and elk numbers would remain high and the species relatively well distributed, animals possibly only avoiding the large, open expanses of the Summit and Reed Fire areas, and high road density areas in the Tincup/Little Butte and Granite Boulder Subwatersheds.

HEI, cover percentages and open road densities, which are all used to evaluate the habitat effectiveness of elk, would remain in their current condition (see Table 102, Table 103, Table 104, and Table 105 beginning on page 187).

Total percent cover would remain above *Land and Resource Management Plan* standards in all subwatersheds. One exception is the Dixie Butte Wildlife Emphasis Area where the Davis/Placer subwatershed is below standards; however, this is probably at full potential given site conditions (see 3.2.6.2.3—MIS—Rocky Mountain Elk , page 183). Otherwise, cover would remain well distributed except in Summit and Reed Fire areas.

Cover quality is skewed towards marginal cover. In summer range, satisfactory cover would remain at 3% or less in the Vinegar and Vincent subwatersheds, well below the *Land and Resource Management Plan* standard of 12%. In winter range, satisfactory cover would remain at 5% in the Little Boulder/Deerhorn and Tincup/Little Butte Subwatersheds, below the *Land and Resource Management Plan* standard of 10%. In the Wildlife Emphasis Area, satisfactory cover would remain at 2% in the Davis/Placer Subwatershed, below the *Land and Resource Management Plan* standard of 40%. It is probably unrealistic to expect greater levels of satisfactory cover, particularly in winter range, where high canopy cover is not particularly sustainable, much less attainable, in Dry Forest types. The Dixie Wildlife Emphasis Area remains deficient in satisfactory cover due to the extent of low canopy, subalpine habitats rather than past management activities. Deficiencies in satisfactory cover may not be severely limiting given the abundance of total cover.

Elk and deer numbers would remain out of balance with forage, particularly in the amount of browse species. Forage would continue to exist in meadows, past harvest units and forested areas where canopy closure is low (<40%). In the Summit and Reed Fires, ground vegetation, both grasses and shrubs, would likely be well established in many areas by the end of the 10-year period. Grasses are recovering quickly, and shrub species such as ceanothus and upland willow are emerging in many areas. The burns may not be fully utilized, however, due to the long distance to cover in many areas. Alternative 1 forgoes the option to plant and protect hardwood shrubs and trees, which are favored browse species of big game.

Open roads would continue to have an adverse effect on big game, especially in locally cover deficient areas as well as riparian areas that may be used for calving and fawning. In winter range, open road densities would remain in excess of the Forest Plan standard of 2.2 miles per square mile in the Tincup/Little Butte (3.92 miles/square mile) and Granite Boulder (7 miles per square mile) subwatersheds. Deer, and particularly elk, would likely avoid such heavily roaded areas, concentrating animals over smaller

areas. Elsewhere, minimum standards for road densities would be met but would not always be at target levels recommended in the *Land and Resource Management Plan* Record of Decision, i.e., 1.5 miles of open road per square mile in summer range and 1.0 miles of open road per square mile in winter range. A few roads may close naturally as a result of encroaching vegetation and very little use, but minimal change in open road densities would be expected. Open roads would continue to affect the distribution and movement of elk and deer, but would likely be highly limiting only in the winter range portion of the Tincup/Little Butte and Granite Boulder Subwatersheds.

Risks of uncharacteristically severe wildfire would remain high on much of the project area. Another wildfire on scale with the Summit Fire could dramatically reduce cover and forage habitat. Deer and elk could be forced into smaller usable areas or into adjacent watersheds.

Over the next 25 years, in the absence of disturbance, canopy cover would gradually increase, both within stands currently classified as satisfactory or marginal cover, and within stands currently classified as forage habitat. Harvest units thinned in the 1980's and 1990's would begin to transition from foraging habitat to marginal cover. Harvest units regenerated in the 1980's and 1990's, including large portions of the Summit and Reed Fires, would begin to transition from forage habitat to hiding cover.

Forage would become more limiting. The quantity and vigor of grasses and shrubs would continue to decline as overstory shading and competition for water and nutrients increases. Natural or accidentally induced fires would likely be suppressed and in most instances held to a few acres. Historically frequent, low intensity fires recycled nutrients and invigorated many grasses and shrub species. The continued absence of these fires would continue to contribute to the decline in species' health and vigor. The decline in forage quantity and quality would likely be most impacting in winter range. Aspen is a favored browse species. 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 watershed within 25 years. All aspen sites may be gone within 100 years.

In the long-term, and in the absence of some major natural disturbance, habitat effectiveness would gradually decline as cover increases and both forage quantity and quality become more limiting.

As forested stands become more crowded, the likelihood and potential severity of a catastrophic disturbance event such as wildfire or insect epidemic would also increase. A large, catastrophic event could eliminate large blocks of cover and/or forage in a short period of time, making large areas of the watershed unsuitable as habitat. HEI values could easily fall below standards. Under such circumstances the decline in habitat effectiveness would be dramatic rather than gradual.

Big Game—Alternatives 2, 3, 4 and 5

The general effects of management activities to big game are described first. Secondly, discussion will address specific changes in HEI, cover and open road density by alternative.

General Direct and Indirect Effects of Action Alternatives

Overall, alternatives 2, 3, and 4 would meet the purpose and need to improve big game habitat, although to varying degrees. Specifically, these alternatives would improve forage habitat, provide well-distributed cover, reduce potential disturbance from road traffic, and reduce the risk of catastrophic disturbances that could destroy large areas of habitat. In localized areas, management has the potential to both positively and negatively impact habitat. Timber harvest and pre-commercial thinning, prescribed fire, road closures, and hardwood planting and protection would have the most pronounced effects.

In Alternative 5, high priority is given to restoring historic vegetation conditions, in some subwatersheds, at the expense of meeting *Land and Resource Management Plan* standards for thermal cover. High priority is also given to increasing road access, at the expense of meeting *Land and Resource Management Plan* standards for open road density. Management tools are identical to those used in Alternatives 2, 3 and 4 – i.e., timber harvest and pre-commercial thinning, prescribed fire, road closures, and hardwood planting and protection – however, in many subwatersheds, they are used more intensively.

Timber Harvest and Pre-commercial Thinning

Under all action alternatives, timber harvest would reduce satisfactory, marginal and hiding cover. Analysis assumed that all recommended harvest treatments in cover - shelterwood harvest (HSH), understory removal (HUR), commercial thin (HTH or HTH1) and pre-commercial thin (SPC or SPC1) - would essentially eliminate thermal cover, i.e., cover will be reduced below the 40% canopy cover needed to classify as marginal cover. This assumption may be conservative. Where only small diameter trees are removed, as in the HUR or SPC treatments, canopy cover may be reduced, but not necessarily fall below the 40% threshold.

Most of the timber harvest in cover would occur in ponderosa pine stands on Dry Forest types. These stands are considered outside HRV; i.e., overstocked and likely unsustainable given the high risk of uncharacteristically severe wildfire or insect epidemics. Many of these stands would likely fall out of cover within the next 25 years if not treated. Harvest would help move theses stands back towards their historical condition. Treatment would reduce the risk that a large-scale disturbance similar to the Summit Fire would reduce large areas of cover and forage.

Pre-commercial thinning of small trees – small pole-, sapling- and seedling-sized trees – would have the greater impact on hiding cover. Road closures would be used to mitigate these losses. In addition, silvicultural prescriptions would be modified to retain cover patches and provide structural diversity as follows:

- In commercial thinning (HTH) units, harvest would be designed to vary tree density by up to 50% to retain patches of cover. Patches would be 0.25 acre to 1 acre in size. High tree density areas would provide higher levels of cover in the short-term. Lower density areas will open up forest stands dramatically, permitting natural regeneration to occur, which in turn should provide patches of hiding cover in about 20 years (see **2.5.6.2.2—Mitigation for Harvest Operations**, Wildlife, page 96)
- In understory removal (HUR) and pre-commercial thinning (SPC) units, a minimum 15% of each unit would be retained in untreated patches scattered throughout the unit. Patches would be 0.25 acre to 1 acre in size. Priority would be given to locating untreated patches adjacent to open roads, meadows, and other natural openings years (see **2.5.6.2.2—Mitigation for Harvest Operations**, Wildlife, page 96)
- In LRMP2 wildlife corridors and KLAs, each HTH1 and SPC1 unit would be marked to manage canopy cover at the upper 1/3 of site potential. Trees 8 feet in height or greater would be retained at a minimum of 180 trees per acre. Tree retention guidelines would apply to commercial harvest , pre-commercial harvest and burning operations. Pre-commercial thinning size material (i.e., 7 inches dbh or less) would be retained in untreated patches, .025 to 1 acre in size, scattered across the unit (see **Commercial Thinning in Connectivity Corridors—HTH1**, page 59 and **Pre-commercial Thin in Connectivity Stands—SPC1** page 64).

Untreated patches would remain at high risk to bark beetle attack, and would likely fall out of cover if tree mortality is high. These patches would be gradually lost over the next 25 years.

Timber harvest, while reducing cover, at the same time has the potential to increase forage. Where canopy cover is reduced, understory vegetation is likely to increase due to less competition for light, water and nutrients.

Where cover/forage ratios are skewed towards cover, timber harvest that removes cover and increases forage will potentially improve big game habitat (Thomas et al., 1979). Where the cover/forage ratio is skewed in favor of forage, cover removal by timber harvest can create areas avoided by deer and elk, most notably if roads provide human access into forage areas. In Southeast Galena, all subwatersheds have total cover in excess of minimum standards, and forage and browse is likely to be the more limiting habitat component.

In La Grande, Oregon, the Pacific Northwest Research Station has been studying ungulates under the 40 square mile Starkey Project. Research has raised the concern that resource managers may be overstating the importance of thermal cover on elk condition (PNW Research Station 2000). The energetic benefits of thermal cover may be inconsequential, and it is forage or nutritional effects that may have the greater impact on individual animal performance. This research compliments Southeast Galena objectives to restore HRV and increase forage at the expense of cover.

Timber harvest and pre-commercial thinning are forgone in most riparian habitat conservation areas (RHCAs), reducing potential disturbance to or losses in calving and fawning habitat. Exceptions exist. Twenty-five aspen groves are located within or near RHCAs. Encroaching conifers would be removed and the groves fenced. Aspen groves make up an incremental portion of the riparian system, and effects to calving and fawning habitat would be essentially inconsequential. In the Vincent and Vinegar Subwatersheds, RHCAs in the 1,400-acre blowdown area would be entered. In the outer ½ of the RHCAs, approximately 50 to 80% of the wind thrown trees would be removed (salvaged) by helicopter. Removal of downed material can have both positive and negative effects. Salvage of downed trees would possibly degrade calving and fawning habitat, even though some of the downed materials would be left in place. On the other hand, large concentrations of down logs can also create barriers to big game movement. Thomas et al., (1979) noted that dead and down material and logging slash greater than two feet in depth can affect the way deer and elk use an area. Although elk are not excluded from areas with large amounts of down timber, they apparently tend to avoid such situations.

During periods of activity, timber harvest and pre-commercial thinning would impose an immediate disturbance to deer an elk. These activities would be conducted over a period of approximately 10 years. At any one time, management activities would be localized in portions of the watershed, and deer and elk are likely to shift use areas as activities progress across the watershed. In big game winter range (MA-4a), timber management activities would be restricted from December 1 to April 1 to minimize disturbance to wintering deer and elk.

Table 149 displays acres of satisfactory and marginal cover harvested in summer range and winter range. Values are displayed for all action alternatives. No timber harvest activities would be conducted in the Dixie Butte Wildlife Emphasis Area, so values are not displayed. Analysis assumes that the greater the reduction in cover, the greater the increase in forage. Juxtaposition of cover and forage patches is also important, since big game use in openings decrease with increased distance from cover. Lekenby (1984) verified that elk use of habitat in the Blue Mountains is influenced by distances from cover/forage edge areas as well as size and spacing of cover and forage patches. Consequently, values in table below need to be considered in conjunction with HEI and cover percentages displayed in Table 152, Table 153and Table 154, beginning on page 311.

Table 149 Acres of satisfactory and marginal cover harvested in summer and winter range. Percentage reduction in cover is also shown. Values are displayed for all action alternatives.

ALTERNATIVE	SUMMER RANGE				WINTER RANGE			
	SATISFACTORY COVER		MARGINAL COVER		SATISFACTORY COVER		MARGINAL COVER	
	Acres	%	Acres	%	Acres	%	Acres	%
1	0	0	0	0	0	0	0	0
2	687	12%	4,315	28%	57	10%	218	11%
3	277	5%	2,750	18%	57	10%	186	9%
4	111	2%	1,249	8%	0	0%	50	3%
5	1,072	19%	5,301	34%	69	12%	313	16%

Regenerated stands (HSH) would be expected to develop into marginal cover within 25 years if pre-commercial thinning is forgone; it may take 30 to 50 years if pre-commercial thinning is conducted.

Thinned stands (HTH or HTH1) would be expected to transition back into marginal cover in approximately 25 to 50 years depending on stand density following harvest. HTH1 stands would be thinned to approximately 80 square feet basal area and HTH stands to 60 square feet; consequently HTH1 stands would transition back into marginal cover more rapidly.

Prescribed fire

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 (USDA, 2000 Wildland Fire In Ecosystems). Small crews of about 5 to 10 people would manage the fire. If ATVs with drip torches are used to traverse the area, deer and elk may move further out from the fire perimeter. Disturbance would be short-term, unlikely lasting more than 2 or 3 days on the larger burning operations. Elk and deer 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. Young calves/fawns could be trapped and killed by fire, although losses would probably not be significant. To help mitigate effects to calves and fawning habitat, fires in RHCAs would be conducted under conditions that promote low intensity fire. Fire ignition would not occur directly in RHCAs, although they would be permitted to creep in from adjacent areas. Prescribed fire would only be permitted in identified calving and fawning areas from July 1 to April 30 when newborns would not be present. In areas not specifically identified as calving or fawning areas crews are to watch for lone elk or deer. If crews see lone animals, they will search the immediate area for calves or fawns and avoid lighting where newborns are found.

Low intensity prescribed fire usually has little effect on thermal cover. Burning does little to reduce overstory canopy that contributes the most to thermal properties. Mortality in dominant and co-dominant trees would not exceed 10%.

Prescribed fire can however reduce hiding cover when allowed to burn at moderate or high intensity in thickets of young understory. In Southeast Galena, burning would be primarily conducted in Dry Forest vegetation types that were historically dominated by open park-like stands of large diameter trees. Fires would burn in a mosaic of burned and unburned patches. Understory tree mortality would vary considerably from 10% to 85%. In HUR and SPC units, mitigation requires that a minimum of 15% of understory trees be retained in patches of .25 to 1 acre, but rarely would burning reduce stocking of understory trees to this level. In the southern half of the District, two large-scale prescribed fires – the Antelope and Spion prescribed burns – were conducted within the last five years; both burns appeared to kill less than 5% of the overstory and understory trees. The negative impact of thicket removal is compounded near roads where sight distance is increased, thereby raising the potential for poaching and harvest vulnerability of deer and elk. Burning might increase the possibility for insect activity, particularly bark beetle activity. If beetle activity intensifies, there would be some risk of additional losses of hiding cover and possibly thermal cover.

In harvest units, prescribed fire could be used in concert with timber harvest and pre-commercial thinning to reduce logging slash and other ground fuels. Pre-commercial thinning would reduce most of the hiding cover; prescribed fire would have minimal additional effects. Regeneration units may be the only exception, where prescribed fires of higher intensity may be used to remove undesirable trees and slash and prepare the sites for planting.

Because prescribed fire would be expected to burn in a mosaic, ground vegetation would be reduced but not entirely eliminated. Temporarily, forage opportunities still may be better elsewhere, at least, until ground vegetation is reestablished. Most native grasses and forbs and many shrubs respond positively to fire. Plants tend to sprout vigorously from their roots if the above ground portions are killed by fire, although it might take 2 to 3 years for species to return to their pre-fire abundance and volume. Fire can also increase nutrient content and palatability of forage, although the increased quantity of forage after a fire

may be more significant than the increased quality of that forage (USDA 2000). Species that respond favorably to fire include pinegrass, elk sedge, rose, snowberry, ceanothus, serviceberry, chokecherry and currant. Species that are adversely impacted by burning include mountain mahogany and bitterbrush. Overbrowsing has been detrimental to existing shrubs and fire might increase abundance and vigor of many species, thus reducing the level of browsing on any individual species or plant. Ideally, landscapes would be underburned every 10 to 15 years to enhance forage quality and quantity.

Little impact to calving and fawning habitat would be expected. As stated previously, fires would be only allowed to creep into RHCAs and would be of low intensity. Based on District experience, it is unlikely that the fires would be of sufficient intensity to kill large amounts of riparian shrubs. Where fire does kill shrubs, forbs and grasses, vigorous sprouting of vegetation would be expected, and plants would regain their pre-fire abundance and size within 2 to 3 years.

Table 150 displays acres of fire treatment by alternative. The table displays acres to be treated both inside and outside timber harvest/pre-commercial thinning units. Fire treatment acres are totaled and displayed as a percentage of the Southeast Galena Restoration Project Area.

Table 150 Acres of fire treatment by alternative. Table displays acres inside and outside harvest units. Treatment acres are totaled and displayed as a % of Southeast Galena Project Area

Alternatives	Prescribed Burn Associated With Timber Sale (Acres)	Hand Pile And Burn Associated With Timber Sale (Acres)	Prescribed Fire (Acres)	Total Fire Treatment	
				Acres	Percent of SE Galena
1	0	0	0	0	0%
2	1,450	2,390	21,780	25,620	54%
3	910	1,430	18,490	20,830	44%
4	0	0	18,490	18,490	39%
5	2,150	2,360	21,780	26,290	55%

Treatment of vegetation, whether through tree cutting or prescribed burning, reduces wildfire risks, and consequently also reduces the potential for loss of wildlife habitat from an uncharacteristically severe wildfire. The greater the number of acres treated, the lower the wildfire risk. Under the no action alternative, risks of uncharacteristically severe fire would remain high to moderate on 72% of the project area. Alternative 2, 3, 4 and 5 would reduce this fire risk to 53%, 58%, 70%, and 48% of the project area respectively. Note that there is actually a temporary increase in fire risk immediately following timber-cutting activities, until cutting slash can be treated. Alternative 5 reduces wildfire risk the most; Alternative 4 reduces wildfire risk the least.

Open Road Densities

Within the first 10 years, new road construction would increase open road densities. When timber sales are active, log haul activities would temporarily increase local traffic levels. Disturbance to big game would be expected to increase over the current condition. Deer and elk are likely to shift use areas as activities progress across the watershed. As timber sales are completed, specified haul roads would be closed. Within the first 5 years, road closures to be completed with harvest activities would be about 20% complete, and road closures not associated with harvest activities would be about 50% complete. By year 10, all roads scheduled for closing, would be about 100% complete. As road closures are completed, disturbance to deer and elk from vehicular traffic and mortality from hunting would be expected to decrease from current levels. Closures would in part mitigate losses in hiding cover that occur due to timber harvest and prescribed fire. In RHCAs, approximately 22 miles of road would be decommissioned or relocated outside RHCAs under all action alternatives. Although road relocation is being conducted primarily to reduce

hydrology and fisheries concerns, moving roads out of RHCAs would improve potential calving and fawning habitat as well. Road closures within RHCAs would also improve calving and fawning habitat.

Alternatives 2, 3, and 4 implement the same "Access and Travel Management Plan." These alternatives would meet standards for open road density in all subwatersheds and management areas. Alternative 5 implements an alternative "Access and Travel Management Plan" and was purposely designed to increase public access, even at the expense of big game habitat effectiveness. Standards for open road density are met only some of the time (see Appendix E, Map 29 Access Travel Management Plan Alternatives 2,3, and 4).

Hardwood Planting and Protection

Many hardwood trees and shrubs are important browse species for deer and elk. The action alternatives would increase the distribution and density of these species. Hardwood trees and shrubs would be planted along 21 miles of streams; seedlings would be fenced to protect them from browsing. An additional 4 miles of existing shrubs would also be fenced. In 25 aspen groves, encroaching conifers would be removed and the sites expanded and fenced. In the first 10 years, many of these trees and shrubs would be essentially off limits to deer and elk, but as new regeneration become established and protective fences deteriorate or are removed, available browse should increase. Calving and fawning habitat would also increase. Aspen groves would be larger, and healthier and more likely to remain a viable component of the landscape. Table 151 summarizes hardwood restoration treatments.

Table 151 Displays miles of hardwood planting and protection, and number of sites and acres of aspen restoration by alternative

Alternatives	Streamside/Riparian Hardwood Planting And Protection (Miles)	Streamside/Riparian Existing Hardwood Protection (Miles)	Aspen Restoration (# Sites/Acres)
1	0	0	0
2	21	4	25/30
3	21	4	25/30
4	21	4	25/30
5	21	4	25/30

Habitat Effectiveness

Habitat Effectiveness Index (HEI), cover percentages and open road densities were calculated by subwatershed for each alternative. Values are displayed in Table 152, Table 153, and Table 154, beginning on page 311, for summer range, winter range and the Dixie Butte Wildlife Emphasis Area, respectively. The previous discussion highlighted the general impacts of timber harvest, pre-commercial thinning, prescribed fire, road management, and hardwood planting and protection on big game habitat. Cover would be reduced and forage would be increased. Open road density would be reduced in all alternatives except Alternative 5. Although management activities would provide both positive and negative impacts to big game habitat, the overall trend is one of habitat improvement. In most instances, the values presented in Table 152, Table 153, and Table 154 confirm these trends with Forest Plan standards being met or exceeded. There are localized instances, however, where management activities would not meet *Land and Resource Management Plan* standards or are causing a downward trend in habitat effectiveness. Discussion following the tables highlights these adverse effects. The "Total HEI" column in each table also rates each alternative relative to the other alternatives. The highest HEI values are rated 1, the second highest rated 2, etc. Alternatives 2 and 3 often generate the highest HEI ratings. Alternative 5 often generates the lowest HEI rating.

There is to some degree a range of weakness in the HEI model which should be noted:

- The HEI model is not highly sensitive to changes in cover habitat. This becomes more of a concern when overall cover levels are low. The HEc standard may be met even though the cover percentage standards (i.e., % satisfactory and % marginal cover) may not. For example, see Table 153, Winter Range, Tincup/Little Butte Subwatershed. Alternative 5 easily meets the

standard for HEc (0.60), but not the total cover percentage standard (21%). Although the *Land and Resource Management Plan* requires that habitat effectiveness be analyzed using both measures, this effects discussion will give more weight to the cover percentages.

- The cover variable (HEc) addresses the quality of cover based on the ratio of satisfactory cover to marginal cover, while the spacing variable (HEs) addresses the amount and distribution of cover. Based on observed differences in elk preference (USDA 1988), satisfactory cover is given a weight of 1.0 and marginal cover is given a weight of 0.5. Consequently, in situations where the amount of satisfactory cover is less than the amount of marginal cover, as is the situation in much of Southeast Galena, a reduction in marginal cover can actually improve the satisfactory/marginal cover ratio and increase the HEc variable. For example, see Table 152, Summer Range, Vinegar Subwatershed. Alternative 2 harvests 737 acres of marginal cover and 0 acres of satisfactory cover, increasing the HEc variable from .53 to .54.
- HEf is a measure of forage quality and quantity. In the absence of forage surveys, changes in the HEf variable are difficult or impossible to quantify. In this analysis, HEf values for all action alternatives are kept at 0.50 (the midpoint between a possible low value of 0.0 and a high value of 1.0) even though forage quantity and quality is expected to increase due to timber harvest, prescribed fire, and hardwood planting and protection. Under the no action alternative, HEf would be expected to decline.

Table 152 Summer Range—HEI values, cover percentages, and open road density

SUBWATERSHED	HEc♥	HEs♥	HEr♥	Total HEI♣ (Rating)♠	%S♦	%M♦	Total Cover %♦	Open Road Density (miles per square mile)
LRMP STANDARD Summer Range	.30	.30	.40	.40	12%	5%	20%	3.2 (1.5) ▲
Davis/Placer								
Alternative 1	.67	.47	.48	.52 *(2)*	17	34	51	2.05
Alternative 2	.68	.47	.53	. 54 *(1)*	15	28	43	1.60
Alternative 3	.67	.47	.53	. 54 *(1)*	16	31	47	1.60
Alternative 4	.67	.47	.53	. 54 *(1)*	17	34	51	1.60
Alternative 5	.69	.48	.42	.51 *(3)*	15	26	41	2.72
Vinegar								
Alternative 1	.53	.64	.50	.54 *(2)*	2	40	42	1.84
Alternative 2	.54	.68	.51	. 55 *(1)*	2	30	32	1.72
Alternative 3	.54	.68	.51	. 55 *(1)*	2	30	32	1.72
Alternative 4	.53	.67	.51	.55 *(1)*	2	34	36	1.72
Alternative 5	.52	.65	.44	.52 *(3)*	1	24	25	2.43
Vincent								
Alternative 1	.53	.63	.52	. 54 *(1)*	3	38	41	1.64
Alternative 2	.56	.59	.51	. 54 *(1)*	3	18	21	1.73
Alternative 3	.55	.62	.51	. 54 *(1)*	3	22	25	1.73
Alternative 4	.53	.61	.51	.54 *(1)*	3	35	38	1.73
Alternative 5	.50	.50	.33	.45 *(2)*	0	16	16	3.66
L. Boulder/Deerhorn								
Alternative 1	.59	.42	.57	.52 *(4)*	12	52	64	1.21
Alternative 2	.61	.58	.62	.58 *(1)*	10	36	46	0.91
Alternative 3	.61	.51	.62	.56 *(2)*	12	41	53	0.91
Alternative 4	.59	.52	.62	.56 *(2)*	10	45	55	0.91
Alternative 5	.61	.58	.54	.55 *(3)*	9	33	42	1.51
Tincup/Little Butte								
Alternative 1	.70	.43	.55	.54 *(4)*	29	42	71	1.42
Alternative 2	.73	.63	.57	.60 *(1)*	22	26	48	1.21
Alternative 3	.70	.44	.57	.54 *(4)*	26	40	66	1.21
Alternative 4	.71	.45	.57	.55 *(3)*	26	40	66	1.21
Alternative 5	.73	.63	.49	.58 *(2)*	20	25	45	1.96
Butte								
Alternative 1	.76	.59	.55	.59 *(3)*	23	21	44	1.38
Alternative 2	.76	.59	.58	.60 *(2)*	19	17	36	1.10
Alternative 3	.75	.65	.58	.61 *(1)*	18	18	36	1.10
Alternative 4	.76	.58	.58	.60 *(2)*	23	21	44	1.10
Alternative 5	.74	.60	.44	.56 *(4)*	16	17	33	2.47
Granite Boulder								
Alternative 1	.73	.53	.55	.57 *(2)*	23	27	50	1.34
Alternative 2	.73	.53	.57	.58 *(1)*	23	27	50	1.19
Alternative 3	.73	.53	.57	.58 *(1)*	23	27	50	1.19
Alternative 4	.73	.53	.57	.58 *(1)*	23	27	50	1.19
Alternative 5	.73	.53	.57	.58 *(1)*	23	27	50	1.21

♠The HEI column displays HEI rating relative to other alternatives (i.e.1=best)

♣HEI = Habitat Effectiveness Index HEI = Hcsr = (HEc x HEs x HEr)1/3

♥HEc = habitat effectiveness derived from quality of cover HEs = derived from size and spacing of cover HEr = derived from density of roads open to vehicular traffic HEf = derived from quantity and quality of forage.

♦%S = Satisfactory Cover %M = Marginal Cover % Total Cover = %S + %M

▲The LRMP standard for open road density in summer range is 3.2 miles/mile$_2$; but strives for 1.5 miles/mile$_2$.

Table 153 Winter Range—HEI values, cover percentages and open road density(see key at bottom of table for definitions in heading).

SUBWATERS HED	HEc♥	HEs♥	HEr♥	HEf♥	Total HEI♣ (rating) ♠	%S♦	%M♦	Total Cover %♦	Open Road Density (miles per square mile)
LRMP STANDARDWinter Range	.40	.30	.50	.40	.50	10%	10%	25%	2.2 (1.0) ▲
Davis/Placer									
Vinegar									
Vincent-									
L. Boulder/Deerhorn									
Alternative 1	.56	.75	.68	.50	.62 (1)	5	34	39	0.72
Alternative 2	.56	.75	.68	.50	.62 (1)	5	34	39	0.72
Alternative 3	.56	.75	.68	.50	.62 (1	5	34	39	0.72
Alternative 4	.56	.75	.68	.50	.62 (1)	5	34	39	0.72
Alternative 5	.56	.75	.42	.50	.55 (2)	5	34	39	2.70
Tincup/Little Butte									
Alternative 1	.58	.63	.30	.50	.48 (3)	5	26	31	3.92
Alternative 2	.59	.60	.54	.50	.60 (1)	5	21	26	0.62
Alternative 3	.59	.60	.54	.50	.60 (1)	5	21	26	0.62
Alternative 4	.58	.63	.54	.50	.60 (1)	5	26	31	0.62
Alternative 5	.60	.60	.48	.50	.54 (2)	4	17	21	2.10
Butte									
Alternative 1	.71	.76	.63	.50	.64 (1)	19	26	45	0.90
Alternative 2	.72	.78	.57	.50	.63 (2)	15	19	34	1.15
Alternative 3	.72	.78	.57	.50	.63 (2)	15	23	38	1.15
Alternative 4	.73	.75	.57	.50	.63 (2)	19	23	42	1.15
Alternative 5	.72	.78	.37	.50	.57 (3)	15	19	34	3.21
Granite Boulder									
Alternative 1	.60	.55	.10	.50	.36 (3)	12	44	56	7.00
Alternative 2	.60	.55	.47	.50	.53 (1)	12	44	56	2.16
Alternative 3	.60	.55	.47	.50	.53 (1)	12	44	56	2.16
Alternative 4	.60	.55	.47	.50	.53 (1)	12	44	56	2.16
.Alternative 5	.60	.55	.30	.50	.47 (2)	12	44	56	3.95

Key

♠The HEI column displays HEI rating relative to other alternatives (i.e.1=best)

♣HEI = Habitat Effectiveness Index HEI = Hcsrf = (HEc x HEs x HEr x HEf)1/4

♥HEc = habitat effectiveness derived from the quality of cover HEs = habitat effectiveness derived from the size and spacing of cover HEr = habitat effectiveness derived from the density of roads open to vehicular traffic HEf = habitat effectiveness derived from the quantity and quality of forage.

♦%S = Satisfactory Cover %M = Marginal Cover % Total Cover = %S + %M

▲The LRMP standard for open road density in summer range is 2.2 miles per square mile; however, the LRMP Record of Decision directs that managers will strive for an open road density of 1.0 mile per square mile.

Table 154 Wildlife Emphasis - HEI values, cover percentages and open road density by subwatershed(see key at bottom of table for definitions in heading).

SUBWATERSHED	HEc♥	HEs♥	HEr♥	HEf♥	Total HEI♣ (rating) ♠	%S♦	%M♦	Total Cover %♦	Open Road Density (miles per square mile)
LRMP STANDARD Wildlife Emphasis	.50	.60	.60	.50	.70	20%	20%	40%	1.5
Davis/Placer									
Alternative 1	.53	.55	1.0	.50	.62 (1)	2	24	26	0.0
Alternative 2	.53	.55	1.0	.50	.62 (1)	2	24	26	0.0
Alternative 3	.53	.55	1.0	.50	.62 (1)	2	24	26	0.0
Alternative 4	.53	.55	1.0	.50	.62 (1)	2	24	26	0.0
Alternative 5	.53	.55	1.0	.50	.62 (1)	2	24	26	0.0
Vinegar									
Vincent									
L.Boulder/Deerhorn									
Alternative 1	.79	.46	1.0	.50	.65 (1)	43	30	73	0.0
Alternative 2	.79	.46	1.0	.50	.65 (1)	43	30	73	0.0
Alternative 3	.79	.46	1.0	.50	.65 (1)	43	30	73	0.0
Alternative 4	.79	.46	1.0	.50	.65 (1)	43	30	73	0.0
Alternative 5	.79	.46	1.0	.50	.65 (1)	43	30	73	0.0
Tincup/Little Butte									
Alternative 1	.96	.26	1.0	.50	.59 (1)	85	8	93	0.0
Alternative 2	.96	.26	1.0	.50	.59 (1)	85	8	93	0.0
Alternative 3	.96	.26	1.0	.50	.59 (1)	85	8	93	0.0
Alternative 4	.96	.26	1.0	.50	.59 (1)	85	8	93	0.0
Alternative 5	.96	.26	1.0	.50	.59 (1)	85	8	93	0.0
Butte									
Alternative 1	.74	.44	.64	.50	.57 (2)	38	43	81	0.84
Alternative 2	.74	.44	.68	.50	.58 (1)	38	43	81	0.70
Alternative 3	.74	.44	.68	.50	.58 (1)	38	43	81	0.70
Alternative 4	.74	.44	.68	.50	.58 (1)	38	43	81	0.70
Alternative 5	.74	.44	.65	.50	.57 (2)	38	43	81	0.84
Granite Boulder									
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Key

♠The HEI column displays HEI rating relative to other alternatives (i.e.1=best)

♣HEI = Habitat Effectiveness Index HEI = Hcsrf = (HEc x HEs x HEr x HEf)1/4

♥HEc = habitat effectiveness derived from the quality of cover HEs = habitat effectiveness derived from the size and spacing of cover HEr = habitat effectiveness derived from the density of roads open to vehicular traffic HEf = habitat effectiveness derived from the quantity and quality of forage.

♦%S = Satisfactory Cover %M = Marginal Cover % Total Cover = %S + %M

4.2.6.3.2—Alternative 2 (HEI)

Summer Range

In Alternative 2, timber harvest would reduce total cover in all subwatersheds except Granite Boulder. *Land and Resource Management Plan* standards for ***total cover*** would be met in all subwatersheds.

In the Vincent and Vinegar subwatersheds, satisfactory cover is already deficient and no additional satisfactory cover would be harvested. In the Little Boulder/Deerhorn subwatershed, 195 acres of satisfactory cover would be entered, reducing the cover percentage from 12% to 10%, below the *Land and*

Resource Management Plan standard of 12%. Harvest units 636, 643, 644 and 646 would be commercially thinned (HTH) and/or pre-commercially thinned (HTH/SPC). All four units occur in mixed conifer stands on Dry Forest types. These stands are considered outside HRV; i.e., overstocked and likely unsustainable given the high risk of uncharacteristically severe wildfire or insect epidemics. Harvest would help move them back towards their historical condition. Hiding cover mitigation and road closures would help offset deficiencies in cover. A non-significant amendment to the *Land and Resource Management Plan* would be required to reduce cover below standard.

Road closures would reduce open road densities in all subwatersheds except theVinegar subwatershed. Open road density in Vinegar would increase slightly to provide access to both an active popular dispersed recreation site and a mine. All subwatersheds would meet the *Land and Resource Management Plan* standard for open road density of 3.2 open road miles per square mile. Four of seven subwatersheds would meet the *Land and Resource Management Plan* objective of 1.5 open road miles per square.

Total HEI improves or remains the same in all subwatersheds. Losses in satisfactory cover in the Little Boulder/Deerhorn Subwatershed would have minimal impact given the high percentage of total cover still remaining. Forage would improve. Open road densities would decrease as timber sales and associated activities are completed; disturbance to big game would be expected to decrease accordingly. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranks 1st in five subwatersheds and 2nd in one subwatershed.

Winter Range

Timber harvest would remove cover only in the Tincup/Little Butte and Butte Subwatersheds. *Land and Resource Management Plan* standards for total cover would be met in all subwatersheds. In the Little Boulder/Deerhorn and Tincup/Little Butte Subwatersheds, satisfactory cover is already deficient and no additional satisfactory cover would be harvested. Hiding cover mitigation and road closures would help offset deficiencies in cover.

Road closures in the Granite Boulder and Tincup/Little Butte subwatersheds would dramatically reduce open road densities. These subwatersheds would meet *Land and Resource Management Plan* standards for open road densities for the first time. HEr values would also decrease; the HEr value for Granite Boulder would remain slightly below standard; however, this is simply a reflection of an inconsistency between the HEI model and the open road density standard. In the Butte subwatershed, open road density would increase slightly to provide better access to trailhead facilities. The Little Boulder/Deerhorn subwatershed would meet the *Land and Resource Management Plan* objective of 1.0 miles of open road per square mile; the other subwatersheds would move towards, but not meet, this target.

Total HEI improves with substantial increases in the Tincup/Little Butte and Granite Boulder Subwatersheds. Large changes in HEr values have a pronounced effect on overall HEI values. Open road densities would decrease as timber sales and associated activities are completed; disturbance to big game would be expected to decrease accordingly. Winter forage would improve. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranks 1st in three subwatersheds and 2nd in one subwatershed.

Wildlife Emphasis Area

Recommended management is identical for Alternatives 2, 3 and 4. No timber harvest or prescribed fire would occur in the Dixie Butte Wildlife Emphasis Area. Only the Butte Subwatershed is roaded. Open road density is already low. Open road density would be reduced incrementally from 0.8 miles to 0.7 miles of open road per square mile.

Overall, HEI would remain the same as the existing condition in three of four subwatersheds. In the Butte Subwatershed, HEI would improve incrementally due to road closures. The difference between the action alternatives and the no action alternative is considered negligible. Effects would be as discussed for Alternative 1 – No Action. No impacts to population numbers or herd distribution would be expected. Deer and elk would continue to use the Dixie Butte Wildlife Emphasis Area during the summer due to cooler

temperatures and higher stand densities that afford decreased human access and increased big game security. Total HEI ranks 1st in all four subwatersheds.

Cumulative Effects (HEI)

Elsewhere in the Middle Fork John Day Drainage, similar projects – timber harvest, prescribed burning, road closures, and/or hardwood planting and protection – are being implemented or are recommended for implementation (see Appendix C-Projects Considered for Cumulative Effects). All projects are expected to improve big game habitat in the long-term. Timber harvest, prescribed fire, and hardwood planting and protection are expected to improve forage quantity and quality. Road closures are expected to reduce disturbance to big game. Restoration of HRV in the Dry Forest types is expected to reduce the risk of catastrophic disturbances such as uncharacteristically severe wildfire and insect epidemics that could destroy large expanses of cover and forage habitat.

4.2.6.3.3—Alternative 3(HEI)

Summer Range

Overall, Alternatives 2 and 3 are similar. Alternative 3 does retain somewhat higher levels of cover habitat than Alternative 2 as can be seen by comparing cover percentages. The most important difference between these two alternatives is that Alternative 3 would not reduce satisfactory cover below *Land and Resource Management Plan* standard in the Little Boulder/Deerhorn subwatershed. This subwatershed would provide 195 acres of additional satisfactory cover, although cover conditions may not be sustainable given the bark beetle risk.

Total HEI improves or remains the same in all subwatersheds. Forage would improve, although not on the same number of acres as Alternative 2. Open road densities would decrease as timber sales and associated activities are completed; disturbance to big game would be expected to decrease accordingly. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranks 1st in five subwatersheds. HEI ranking drops in the Tincup/Little Butte and Butte subwatersheds as compared to Alternative 2.

Winter Range

In winter range, Alternatives 2 and 3 are identical. Effects would be as described for Alternative 2. Total HEI would improve or remain the same in all subwatersheds. In the Tincup/Little Butte and Granite Boulder Subwatersheds, HEI would improve significantly upon completion of road closures. Open road densities would decrease as timber sales and associated activities are completed; disturbance to big game would be expected to decrease accordingly. Winter forage would improve. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranks 1st in three subwatersheds and 2nd in one subwatershed.

Wildlife Emphasis Area

In the Dixie Butte Wildlife Emphasis Area, Alternatives 2, 3 and 4 are identical. Effects would be as described for Alternative 2. Total HEI would remain the same as the existing condition in three of four subwatersheds. In the Butte Subwatershed, HEI would improve incrementally due to road closures. The difference between these alternatives and the no action alternative is considered negligible. No impacts to population numbers or herd distribution would be expected. Deer and elk would continue to use the Dixie Butte Wildlife Emphasis Area during the summer due to cooler temperatures and higher stand densities that afford decreased human access and increased big game security. Total HEI ranks 1st in all four subwatersheds.

Cumulative Effects (HEI)

Cumulative effects would be the same as described for Alternative 2. For Alternative 3, fewer cover acres would be treated under this project, however overall trends would be similar.

4.2.6.3.4—Alternative 4(HEI)

No commercial harvest would occur, only pre-commercial thinning of small diameter trees. This effects analysis assumes pre-commercial thinning would reduce canopy cover below the 40% threshold needed to classify as marginal cover. In reality, cover may be degraded rather than eliminated.

Summer Range

Although Alternative 4 reduces cover habitat within the project area, it does so to a much lesser degree than Alternatives 2 and 3, comparing cover percentages. Cover habitat would be retained on more acres, reducing opportunities to increase/improve forage habitat. Even in treatment units, limiting tree removal to small, understory trees, may only marginally open up canopy cover.

As in Alternative 2, loss of cover may be of concern only in the Little Boulder/Deerhorn Subwatershed. Alternative 2 harvests 196 acres of satisfactory cover in this subwatershed; Alternative 4 harvest 110 acres. The satisfactory cover percentage falls from 12% to 10%, below the *Land and Resource Management Plan* standard of 12%. Harvest units 643, 644 and 646 would be pre-commercially thinned (SPC). All three units occur in mixed conifer stands on Dry Forest types. As described under Alternative 2, these stands are considered outside HRV; harvest would help move them back towards their historical condition. Hiding cover mitigation and road closures would help offset deficiencies in cover. A non-significant amendment to the *Land and Resource Management Plan* would be required to reduce cover below standard.

Total HEI improves or remains the same in all subwatersheds. Forage would improve, although not on the same number of acres as Alternatives 2 or 3. Open road densities would decrease as timber sales and associated activities are completed; disturbance to big game would be expected to decrease accordingly. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranking drops in several subwatersheds as compared to Alternatives 2 and 3; cover/forage ratios would not be as good.

Winter Range

Effects are similar to Alternatives 2 and 3. As in summer range, Alternative 4 reduces less cover habitat in winter range. Opportunities to increase or improve forage habitat are reduced. In winter range, differences between alternatives are much less than those that would occur in summer range.

Overall, HEI would improve or remain the same in all subwatersheds. In the Tincup/Little Butte and Granite Boulder Subwatersheds, HEI would improve significantly due to road closures. Open road densities would decrease as activities are completed; disturbance to big game would be expected to decrease accordingly. Winter forage would improve, although on less acres. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranking drops in several subwatersheds as compared to Alternatives 2 and 3; cover/forage ratios would not be as good.

Wildlife Emphasis Area

In the Dixie Butte Wildlife Emphasis Area, Alternatives 2, 3 and 4 are identical. Effects would be as described for Alternative 2. Total HEI would remain the same as the existing condition in three of four subwatersheds. In the Butte Subwatershed, HEI would improve incrementally due to road closures. The difference between these alternatives and the no action alternative is considered negligible. No impacts to population numbers or herd distribution would be expected. Deer and elk would continue to use the Dixie Butte Wildlife Emphasis Area during the summer due to cooler temperatures and higher stand densities that afford decreased human access and increased big game security. Total HEI ranks 1st in all four subwatersheds.

Cumulative Effects (HEI)

Cumulative effects would be the same as described for Alternative 2. For Alternative 4, fewer cover acres would be treated under this project, however overall trends would be similar.

4.2.6.3.5—Alternative 5 (HEI)

In Alternative 5, high priority is given to restoring historic vegetation conditions, in some subwatersheds, at the expense of thermal cover falling below *Land and Resource Management Plan* standards. Alternative 5 was purposely designed to increase public access, even at the expense of increasing disturbance to deer and elk.

Summer Range

Timber harvest would reduce total cover in all subwatersheds except Granite Boulder. *Land and Resource Management Plan* standards for total cover would be met in all subwatersheds except the Vincent Subwatershed, where harvest would reduce cover from 41% to 16%, below the *Land and Resource Management Plan* standard of 20%. A non-significant amendment to the *Land and Resource Management Plan* would be required to reduce cover below standard.

Satisfactory cover would be reduced in the Vincent, Vinegar and Little Boulder/Deerhorn subwatersheds, even though these subwatersheds are already at or below the *Land and Resource Management Plan* standard of 12%. Changes are described in detail below:

- In the Vincent subwatershed, all satisfactory cover, approximately 94 acres, would be entered, reducing the cover percentage from 3% to 0%. Harvest units 426, 444 and 446 would be shelterwood harvested (HSH); units 440 and 441 would be commercial thinned (HTH).
- In the Vinegar Subwatershed, about 126 acres of satisfactory cover would be entered, reducing the cover percentage from 2% to 1%. Harvest units 204, 212, 214, 216 and 218 would be shelterwood harvested (HSH).
- In the Little Boulder/Deerhorn Subwatershed, 230 acres of satisfactory cover would be entered, reducing the cover percentage from 12% to 9%. Harvest units 610, 636, 643, 644 and 646 would be commercial and precommercial thinned (HTH/SPC).

All units in satisfactory cover occur in mixed conifer or ponderosa pine stands in Dry Forest types. All stands are considered outside HRV; i.e., overstocked and likely unsustainable given the high risk of uncharacteristically severe wildfire or insect epidemics. Harvest would help move them back towards their historical condition. Hiding cover mitigation would help offset deficiencies in cover. A non-significant amendment to the *Land and Resource Management Plan* would be required to reduce cover below standard.

Open road density would increase in all subwatersheds except Granite Boulder. The Vincent subwatersheds' open road density of 3.66 miles of open road per square mile would no longer meet the *Land and Resource Management Plan* standard (3.2 miles of open road per square mile). All other subwatersheds would meet standards, but the trend is away from a desired open road density of 1.5 miles per square mile. Only two of seven subwatersheds would meet the *Land and Resource Management Plan* objective of 1.5 open road miles per square mile versus three of seven subwatersheds today. In the HEI model, all HEr values would decrease, except in the Granite Boulder subwatershed. A non-significant amendment to the *Land and Resource Management Plan* would be required to increase open road density beyond *Land and Resource Management Plan* standards.

Effects to HEI vary. Where total cover habitat is high, timber harvest would improve cover/forage ratios. In the Little Boulder/Deerhorn, Tincup/Little Butte, and Granite Boulder subwatersheds, HEI would increase over the existing condition. Forage would improve. Population numbers would likely remain about the same; herd distribution would improve. Losses in satisfactory cover in the Vinegar and Little Boulder/Deerhorn Subwatersheds would likely have minimal impact given the high percentage of total cover still remaining. HEI in the Davis/Placer subwatershed would decrease slightly due to increased road densities, however the change is insignificant.

In the Vincent subwatershed, treatments would reduce habitat effectiveness. HEI would fall below the *Land and Resource Management Plan* standard. Impacts to deer and elk would likely be greater at higher elevations where cooler temperatures and denser canopies provide some of the better summer range. Such stands also function as security and escapement cover during hunting season. Cover losses combined with increased road densities are likely to cause increased elk and deer vulnerability to poaching and harvest. Deer and elk numbers would likely decrease. Herds may move into adjacent subwatersheds with suitable amounts of cover. Impacts would be expected to last 15 to 20 years, after which time stand regeneration and an in increase in understory development would begin to provide hiding cover, increased security and relief from summer heat.

Total HEI rankings are often lower than HEI rankings for the other action alternatives.

Winter Range

Timber harvest would remove cover only in the Tincup/Little Butte and Butte Subwatersheds. *Land and Resource Management Plan* standards for cover would be met in all subwatersheds except Little Boulder/Deerhorn and Tincup/Little Butte where satisfactory cover is already deficient. In the Tincup/Little Butte subwatershed, thinning on 222 acres would reduce total cover from 31% to 22%, below the *Land and Resource Management Plan* standard of 25%. Only marginal cover would be treated, no satisfactory cover would be entered. Recommended units in marginal cover are units 23, 29, 30, 31, 39, 41, and 46. Only a portion of units 31 and 41 are in winter range. These units would be commercially thinned (HTH) and/or pre-commercially thinned (SPC). Units occur in mixed conifer or ponderosa pine stands in Dry Forest types. These stands are considered outside HRV; i.e., overstocked and likely unsustainable given the high risk of uncharacteristically severe wildfire or insect epidemics. Harvest would help move them back towards their historical condition. Hiding cover mitigation would help offset deficiencies in cover.

As in summer range, road access in winter range would be increased at the expense of increased disturbance to deer and elk. Although some roads would be closed, the general trend would be towards greater access and a more even distribution of open roads. Open road miles would increase significantly in the Little Boulder/Deerhorn and Butte Subwatersheds; these subwatersheds would no longer meet the *Land and Resource Management Plan* standard for open road density (2.2 miles of open road per square mile). Open road densities would be reduced in the Tincup/Little Butte and Granite Boulder Subwatersheds, although only the Tincup/Butte Subwatershed would meet standards. No subwatershed would meet the *Land and Resource Management Plan* objective of 1.0 open road miles per square mile. HEr values would not meet standards.

The Granite Boulder Subwatershed would not meet the total HEI standard due to high road densities. The Little Boulder/Deerhorn, Tincup/Little Butte, and Butte Subwatersheds would meet total HEI standards, primarily due to good cover/forage ratios. In reality, habitat effectiveness would probably still be low due to high road densities, particularly in the Little Boulder/Deerhorn and Butte Subwatersheds. High road densities would likely elevate vehicular traffic and increase disturbance to deer and elk. Animals would likely avoid portions of winter range, forcing herds into adjacent subwatersheds and concentrating them into smaller areas. Easy access on forest roads would also lead to reduced deer and elk escapement during hunting seasons and facilitate illegal taking of game animals. In the Tincup/Little Butte Subwatershed, reductions in cover below standards would also decrease habitat effectiveness. Total HEI rankings are often lower than HEI rankings for the other action alternatives.

Wildlife Emphasis Area

No timber harvest or prescribed fire would occur within the Dixie Butte Wildlife Emphasis Area. No roads would be closed. Open road density would remain static. Effects would be as discussed for Alternative 1 – No Action. Recommended management under Alternative 5 is nearly identical to actions recommended in Alternatives 2, 3 and 4 as well. The only difference is Alternatives 2, 3 and 4 would reduce open road density incrementally in the Butte subwatershed from 0.8 to 0.7 miles of open road per square mile.

Total HEI would remain the same as the existing condition in all four subwatersheds. The difference between the action alternatives and the no action alternative is considered negligible. Effects would be as discussed for Alternative 1 – No Action. No impacts to population numbers or herd distribution would be expected. Deer and elk would continue to use the Dixie Butte Wildlife Emphasis Area during the summer due to cooler temperatures and higher stand densities that afford decreased human access and increased big game security. Total HEI ranks 1st in all three subwatersheds, 2nd in one subwatershed due to a slightly higher open road density.

Cumulative Effects (HEI)

Cumulative effects would be similar to those described for Alternative 2. Across the Middle Fork John Day subbasin timber harvest, prescribed burning, road closures, and hardwood planting and protection are expected to improve habitat effectiveness. Only in SE Galena, where Alternative 5 prescribes more intensive treatment, are effects more variable. Additional cover acres would be treated and open road densities would generally increase rather than reduce. In some subwatersheds, habitat effectiveness would be reduced. Deer and elk may be forced to move, concentrating them in smaller areas located elsewhere in the subbasin. Given the amount of cover loss due to the Summit and Reed fires, additional reductions in habitat effectiveness may not be desirable.

4.2.6.4—Effects to Goshawks—Treatment in Post-Fledging Areas (PFAs)

Alternatives 1 and 4

For existing condition of Northern Goshawk *Accipter gentilis* see page,191.

Alternatives 1 and 4 do not enter potential fledging areas (PFAs) for timber harvest or precommercial thinning. No direct, indirect or cumulative effects to goshawks would be anticipated.

Alternatives 2, 3 and 5

Alternatives 2, 3 and 5 propose timber harvest within the Sulpher Potential Fledging Areas (PFA). Units 808 and 810, 38 acres, would be shelterwood harvested. Harvest will convert these stands from SEOC to SI (see structural stage definitions page 145). These units/stands are in the Dry Forest type and were originally harvested under Ragged Timber Sale, Unit 13, with a current canopy closure of 27%. Harvest on the timber sale thinned the stands, removing overstory ponderosa pine and retaining the grand fir. The grand fir is currently in poor condition. Harvest reentry under Southeast Galena would retain a minimum 15 to 20 trees per acre as shelter trees, predominantly ponderosa pine tree, if available. Sites would be planted with ponderosa pine. The objective of harvest is to regenerate sites to restore the seral (pine) component.

These stands currently do not provide nesting habitat for goshawks, but they likely provide foraging habitat. Timber harvest treatment would reduce canopy cover to less than 20%. Goshawk feeding habitat would likely improve. More open stand conditions would create foraging habitat that would permit this raptor to detect and acquire prey more efficiently.

The Southwestern Guide for managing goshawks (USDA 1992) recommends that PFAs be managed for the following structural stages and percentages: OFMS and YFMS at 60%, SEOC and UR at 20%, SI at 10% and grass/forbs at 10%. Harvest treatment would convert approximately 10% of the PFA to a SI structural stage; meeting distribution recommendations. Foraging habitat within the PFA should improve.

The remaining stands in the PFA have high canopy covers ranging from 45% to 77% closure; these stands will not be entered at this time.

Alternatives 2,3 and 5 do not enter the three other established PFA's for timber harvest or precommercial thinning. No direct, indirect or cumulative effects to goshawks would be anticipated.

4.2.7 TREATMENT OBJECTIVES FOR NOXIOUS WEEDS

Noxious weeds are invading the ecosystem and displacing native species.

*See **1.2.2.7 Desired Condition: Noxious Weeds** page 28; **ISSUE 1.4.8—Effects of Toxic Chemicals** page 32; and **3.2.7—Noxious Weeds** , page 203 4.3.8.3—Noxious Weeds, page392.*

Table 155 Noxious Weeds

Statement of Need	Desired Restorative Outcome or objective
A need exists to control populations of noxious weeds while enhancing the vigor of native vegetation to reduce future weed infestations.	The landscape is free of noxious weeds and native vegetation is vigorous and resistant to future weed invasion.

Effects by Alternative

The result of ineffective noxious weed control is an increase in numbers of noxious plants, and of acreage adversely affected by their presence. As noxious weeds increase, they displace native vegetation. Eliminating as many weed seed sources as possible will help slow this process. The rate at which it progresses varies depending on the species involved, the weather, amounts of moisture available, competition from surrounding plants, amount of canopy cover, winds, presence of animal "carriers", soil types, amounts and degree of soil disturbance, etc. Accurate forecasts of the spread rates of weeds are virtually impossible to make; however, relative rates for the alternatives can be projected based on the most predictable factor - relative amounts of disturbance.

It should be recognized that infestation by noxious weeds does not necessarily follow the creation of newly disturbed seedbeds. Disturbance has been on-going for over 100 years, and at this point in time, the MFJD watershed has a total of 67.3 acres of inventoried noxious weeds, scattered over more than 200,000 acres.

4.2.7.1—Alternative 1

Direct /Indirect Effects

There are no direct effects with this alternative. Under the No Action alternative, the district would continue monitoring of newer noxious weed sites as funding allows. Populations included in the *2000 Malheur National Forest Noxious Weed Environmental Assessment* would be treated as analyzed in that document. All of the newer weed infestations would persist, enlarge, and/or spread seed to new locations, displacing an ever-enlarging area of native vegetation.

There is no issue of chemical risk to the ecosystem or to understory vegetation with this alternative.

Without road construction, reconstruction, logging, or prescribed burning, new habitat for noxious weeds will be limited to natural burn areas and ground disturbance by cattle, wildlife, and off-road vehicle travel. Existing road size will remain the largest proportion of susceptible habitat.

If severe wildfires occur in areas of heavy fuel loading, large patches of un-vegetated habitat, including fire lines, will provide prime opportunities for establishment of noxious weeds, which are likely to spread quickly to the newly disturbed soils. Early seral plant communities with little or no canopy cover will favor the rapid expansion of such populations, requiring intensive and expensive eradication measures.

As weeds spread, excluding native plant species, cover vegetation could decrease in diversity as well as in moisture and soil-holding capacity, and run-off and sedimentation rates could increase. As soil horizons are lost following a decrease in root structure, so is the likelihood of restoring the native species.

Disturbed areas are always the most susceptible to infestation by noxious weeds. Therefore the avoidance of ground and vegetative disturbance with this alternative reduces the likelihood of new populations establishing, even with the persistence of local weed seed sources that is likely without herbicide use. Wildfire, on the other hand, would probably increase the rate of weed spread, depending on severity of the burn.

Grazing can create small areas of ground disturbance and compact the soils, favoring the spread of weedy plants. It can weaken the root systems of native plants, as well as decreasing the aboveground biomass that the plants provide. This combination opens niches that several noxious weed species are able to exploit to become established. Cattle, as well as wild ungulates, can act as seed "carriers", spreading weed seed from areas of initial infestation to distant sites that offer susceptible habitat. Grazing practices are the same across all alternatives for this project.

The *Noxious Weed EA* specifies chemical treatment of several known noxious weed populations within these subwatersheds for a total of 35.3 acres within the project area (see Table 157, page 323). The area of herbicide use by Grant County along Highway 20 totals approximately 9.5 acres, all within the road prism of the highway. Alternative one does not increase cumulative effects of chemicals to those subwatersheds.

The cost and logistics of treating weed populations manually decrease the likelihood of effective containment in the long run, compared to treating with herbicides. Lack of effective containment may lead to expansion of both numbers and size of infestations, resulting in a "snowball" effect on both expense and inefficacy of future treatments. The time scale of this trend is unpredictable, as it involves numerous variables. Long-term productivity of non-forest lands, as well as biodiversity, is likely to decrease as exotic species increase.

Failure to eradicate existing weed populations within this project area could offset the effects of treatments under the *Noxious Weed EA*, allowing untreated populations to re-infest the treated areas. In the long run, this could offset the effort and expense of eradication efforts within the watershed, and add to the burden of off-forest weed seed that will inevitably initiate new infestations.

Cumulative Effects

The potential disturbance in the Middle Fork of the John Day River area would be fewer than those in the recommended action by 32,730 acres.

Acres of disturbance for the future Northwest Galena analysis area were estimated at the same percentage of total as is recommended for Southeast Galena.

Table 156— Middle Fork of the John Day River (MFJD) potential disturbance acres Alternative 1.

MFJD Watershed Acres	Crawford	Olmstead	Southeast Galena (Alt 1)	Summit Fire	Northwest Galena	Total Disturbance Acres
200,910	18,540	5,080 (less roads)	0	30,000	29,800	83,420

Effects Common to all Action Alternatives

Direct /Indirect Effects

There are no direct effects common to all the action alternatives. The major effect to understory vegetation of all the action alternatives comes from an increase in ground disturbance. While the amount of disturbance will vary according to the particular alternative (see table below), in all cases the disturbance increases the potential seedbed for noxious weed establishment over the No Action alternative.

A less drastic effect common to all the action alternatives is the decrease in canopy cover (vegetation disturbance), which varies in degree according to the particular prescription. Decreases in overstory

shading increase potential weed habitat, at least temporarily, although not to the same extent as soil disturbance.

To the degree that the action alternatives decrease the risk of uncharacteristically severe wildfires, the potential for new seedbeds for weed establishment and spread are also reduced. Although harvest activities do create ground disturbance, the affected acreage is both appreciably smaller and notably more accessible to treatment than the acreage potentially disturbed by a large, severe wildfire. While prescribed fires may offer limited, patchy seedbeds for noxious species, resulting invigoration of native understory plants by fire would increase competition with any invading weeds and largely offset negative effects of the burning.

Total acres to be treated offer a general measure for comparison of relative disturbance for the 5 alternatives. Reconstructed or newly constructed roads and trails, dispersed campsites, and logging units, respectively, provide the most suitable habitats for noxious weed increase (see table below).

Because the trend of introduction of weed seed from surrounding lands is increasing over time, disturbed areas will increase in susceptibility to infestation by noxious species. Ground disturbance increases the likelihood of new populations establishing for 2 to 3 years after the disturbance, or until the ground is successfully re-vegetated. Decreases in canopy cover will further increase the likelihood of new weed populations establishing and spreading.

Cumulative Effects

Past grazing practices have removed biological soil crusts and altered the native ground vegetation from pre-European conditions, allowing noxious weeds to establish, and predisposing much of the landscape to weed invasion and spread throughout the Middle Fork John Day watershed. Past road and railroad construction and mining activities have altered soil horizons, and have exposed mineral soil and tailings that can support only early seral forbs and grasses that are easily out-competed by noxious weeds.

Grazing can create small areas of ground disturbance, and also compact soils, thus favoring the spread of weedy plants. It can weaken the root systems of native plants, as well as decreasing the aboveground biomass that the plants provide. This combination opens niches that several noxious weed species are able to exploit to become established. Cattle, as well as wild ungulates, can act as seed “carriers”, spreading weed seed from areas of initial infestation to distant sites that offer susceptible habitat. Grazing practices are the same across all alternatives for this project.

The Summit Fire of 1996 not only eliminated all canopy cover from approximately 30,000 acres; it also severely burned the soils on approximately 7,000 of those acres, opening large tracts to potential noxious weed establishment. Several new infestations have been found within its boundaries since the fire. While much of the burn is re-vegetating rapidly, there are still areas on which native plants have not re-established, probably due to the localized severity of the fire, and these areas remain susceptible to noxious weed infestation.

Within the analysis area, recent logging on the Moe Timber sale has created areas of ground disturbance on skid trails and landings. Canopy loss is creating some vegetation disturbance as well. Road maintenance on Highway 20, as well as on Forest Service roads, produces narrow corridors of on-going disturbance that are highly susceptible to noxious weed invasion.

The adjacent Crawford project proposes road construction and reconstruction, commercial logging, and prescribed burning, all involving soil disturbance. Future watershed restoration efforts in the northwestern portion of the Middle Fork drainage (NW Galena project area) will likely involve similar activities.

Grant County annually applies a mix of herbicides in 4 foot wide bands on either side of the pavement along portions of the Highway 20 road corridor. The total area treated by the county is approximately 9.5 acres, along 19 miles of roadway.

The potential deleterious effects of weed infestations related to recommended , past, ongoing, and future ground-disturbing activities are tied to the scale of ground disturbance and vegetation disturbance resulting from all these activities.

Table 157below shows total acres subject to vegetative disturbance by projects within the MFJD (including the Upper MFJD) watershed from about 1996 through 2010, using Alternative 2.

Acres for the future Northwest Galena analysis area are estimated at the same percentage of total as is recommended for Southeast Galena.

4.2.7.2—Alternative 2

Direct Effects

1.5 acres will be subject to wick or spot application of herbicide to noxious weed plants, with the expectation that all of the 6 populations involved will be eliminated in 2 to 5 years. 0.4 acres of weeds will be treated manually, with the expectation that the 4 populations involved will be reduced in size, and prevented from setting and dispersing seed during all years that they are treated. These populations may not be completely eliminated, and will likely require long term monitoring. Very small areas of ground disturbance will accompany the pulling or grubbing of weeds at the 4 manual treatment sites.

Indirect Effects

Spread of weeds from the sites treated with herbicide will be eliminated, and from sites treated manually will decrease drastically. At the same time, 22,140 acres will be subject to ground and/or vegetation disturbing activities, creating seedbeds that could be infested from seed sources either outside the project area, or simply not identified yet within the project area.

Combining acres with those from the *Noxious Weed EA*, which will be treated simultaneously, the total acres to be chemically treated for noxious weeds within each of the affected subwatersheds are shown in the following table.

Table 157 Chemical Treatment Areas

SWS NAME	Noxious Weed EA ACRES	SE GALENA ACRES	TOTAL ACRES
Bridge	2	0	2
Davis/Placer	0.3	0	0.3
Vinegar	12.2	0	12.2
Vincent	7.4	0	7.4
Little Boulder	7.2	0	7.2
Tincup	2.3	0.1	2.4
Butte	0.9	1.2	2.1
Granite Boulder	1.6	0	1.6
Beaver/Ruby	1.2	0.1	1.3
Dry/Sunshine	0.2	0.1	0.3

EA Acres include all sites to receive chemical treatment under the Weed EA.

SE Gal Acres are all those analyzed for chemical treatment in this document.

Cumulative Effects

Ground and vegetation disturbance within the watershed over 14 years may be as high as 58% of the total acres.

The trend for noxious weed populations is one of increasing numbers and increasing size. The risk of noxious weed invasion within the analysis area is amplified and accelerated by the recommended activities in direct proportion to the amount of ground disturbance associated with the alternative. This one proposes the second largest number of disturbance acres of any of the action alternatives.

Table 158—MFJD Potential Disturbance Acres—Alternative 2

MFJD Watershed Acres	Crawford	Olmstead	Southeast Galena (Alt 2)	Summit Fire	Northwest Galena	Total Disturbance Acres
200,910	18,540	5,080 (less roads)	22,140	30,000	29,800	106,560

4.2.7.3—Alternative 3

Direct Effects

Under this alternative, the district will continue monitoring and containment by hand of newer noxious weed sites as funding allows. (Populations included in the *Noxious Weed EA* will be treated as analyzed in that document.)

Alternative 3 will have no chemical effects from noxious weed treatment. Very small areas of ground disturbance will accompany the pulling or grubbing of weeds.

Indirect Effects

Because manual treatment methods are not always effective, some of the newer weed infestations are likely to persist, enlarge, and/or spread seed to new locations. Spread of known populations will be slower, and amount of seed dispersed will be less, than in the no action alternative, but both may continue if the infestations cannot be eliminated. The need for monitoring and hand treatment will continue into the foreseeable future. 18,970 acres will be subject to ground and/or vegetation disturbing activities, opening potential seedbeds for noxious species.

Cumulative Effects

Ground and vegetation disturbance within the watershed over 14 years may be as high as 57% of the total acres.

The trend for noxious weed populations is one of increasing numbers and increasing size. The risk of noxious weed invasion within the analysis area is amplified and accelerated by the recommended activities in direct proportion to the amount of ground disturbance associated with the alternative. This one proposes the third largest number of disturbance acres of any of the action alternatives.

Table 159—MFJD Potential Disturbance Acres—Alternative 3

MFJD Watershed Acres	Crawford	Olmstead	Southeast Galena (Alt 3)	Summit Fire	Northwest Galena	Total Disturbance Acres
200,910	18,540	5,080 (less roads)	18,970	30,000	29,800	102,390

4.2.7.4—Alternative 4

Direct Effects

Under this alternative, the district will continue monitoring and containment by hand of newer noxious weed sites as funding allows. (Populations included in the noxious *Noxious Weed EA* will be treated as analyzed in that document.)

Alternative 4 will have no chemical effects from noxious weed treatment. Very small areas of ground disturbance will accompany the pulling or grubbing of weeds.

Indirect Effects

Because manual treatment methods are not always effective, some of the newer weed infestations are likely to persist, enlarge, and/or spread seed to new locations. Spread of known populations will be slower, and amount of seed dispersed will be less, than in the no action alternative, but both may continue if the infestations cannot be eliminated. The need for monitoring and hand treatment will continue into the foreseeable future. 20,010 acres will be subject to ground and/or vegetation disturbing activities, opening potential seedbeds for noxious species.

Cumulative Effects

Ground and vegetation disturbance within the watershed over 14 years may be as high as 53% of the total acres.

The trend for noxious weed populations is one of increasing numbers and increasing size. The risk of noxious weed invasion within the analysis area is amplified and accelerated by the recommended activities in direct proportion to the amount of ground disturbance associated with the alternative. This one proposes the third largest number of disturbance acres of any of the action alternatives.

Table 160—MFJD Potential Disturbance Acres—Alternative 4

MFJD Watershed Acres	Crawford	Olmstead	Southeast Galena (Alt 4)	Summit Fire	Northwest Galena	Total Disturbance Acres
200,910	18,540	5,080 (less roads)	20,010	30,000	29,800	103,430

4.2.7.5—Alternative 5

Direct Effects

This alternative proposes chemical treatment of 6 weed sites totaling 1.5 acres.

1.5 acres will be subject to wick or spot application of herbicide to noxious weed plants, with the expectation that all of the 6 populations involved will be eliminated in 2 to 5 years. 0.4 acres of weeds will be treated manually, with the expectation that the 4 populations involved will be reduced in size, and prevented from setting and dispersing seed during all years that they are treated. These populations may not be completely eliminated, and will likely require long term monitoring. Very small areas of ground disturbance will accompany the pulling or grubbing of weeds at the 4 manual treatment sites.

Indirect Effects

Spread of weeds from the sites treated with herbicide will be eliminated, and from sites treated manually will decrease drastically. 23,150 acres will be subject to ground and/or vegetation disturbing activities, creating seedbeds that could be infested from seed sources either outside the project area, or simply not identified yet within the project area.

Combining acres with those from the *Noxious Weed EA*, which will be treated simultaneously, the total acres to be chemically treated for weeds within each of the affected subwatersheds are the same as for Alternative 2.

Cumulative Effects

Ground and vegetation disturbance within the watershed over 14 years may be as high as 58% of the total acres.

The trend for noxious weed populations is one of increasing numbers and increasing size. The risk of noxious weed invasion within the analysis area is amplified and accelerated by the recommended activities in direct proportion to the amount of ground disturbance associated with the alternative. This one proposes the third largest number of disturbance acres of any of the action alternatives.

Table 161—MFJD Potential Disturbance Acres—Alternative 5

MFJD Watershed Acres	Crawford	Olmstead	Southeast Galena (Alt 5)	Summit Fire	Northwest Galena	Total Disturbance Acres
200,910	18,540	5,080 (less roads)	23,150	30,000	29,800	106,570

4.2.7.6—Effects to Culturally Significant Plants

Two of the ten sites analyzed for chemical treatment occur near known populations of edible plant species of cultural significance, however the small areas to be treated with herbicide would not affect the edible plants. Site 300726 near the junction of Highway 20 and the 4550 Road is small (a total of less than 0.1 acres), and, because it is in the riparian area, will be treated only with direct wick or spot application of herbicide. Such application precludes any problem of drift or air movement of herbicide. The nearby chokecherry stand starts more than 300 feet away from the noxious weed population, with numerous intervening riparian shrubs, and would not be affected by treatment of the weeds.

The second site occurs on an upland scab that supports biscuitroots (*Lomatium species*) and probably yampah (*Perideridia species*). However, this population of St. Johnswort consists of only one small group of plants covering less than a square yard, and its treatment by spot herbicide application would, at most, affect other plants within the square yard treatment area. Main concentrations of the edible root crops are several hundred feet from the weed site.

There will be no direct, indirect, or cumulative effect to culturally significant plants.

4.2.7.7—Effects to Sensitive Plant Species

No populations of plant species designated as sensitive on the Forest Service Region 6 Sensitive Species List, 1999, have been found in areas adjacent to noxious weed sites. Only one of the weed treatment sites occurs in potential habitat for sensitive plants. That site is #300732, and contains a few plants of St. Johnswort (*Hypericum perforatum*) occupying approximately one square yard of upland dry scab that could potentially support Henderson's ricegrass (*Achnatherum hendersonii/wallowensis*). Surveys of the area have not documented any populations of the ricegrass, or of any other sensitive plant species.

Treatment of noxious weed populations will have no effect on any sensitive plant species.

4.3—PREDICTED EFFECTS ON RELEVANT RESOURCES OF ALL ALTERNATIVES—BY ISSUE

*Issues are described in detail in Chapter 1.0 in section **1.4 Issues Studied in Detail**, page 30.*

4.3.1—ISSUE 1.4.1—RESTRICTED ACCESS

*The Agency's recommended action to decommission and close some roads will reduce motorized access within the project area. See **ISSUE 1.4.1—Restricted Access**, page 30 and* Appedix G--Roads Analysis.

BACKGROUND

Alternatives 2, 3, and 4, (see Chapter 2.0 Alternatives Considered in Detail, page, 44) display essentially the same access plan for the Southeast Galena Restoration Project Area. Included in this analysis are proposals to construct, reconstruct, decommission, and close roads. These alternatives do not provide access to the Deerhorn and Little Butte subwatersheds. The existing transportation system within these two subwatersheds would be decommissioned with the implementation of any of these alternatives.

Alternative 5 displays the same considerations but includes additional lands accessed by new roads compared to Alternatives 2, 3, and 4. Alternative 5 provides access to the Deerhorn and Little Butte subwatersheds by proposing a connector road off of Forest Road 2614452. Additional roads would also be left open for motor vehicle travel by users and for management of National Forest lands.

ALTERNATIVE 1—Restricted Access

Overall road density and open road density would remain the same as they are currently. No changes or new restrictions to roads, trails, or dispersed camping sites would occur under this alternative.

Safety concerns associated with the use of the Davis Creek Trail by ATVs would continue causing potential conflicts and hazards with other users.

Ecological values associated with fish, terrestrial and plant habitats and associated populations of species, water quality, vegetation and fire regimes would continue in an undesirable condition. The risk of wildfires resulting from overstocked stand conditions will continue to increase.

The existing road system provides relatively rapid access for ground based fire suppression forces to manage wildfires for about two thirds of the area and most of the roads in this area can be utilized as fire breaks due to locations and fuel types present. However, a large portion of the area south of the Middle Fork has native surface roads that are narrow and deeply rutted. Many of these roads are not safely drivable making it dangerous to conduct prescribed burning or suppression activities in much of that area.

About one third the project area is not accessible for fuels management activities due to lack of roads. The areas with no roads, or those areas with narrow roads not passable for most types of vehicles, can be staffed with smoke jumpers or helitack crews, provided these types of crews are available and use of helicopters and airplanes can be utilized to drop water or retardant. However, if an extended attack is needed it will remain difficult to staff fires or to bring in equipment and the result would be fire suppression at a reduced capacity and larger fires are likely to result because this portion of the project area is unroaded.

ALTERNATIVES 2, 3, & 4—Restricted Access

Open road miles inside the project area would decrease from about 132 miles to about 91 miles for Alternatives 2 and 3, and to 89 miles in Alternative 4. Open road density for the project area will have

decreased from 1.71 to about 1.18 miles per square mile for Alternatives 2 and 3, and slightly lower for Alternative 4.

These changes would result in a decrease in road maintenance funding needs because of the reduction in both open road miles and total road miles. Decommissioning work will produce some contracting and employment opportunities, which could support some locally available skills and equipment over the next 10 years.

Average daily traffic (ADT) numbers on virtually all roads that remain open would be higher, because of a moderate increase in the amount of recreational and other use will result in more traffic using a smaller amount of open road miles.

People who prefer more primitive and non-motorized settings will be positively affected by decreases in the quantity of motorized access, while those that prefer more motorized uses will be negatively affected. Decommissioning of existing open roads would decrease motorized access for recreation experiences and non-timber forest products gathering, but would increase the quality of recreational activities for those seeking non-motorized experiences.

These alternatives would not provide any motorized access to the Little Butte Creek drainage and the west half of the Deerhorn Creek drainage except for the existing Davis Creek ATV trail.

Closing the Davis Creek Trail to OHV use under Alternative 4 would eliminate motorized use of the area and displace ATV users. Non-motorized use would be enhanced for hikers, horseback riders and mountain bikers. These activities would have no effect on cross-country skiers or snowmobile use.

In Alternatives 2 and 3, improvements in the safety and quality of the trail conditions and facilities associated with the Davis Creek trail and increases in access to the Blackeye Trail and other adjoining trails in the Scenic Area, would increase the quality of the dispersed recreation experience for hiking, wildlife viewing, mushroom collection, horn hunting, and ATV use.

Relocation of dispersed campsites or converting these sites to day use would displace some users but also would reduce resource impacts. Some users would potentially be displaced due to the change in location and their perception of the need for change. Dispersal of current and increased use in the area would increase social encounters and decreases in quality of semi-primitive experience. Some use would potentially be displaced from the area due to this perception of change in quality. Motorized dispersed camping opportunities along FR4559 would be eliminated.

Under all of these alternatives, reductions in open and total road miles, and particularly reductions in RHCA miles, would provide improvements in water quality, fish habitat, and wildlife habitat. In the long-term (10 years+), the revegetated appearance of decommissioned roads would increase people's perception of the ecological value of the area. Moving dispersed campsites away from riparian zones would also improve fisheries and wildlife habitat.

The improvements to the open and closed road system would provide improved access for ground based fire suppression forces to manage wildfires for about two thirds of the area. Most of these roads could be utilized as fire breaks due to locations and fuel types present.

About one third the project area will remain relatively inaccessible for fuels management and wildfire suppression activities due to lack of roads. The areas with no roads can be staffed with smoke jumpers or helitack crews, provided they are available and use of helicopters and airplanes can be utilized to drop water or retardant. However, if extended attack is needed or if project fires are in these areas, it will remain difficult to staff fires or to bring in equipment. The result is a restricted capacity to suppress fires, and larger fires are more likely to result.

These alternatives are not expected to significantly affect range resources, but decommissioning roads used by livestock for driveways would slow herding and increase the time a permittee spends managing and moving livestock.

ALTERNATIVE 5—Restricted Access

Open road miles would increase from about 132 miles to about 164 miles. Open road density for the project area will have increased from 1.71 miles to about 2.2 miles per square mile.

Over the long term (beyond 10 years), these changes would result in an increase in road maintenance funding needs because of the increase in open road miles, despite a decrease in total road miles. Decommissioning work will produce some contracting and employment opportunities, which could support some locally available skills and equipment over the next 10 years

Average daily traffic (ADT) numbers on local roads that remain open will be lower at least in the short-term, because despite a moderate increase in recreational and other uses, the amount of traffic will be dispersed over a larger number of open road miles.

People who prefer more motorized uses and settings will be positively affected by increases in the quantity and quality of motorized access, while those preferring more primitive uses and non-motorized settings will be negatively affected. Decommissioning of existing open roads would decrease motorized access for recreation experiences and non-timber forest products gathering in a few areas, but in those areas the quality of recreational activities for those seeking non-motorized experiences would be increased.

Alternative 5 would provide the most potential benefit to elderly or disabled people, or low-income groups that prefer or require motorized access to participate in recreational activities such as hunting, dispersed camping, subsistence firewood gathering, or collection of non-timber forest products.

Closing and decommissioning of existing roads would decrease motorized access for dispersed driving and camping and increase hunting experience for hikers and other users of seeking non-motorized experiences.

This alternative would provide motorized access to the Little Butte Creek drainage and the west half of the Deerhorn Creek drainage in addition to the existing Davis Creek ATV trail.

In this alternative, improvements in the safety and quality of the trail conditions and facilities associated with the Davis Creek trail and increases in access to the Blackeye Trail and other adjoining trails in the Scenic Area, would increase the quality of the dispersed recreation experience for hiking, wildlife viewing, mushroom collection, horn hunting, and ATV use.

Relocation of dispersed campsites or converting these sites to day use would displace some users but also would reduce resource impacts. Some users would potentially be displaced due to the change in location and their perception of the need for change. Dispersal of current and increased use in the area would increase social encounters and decreases in quality of semi-primitive experience. Some use would potentially be displaced from the area due to this perception of change in quality. Motorized dispersed camping opportunities along FR4559 would be eliminated.

The improvements to the open and closed road system would provide improved access for ground based fire suppression forces to manage wildfires for about two thirds of the area. Most of these roads could be utilized as fire breaks due to locations and fuel types present.

The amount of the project area that remains relatively inaccessible for fuels management and wildfire suppression activities due to lack of roads would be reduced by about 2500 acres. The areas with no roads can be staffed with smoke jumpers or helitack crews, provided they are available and use of helicopters and airplanes can be utilized to drop water or retardant. However, if extended attack is needed or if project fires are in these areas, it will remain difficult to staff the fires or to bring in equipment. The result is a restricted capacity to suppress fires, and larger fires are more likely to result.

These alternatives are not expected to significantly affect range resources, but decommissioning roads used by livestock for driveways would slow herding and increase the permittee's time managing and moving livestock.

4.3.2—ISSUE 1.4.2—EFFECTS OF ALL TERRAIN VEHICLE (ATV) USE

The Agency's proposal is inadequate in addressing ATV use that is causing resource damage, especially within RHCAs. See Chapter 1.0 ISSUE 1.4.2—Effects of All Terrain Vehicle (ATV) use page 31.

BACKGROUND

The Notice of Intent (NOI) initiating this analysis did not clearly describe the recommended actions concerning ATV use. The description of the recommended action was modified in C0hapter 1 to clearly define the actions. The issue is twofold: 1) ATV use on existing trails and 2) cro ss country use of ATVs. In the past 10 years, the number of off-highway vehicles accessing the area has increased due to greater interest in horn hunting, mushroom collecting, pleasure driving, and hunting. Most of these activities are adjacent to or within the stream course. Many areas are now being impacted from this increased use, especially during wet seasons. Cross-country ATV travel is impacting streams and riparian areas by channeling water and sediment and increasing width to depth ratios in fish bearing reaches. Travel across moist and wet meadows is causing compaction and other soil damage. One trail in particular, the Davis Creek Trail (Forest Trail #244), extends from Davis Creek to Butte Creek. This trail is open to motorcycles, ATVs, horseback riders, and hikers. The condition and location of Trail 244 near the end of the Road 2614 and Trail 244 is impacting a segment of Davis Creek. Current use is causing bank instability, sediment input and contains at least one crossing in a fish bearing reach.

Forest Service resource specialists are concerned about Butte Creek and Davis Creek which contain threatened species, summer-run steelhead, a sensitive species, redband trout, and are listed as historic bull trout streams (bull trout occupied prior to 1990).

ALTERNATIVE 1—Effects of ATV use

No changes would be made to the Davis Creek Trail. Increased trail use and cross-country travel is expected to exacerbate chronic disturbances. Use of 6 unimproved stream crossings and trails in RHCAs would continue to channel water and sediment to Butte, Davis and Placer Creeks and degrade stream baseline conditions. This would impact fish and fish habitat.

Impacts to fish and to fish habitat include disturbance of spawning activities of fall spawning fish (bull trout), direct damage to redds, sediment covering redds before eggs hatch, disturbance to rearing of both juveniles and to adult fish, and sediment influx in both wet and dry conditions from ATV usage in and around the stream. Suspended sediments caused from bank erosion of recreational trails can also negatively affect rearing salmonids.

No effects are expected beyond direct and indirect effects to fish in project area streams or in the Middle Fork John Day River and baseline condition listed above. Risk that stream bank and stream bed at crossings would be modified by motorized vehicles use remains elevated compared to a pristine condition and contributes to the overall chronic disturbance in the project area.

Alternatives 2 and 3— Effects of ATV use

Several chronic sediment sources to three streams would be reduced by the construction of trail/road improvements (where ATV trail segments are located on roads) or by relocation of trail segments. The ford on Placer Gulch will be improved by constructing a bridge of appropriate width for ATVs. The Davis Creek ford on Road 2614, currently open to highway vehicles and ATVs, would be replaced with a bridge. The streamside (Davis Creek) section of Road 2614/Trail 244 would be improved. An additional, unofficial streamside trail segment and ford near the end of Road 2614, currently used only by ATVs because of a

short blockage of natural regeneration and down logs, would be removed with decommission of that portion of Road 2614 under the ATM plan. Reconstruction of 9 trail bridges 6 rock fords where fords or bridges designed for motorcycles exist would reduce sediment input to Davis Creek and the tributaries of this stream. Portions of the Davis Creek Trail would be relocated out of the Butte Creek RHCA and the segments currently in the RHCA would be decommissioned (see Table 162 Trailheads, stream crossings miles of ATV trails improved by Alternative, page 331). Three stream crossings (fords) on fish-bearing segments of Butte Creek would be removed and stream banks rehabilitated and 2 fords at intermittent crossings would be constructed when the trail is relocated.

Sediment inputs to streams during bridge construction are expected to be equivalent to that created by the current use of the ford in one year. Sediment inputs to streams are expected to be reduced up to 90% over the long term (after year one when the banks stabilize) with use of the trail bridges.

The Davis Creek trailhead (on Butte Creek) and beginning portion of the trail along with 3 fords would be removed from the riparian area and relocated (constructed) upslope off Road 2050-020. The old trail will be blocked at the existing barricade with additional boulders and planted with native hardwoods and conifers to make it visually blend with the surrounding landscape to stop further motorized use. This new trail will not enter fish bearing RHCAs. Two crossings of intermittent streams and associated RHCAs would be constructed with mitigation measures such as waterbars, rocking, trail bridges, culverts and energy dissipating structures to minimize effects. Reducing the number of crossings, relocating crossings and improving those recommended for future use are expected to reduce sedimentation, bank damage and risk of detrimental modification of stream channel morphology after year one. No sediment is expected to reach fish bearing portions of Butte Creek from the construction or use of the new trail.

ATVs are currently using the trail, which was originally designed for motorcycle and non-motorized use. The trail would be widened to 62 inches to accommodate ATV use. Since the trail is already being used by ATVs, reconstruction to trail standards at the new width is expected to mitigate soil disturbance and damage that has already occurred and would be likely to worsen without reconstruction. Trailheads would be enlarged and developed with proper drainage and hardened to reduce watershed impacts. Alternative 5 includes measures that would address this segment of the trail in the same manner.

The direct deposition of gas and lubricants to streams from leaking motorized vehicles and risk of larger spills would likely be reduced with these alternatives. Posting signs at trailheads requesting ATV users to utilize trail bridges and avoid instream ATV use is expected to reduce impacts to the stream course. The potential for harassment of listed fish would likely be reduced with these action alternatives.

Table 162 Trailheads, stream crossings miles of ATV trails improved by Alternative

Improvements	Alternatives 2 & 3	Alternative 4	Alternative 5
Improved or relocated trailheads	2	0	2
Number of improved stream crossings	15	1	15
Number of relocated stream crossings	3	1	3
Miles of ATV trails improved and upgraded	8.3	0	8.3

Information would be posted at trailheads concerning cross county use of off-road vehicles and the potential resource impacts under all action alternatives. A larger scale planning process is beginning to address the issue of ATV use on National Forest land that is beyond the scope of this analysis. Strategies and direction from that effort would be incorporated as it becomes available.

The effects of ATV use on fish and fish habitat will be reduced with these alternatives and result in an upward trend.

Cumulative effects to the Middle Fork John Day River would not likely change drastically as ATV use is a small impact relative to effects of all other activities taking place in the analysis area. Risk that stream bank and bed at crossings would be modified by motorized vehicles use remains elevated compared to a pristine condition and contributes to the overall chronic disturbance in the project area.

ALTERNATIVE 4—Effects of ATV use

Alternative 4 would differ by reclassifying the existing trail to horse and foot traffic only with no reconstruction. Reclassifying the trail would require a *Land and Resource Management Plan* amendment. Soil disturbance and damage that has already occurred under ATV use would be likely to worsen without reconstruction. Additional sedimentation and compaction caused by active ATV use is expected to be eliminated. The Davis Creek ford on Road 2614, currently open to highway vehicles and ATVs, would be replaced with a bridge with effects similar to those described for Alternatives 2 and 3.

Horse use in wet weather or when intermittent streams are flowing is expected to cause some disturbance, such as localized sedimentation and bank trampling near stream-trail crossings, except at the improved Davis Creek/2614 crossing. There would still be some sedimentation and bank sloughing at the unimproved crossings, caused mainly from horses, but most of the damage will be minimized because of no ATV usage.

The direct deposition of gas and lubricants to streams from motorized vehicles using the trail will be eliminated.

This alternative will be beneficial to fish and to fish habitat because it will likely reduce the sedimentation and bank sloughing caused by ATV use. Generally, under this Alternative the contribution to chronic disturbance is expected to be the smallest of the Action Alternatives. Loss of access to a maintained motorized trail in this area is expected to result in increased cross-country travel and effects would be similar in nature to those described for Alternatives 2 and 3 or greater because there are no area closures planned with this alternative.

Since ATV use is not expected to change the Middle Fork John Day River under Alternatives 2 and 3, the change to lighter foot and horse use is also not expected to modify the river channel. There would be no potential for motorized vehicles to adversely affect stream crossings. A lower risk that stream bank and bed at crossings would be modified is associated with horses and hikers; this risk level is slightly elevated compared to the undisturbed condition and trail use would contribute to the overall chronic disturbance in the project area.

ALTERNATIVE 5— Effects of ATV use

The effects of Alternative 5 for the relocation of the Davis Creek Motorized Trail are similar to those described for Alternatives 2 and 3. Additional soil disturbance, in the form of compaction, loss of ground cover, and risk of concentration of surface flow, is expected to occur on the segment of recommended new trail in the Deerhorn subwatershed. The effects of cross-country ATV use would be similar to those described for Alternatives 2 and 3.

The loop portion of the Davis trail would utilize existing roads except at the west terminus of Road 452 in the Deerhorn subwatershed. It would also utilize a road segment constructed for timber activities under this alternative. A section of trail would be constructed to connect the road segments into a loop. The impacts of the road are discussed in the peak flow, water quality, fish habitat needs sections and under issue 4.3.3 (Harvest Activity and Road Construction Affect Aquatics and Hydrology). The risk of impacts is greater with this alternative than any other alternative due to continued use of this crossing.

The direct deposition of gas and lubricants to streams from leaking motorized vehicles will likely be reduced except at the new crossing in the Deerhorn subwatershed. The deposition of sediment, continuation of bank damage as well as the potential for harassment of listed fish will likely be reduced with this alternative. This would be an improvement for fish and fish habitat baseline conditions.

This new trail segment is expected to contribute to the overall chronic disturbance of the project area, creating additional points where soil disturbance may become connected to form larger disturbances which may result in erosion of ephemeral draws and the conversion of ephemeral draws to intermittent streams according to the PACFISH definition.

The Middle Fork John Day River would not likely change drastically as ATV use is a small impact relative to effects of all other activities taking place in the project area. Risk that stream banks and bed at crossing would be modified by motorized vehicles use remains elevated compared to the undisturbed condition and contributes to the chronic disturbance in the project area.

Comparison of Alternatives— Effects of ATV use

Alternative 1 does not alleviate any of the problems ATVs are currently causing in the analysis area. Alternatives 2 and 3 eliminate most impacts caused by. Alternative 5 has greater impacts associated with development and continue use of the stream crossing at Deerhorn Creek. Otherwise, it is identical to Alternatives 2 and 3. While there would be some small, short term impacts associated with trail relocation, much of the disturbance is in upland areas. Alternative 4 reduces impacts by ATVs on trails crossing fish bearing streams by changing use to foot and horse travel only. Under Alternative 4 only one stream crossing, in conjunction with road reconstruction, is improved. Alternative 4 does not address the overall need for controlled ATV use opportunities in the project area and may promote expanded cross-country use.

4.3.3—ISSUE 1.4.3—EFFECTS OF GROUND BASED SYSTEMS

The Agency's recommended action of tree harvest with associated activities (new roads) would cause unnecessary damage to the hydrologic function of the area's soils and streams. See ISSUE 1.4.3—Effects of Ground Based Systems, page 31.

There are numerous impacts that influence hydrologic processes. The effects on many of these were discussed in Section 4.2.3 Water Quantity Need. Harvest and related activities affect two processes primarily (1) soil compaction and (2) concentration of water runoff. Increases in these processes tend to result in decreases in water infiltration and increases in risk of sediment transport.

These impacts raise the risk of potential sediment increases on nearby riparian habitats and increase the potential cumulative impacts to fish populations. Possible increased sediments equates to potential degradation to fish habitat and fish populations

Alternatives 2, 3, and 5 do propose different levels of harvest activities including new roads displaying different degrees of impacts and risks toward hydrologic function due to compaction and concentration of water runoff. Alternative 4 proposes no harvest. All action alternatives propose a reduction in total road miles throughout the project area.

Measures:

- Acres of ground-based systems used in each alternative and specifically on sensitive soils.
- Acres of skyline-based system used in each alternative and specifically on sensitive soils.
- Miles of road construction per subwatershed.
- Miles of road reconstructed per subwatershed.

- Miles of decommissioned roads per subwatershed.
- Miles of roads removed from RHCAs.
- Miles of open and closed roads.
- Total road density and open road density per subwatershed.
- Equivalent Roaded Acres cumulative effects model.
- Acres of Harvest in RHCAs

Alternatives 2, 3, and 5 propose similar harvest and related activities, including new road construction, but at different intensities. The alternatives display different degrees of impacts and risks toward hydrologic function due to difference in amount and distribution of compaction and concentration of water runoff. Alternative 4 does not propose any harvest although it includes 2.2 miles of new road construction, which are also common to all action alternatives. The construction of these road segments removes road from RHCAs and reduces the number of crossings and relocates access to the uplands.

BACKGROUND

The Galena Watershed Analysis recommended development of an access and travel management plan based on geology, sediment production, impacts on stream channels, including road location. The action alternatives used road location (valley bottom or hillslope) as the primary criterion to identify roads for decommissioning or for major improvements. Two Access Travel Management Plans (ATMs) were developed for the action alternatives (see also Appendix G developed later than these plans). ATMB is associated with Alternatives 2, 3 and 4 while ATMA is associated with Alternative 5. The road miles are slightly different for each alternative, even those under the same ATM, because of the different harvest unit pool and access needs.

The matrix of pathways and indicators for bull trout (USF&W 1998) lists road densities of <1 mi/mi^2 with no valley bottom roads as Properly Functioning, 1-2.4 mi/mi^2 with some valley bottom roads as Functioning at Risk, and densities over 2.4 mi/mi^2 as Functioning at Unacceptable Risk. The matrix of pathways and indicators for steelhead (NMFS 1996) lists road densities of <2 mi/mi^2 with no valley bottom roads as Properly Functioning, 2-3 mi/mi^2 with some valley bottom roads as Functioning at Risk, and densities over 3 mi/mi^2 with many valley bottom roads as Not Properly Functioning. Based on PACFISH/INFISH/SCREENS listed in the Regional Forester's Eastside Forest Plan Amendment #2, a neighboring forest in the Blue Mountains, the Wallowa-Whitman National Forest, recommends reducing road mileage and emphasizes road closure, obliteration, and revegetation at total road densities over 2.0 mile/mi^2 in high priority watersheds. Since this Forest is very similar in geology and habitat as well as location, these indices may be useful.

Current fisheries information shows Granite Boulder Creek and Vinegar Creek as containing bull trout and steelhead so USF&W matrix screens will be used. All other streams contain steelhead so the NMFS matrix will be applied as a guideline.

ALTERNATIVE 1—Ground Based Systems

Current baseline conditions will remain. Road maintenance, which can be considered a benefit from re-grading roads, cleaning plugged culverts and cleaning blocked ditchlines, would continue. No direct impacts such as sediment from timber harvest, road construction, reconstruction, realignment (relocation) or decommission would occur with this alternative.

This alternative will leave the road systems as they are, except for on-going maintenance. No road mitigation improvement, relocation or decommissioning projects would occur with this alternative. All open roads within the riparian areas will continue to be left open. Overall road densities and road miles in RHCAs would remain at current levels listed in Table 163. Some roads have been decommissioned prior to this project.

Road densities and miles in RHCAs would remain high (see Table 163). The Little Boulder/Deerhorn subwatershed density would remain at Functioning at Risk for this element of the NMFS matrix for TES species inhabiting those streams. All other subwatersheds would remain "Not Properly Functioning" for this element according to appropriate matrices by NMFS and USF&W.

Roads would continue to degrade fish habitat by contributing sediment to the stream, increasing the stream's width/depth ratio through bank damage, decreasing the shade component by firewood cutting or current road conditions adjacent to streams, and/or by further impacting threatened fish numbers through easy angler access. Stream sedimentation caused by roads would continue to adversely impact stream attributes such as pool riffle ratios, pool to pool spacing and lack of quality deep pool habitat; these attributes would continue to remain out of balance compared to those expected for the analysis area streams. Compacted roadbeds would continue to confine the stream meander pattern.

Roads in the project area that occur within RHCAs or cross stream channels would continue to impact the aquatic resource more than roads located in uplands. Current amounts of rilling and gullying would continue to occur where road drainage is not adequate for the site and would be likely to worsen. These streams would continue to route run off to the streams more rapidly and to intercept soil water and route it more rapidly routed to streams as surface flow. Mass failures and landslides are expected to remain rare in the current climate regime. Peak, near peak, and base flows would remain altered in the project area. Peak flow events would remain at current levels.

Other effects of this alternative include continued vegetation succession without harvest or thinning activities resulting in an increased risk of catastrophic wildfire. In the event of catastrophic wildfire, surface sediment and flow response yields would increase, thus impacting fish and/or habitat.

Species such as bull trout that are dependent on adequate water levels and temperatures during base flow periods for access to tributaries for spawning activities may be unable to reproduce or have limited success.

Fish populations and fish habitat downstream in the Middle Fork John Day River would continue to be adversely affected by current conditions. Temperature, sediment, flow magnitudes and duration all have the ability to affect TES fish, particularly fluvial bull trout and chinook salmon, in the entire sub basin. There is potential for effects from catastrophic wildfire and post-fire events to affect both temperature and sediment in the Middle Fork John Day River.

Table 163 Road Information Summarized by Subwatershed for All Alternatives[68]

Alternative	Davis / Placer	Vinegar	Vincent	Little Boulder / Deerhorn	Little Butte / Windlass	Butte	Granite Boulder	Total
Miles of Open and Closed Road								
Alternative 1 [No Action]	45.2	42.1	30.6	41.7	37.1	28.2	40.1	265.0
Alternative 2	37.9	37.4	29.3	33.4	29.3	20.4	31.3	219.0
Alternative 3	37.9	37.4	29.3	33.4	29.3	20.4	31.3	219.0
Alternative 4	35.7	33.1	25.2	31.3	27.1	20.1	31.2	203.7
Alternative 5	38.8	38.4	30.0	36.9	32.5	20.5	31.3	228.4
	Miles of Open and Closed Roads in RHCAs♠ / # Stream Crossings (Percent of Open and Closed Road Miles in RHCAs)							
Alternative 1 [No Action]	9.9/75 (22%)	8.8/93 (21%)	7.1/53 (23%)	10.1/71 (24%)	8.0/53 (22%)	5.8/42 (21%)	9.8/80 (24%)	59.5/467 (22%)
Alternative 2	5.1/35 (13%)	5.0/48 (13%)	4.6/34 (16%)	5.9/35 (18%)	6.2/35 (21%)	3.0/29 (15%)	5.9/46 (19%)	37.7/262 (17%)
Alternative 3	5.1/35 (13%)	5.0/48 (13%)	4.6/34 (16%)	5.9/35 (18%)	6.2/35 (21%)	3.0/29 (15%)	5.9/46 (19%)	37.7/262 (17%)
Alternative 4	5.0/35 (14%)	5.0/48 (15%)	4.6/34 (18%)	5.9/35 (19%)	6.2/35 (23%)	3.0/29 (15%)	5.9/46 (19%)	35.6/262 (17%)
Alternative 5	5.4/38 (14%)	5.0/49 (13%)	4.6/34 (15%)	6.4/40 (17%)	6.3/36 (19%)	3.0/29 (15%)	6.0/46 (19%)	36.7/272 (16%)
	Total Decommissioned Road Miles							
Alternative 1 [No Action]	5.5	5.5	12.0	5.0	2.4	4.0	6.5	41.9
Alternative 2	15.5	17.3	17.1	17.2	12.6	12.1	15.3	107.1
Alternative 3	15.5	17.3	17.1	17.2	12.6	12.1	15.3	107.1
Alternative 4	15.5	17.3	17.1	17.2	12.6	12.1	15.3	107.1
Alternative 5	14.7	17.1	17.5	15.6	10.3	12.6	15.3	103.1
	Open and Closed Road Density (mi/mi^2)							
Alternative 1 [No Action]	3.88	3.55	5.20	2.43	3.20	3.71	3.48	3.43
Alternative 2	3.25	3.16	4.97	1.95	2.52	2.69	2.71	2.83
Alternative 3	3.25	3.16	4.97	1.95	2.52	2.69	2.71	2.83
Alternative 4	3.06	2.79	4.28	1.82	2.33	2.65	2.70	2.64
Alternative 5	3.33	3.24	5.09	2.15	2.80	2.70	2.71	295
♠RHCA information includes roads on public, County and private land								

[68] ♠This table is based on an earlier version of roads layers in the Geographic Information System than in other tables in this document consequently values may differ slightly.

ALTERNATIVE 2—Ground Based Systems

Harvest Systems

Ground based harvest systems cause the largest amount of ground-disturbance because of road and skid trail building/use required for yarding timber. Skyline yarding compacts or otherwise disturbs less ground. Helicopter yarding causes very little disturbance in harvest units; landings associated with helicopter yarding are commonly 2-6 times the size of tractor landings. The effects of these different harvest systems on water yield and associated soil disturbance are discussed in section 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows page 239. Risk of sedimentation is associated with concentrated flows and decreases in water absorption and storage were described. Risk of sedimentation would be expected to increase when concentrated flows increase and when water absorption and storage decrease. Table 164 displays area by different yarding systems and subwatersheds. Table 121 (section 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows) displays activity area by sensitive soil by harvest system.

Table 164 Alternative 2 Logging System Acres

SUBWATERSHED	Tractor (Sensitive soil acres[69])	Skyline	Helicopter
Davis/Placer Gulch	1,530 (443)	210	80
Vinegar	800 (117)	450	460
Vincent	960 (62)	460	180
Little Boulder/ Deerhorn	960 (16)	320	630
Tincup/Little Butte	740 (100)	400	1,010
Butte	100 (223)	270	310
Granite Boulder	0	0	0
TOTAL	5,090	2,110	2,670

Harvest effects are generally considered pulse disturbances which tend to be greatest in the first few years after harvest and decline as the ground recovers and revegetates after harvest. However in the project area, previous disturbance may interact with new disturbance, synergistically increasing the effects of either disturbance pulse. Also, because of the history of human activity in the area one pulse of disturbance tended to be followed by another pulse while the first disturbance was in the recovery stage. In addition, inherent characteristics of the soil and much of the previous disturbance contribute to the concentration of flows and more rapid run off as described in section 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows *Land and Resource Management Plan* Standard #126 for detrimental soil condition is expected to be met at the completion of unit activities.

Harvest and thinning activities will reduce the potential for stand replacing wildfires. Catastrophic wildfires could negatively fish and fish habitat in project area streams. These effects are discussed in more detail in Section 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows .

Roads

Increases in sediment yield beyond a stream's ability to transport the material can decrease the amount of instream habitat available. Road construction, especially in both the clayey/loamy and in ash soils may have adverse effects to watershed condition. Alternatives may result in short term increases in sedimentation, which may result in increased embeddedness of gravel and cobble substrates. This effect is greatest in the first year following construction.

[69] Includes all types of sensitive soils as described in soils descriptions, beginning page 114 and Table 87, page 115.

Table 165 Road Construction ATM B

Subwatershed	Mi./Mi. in RHCA
Davis/Placer Gulch	2.7/0.07
Vinegar	4.5/0.02
Vincent	3.9/0.0
Little Boulder/ Deerhorn	3.8/0.0
Tincup/Little Butte	2.4/0.03
Butte	0.3/0.0
Granite Boulder	0.1/0.0
TOTAL	17.7/0.12

An essential part of the action alternatives is to decommission roads in valley bottoms impacting RHCAs and streams and to relocate transportation systems higher on the landscape where impacts will be minimized. Some existing roads will be decommissioned after use for harvest/haul as part of this project.

Realignment/relocation of some roads, minimum of 2.8 mi. with ATM B, would place new road construction in uplands where impacts to aquatic resources are reduced. Fewer roads would be encroaching on streams and active floodplains. Removing roads in riparian areas allows the stream to meander, reducing slope and stream energy. New roads would remain on the landscape. Impacts to streams (peak flow increase, sediment, etc.) would remain but they would be fewer and smaller in magnitude than the baseline impacts caused by the roads that were removed. Road realignment activities would create short term impacts (2-5 years) associated with disturbance of soils but would have long term benefits (from 5 years on) to streams and fish by removing or reducing sediment inputs from chronic sediment producing areas and reducing interception of ground water from roads to be decommissioned.

Table 166 lists miles of reconstruction by subwatershed (and in RHCAs) for each alternative. Major reconstruction activities would create short term impacts (2-3 years) associated with disturbance of soils but would have long term benefits to streams and fish by removing or reducing sediment inputs from chronic sediment producing areas. The recommended minor reconstruction would be considered maintenance on many roads. Currently degraded Forest Service roads would be brought up to standard with this work. Culverts that are currently barriers to fish should be replaced in a manner benefiting fish of all life stages with access as reconstruction occurs. Benefits of replacing undersized culverts would also be seen with any large runoff event. The roads would remain on the landscape; impacts to streams (peak flow increase, lower LWD, etc.) would remain.

Table 166 Road Decommission ATM B

Subwatershed	Mi./mi. in RHCA
Davis/Placer Gulch	10.01/4.87
Vinegar	12.66/4.53
Vincent	5.72/2.56
Little Boulder/ Deerhorn	12.16/4.17
Tincup/Little Butte	10.20/1.81
Butte	8.11/2.78
Granite Boulder	9.19/4.05
TOTAL	68.05/24.77

Decommission projects total 68 miles with Alternative 2. Table 166 lists decommission activity for the alternative by subwatershed. Total road densities would be less than existing conditions in every

subwatershed with this alternative (see Table 163). Road densities in Butte Creek and Little Butte/Windlass subwatersheds, which contain steelhead, would improve from Not Properly Functioning to Functioning at Risk (NMFS standards) by going below the 3 mi/mi^2 threshold. However, road density would still be greater than 3 mi/mi^2 (considered Not Properly Functioning by NMFS) in Davis/Placer and Vincent Creek subwatersheds which contain steelhead. The streams containing bull trout (Granite Boulder and Vinegar Creek) would both still be considered Functioning at Unacceptable Risk by USF&W after project implementation but road densities would drop by 0.55 mi/mi^2 to be 3.00 mi/mi^2 in Vinegar Creek and drop by 1.05 mi/mi^2 to be 2.41 mi/mi^2 in Granite Boulder Creek (2.4 mi/mi^2 is the break to Functioning at Risk). Roads in RHCAs would be reduced by 25 miles.

Stream crossings would be rehabilitated (recreated) when decommissioning roads. This entails removing culverts and through fill material, resloping the banks to mimic the natural grade of the valley bottom and planting native grasses, forbs, hardwoods and conifers to stabilize the area. While closing roads can reduce sediment concerns from use during periods of concern to fisheries, decommissioning is more effective at reducing or removing impacts.

There would be some disturbance or impacts associated with decommission activities and realignment of roads from valley bottoms to locations higher in the subwatersheds but these would be short term in nature and would have long term benefits to fish and fish habitat. The projects would likely contribute some sediment to area streams but this would be minimized because proper design criteria and mitigation measures are included in the project. Decommission without realignment would show a greater benefit to fisheries but would not meet needs of other resources within the Forest Service.

Table 163 located at the end of the Alternative 1 section shows the total number of road/stream crossings for each ATM plan. It is important to note that while the number of stream crossings increases, they are on intermittent or non-fish bearing streams. Crossings on perennial fish bearing streams are reduced (see hydrology section). All action alternatives show a substantial reduction in the total miles of roads and miles of roads within RHCAs.

It is expected that peak and base flows would improve with this alternative and that stream flows would allow better access and temperatures for TES fish in project area streams. Fish habitat and populations should begin to show benefits within 7-10 years and will likely show vast improvements from 25years and into the future.

Potential cumulative effects of harvest are the addition of sediment to the Middle Fork John Day River and/or changes in flow regime associated with harvest activities that could impact fish and fish habitat. Another potential effect is that of the reduction in likelihood of catastrophic wildfire and resultant sediment input and temperatures on the Middle Fork John Day River as well as effects on fish habitat and fish populations contained within.

Cumulative effects of harvest from Alternative 2 are expected to include reduced sediment loads, lower stream temperatures and greater discharge during low flow periods entering the Middle Fork John Day River from project streams in the long term. This would result in benefits to fish and fish habitat in the subbasin. Chinook salmon reproduction would greatly benefit these conditions because they hold from May through August then spawn during September in the Middle Fork John Day River. Connectivity for fluvial bull trout would also be improved with this alternative.

ALTERNATIVE 3—Ground Based Systems

Harvest Systems

Effects of different harvest systems were discussed in Alternative 2.

Table 167 Harvest acres, including those on sensitive soils, by subwatershed.

SUBWATERSHED	TRACTOR	SKYLINE	HELICOPTER
	Acres (Sensitive Soil Acres)	Acres	Acres
Davis/Placer Gulch	1,300 (443)	190	30
Vinegar	750 (117)	450	460
Vincent	880 (62)	390	170
Little Boulder/Deerhorn	710 (12)	250	190
Tincup/Little Butte	840 (100)	210	120
Butte	100 (100)	230	120
Granite Boulder	0	0	0
TOTAL	4,580	1,720	1,090

There is a total of 6,747 acres harvested in Alternative 3. Harvest acres, including those on sensitive soils, are listed in Table 183 Harvest on Sensitive Soils, page 359. Project area streams would have additional protection in the Category 4 riparian areas of 125 feet placed on a total of 0.44 miles.

Harvest and thinning activities will reduce the potential for stand replacing wildfires. Catastrophic wildfires could negatively fish and fish habitat in project area streams. These effects are discussed in more detail in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows, page 239. In this portion of the document, the risk of sedimentation associated with concentrated flows and decreases in water absorption and storage was described. Risk of sedimentation would be expected to increase when concentrated flows increase and when water absorption and storage decrease. *Land and Resource Management Plan* Standard #126 for detrimental soil condition would be met at the completion of unit activities, as described.

Roads (ATM B)

Access Travel Management Plan B is associated with Alternative 3; the road miles are slightly different from Alternatives 2 and 4, because of different harvest unit pool and access needs.

Table 168 Road Construction ATM B

SUBWATERSHED	Mi./Mi. in RHCA
Davis/Placer Gulch	2.6/0.07
Vinegar	4.3/0.02
Vincent	4.1/0.0
Little Boulder/ Deerhorn	3.4/0.0
Tincup/Little Butte	2.2/0.03
Butte	0.3/0.0
Granite Boulder	0.1/0.0
TOTAL	17.0/0.12

The effects of road realignment/relocation, construction, reconstruction, and decommissioning were discussed for Alternative 2. Table 169 lists miles of reconstruction by subwatershed (and in RHCAs) for each alternative. Table 163, page 336 shows numbers of road/stream crossings existing and for each ATM plan.

Table 169 Road Reconstruction ATM B

Subwatershed	Mi./mi. In RHCAs
Davis/Placer Gulch	29.16/3.26
Vinegar	32.41/4.73
VINCENT	24.25/4.19
Little Boulder/ Deerhorn	26.19/3.89
Tincup/Little Butte	21.03/2.16
Butte	18.07/3.09
Granite Boulder	20.54/1.32
TOTAL	171.65/22.64

Total road densities would be lower than existing baseline conditions in every subwatershed with this alternative (see Table 163 Road Information Summarized by Subwatershed for All Alternatives, page 336). Decommission projects total 68 miles with Alternative 3. Road densities in Butte Creek and Little Butte/Windlass subwatersheds that contain steelhead would drop from Not Properly Functioning to Functioning at Risk (NMFS standards) by going below the 3 mi/mi^2 threshold. However, road density would still be greater than 3 mi/mi^2 (considered Not Properly Functioning by NMFS) in Davis/Placer and Vincent Creek subwatersheds which contain steelhead. Vinegar Creek, which contains bull trout, would both still be considered Functioning at Unacceptable Risk by USF&W after project implementation but road densities would drop by 0.55 mi/mi^2 to be 3.00 mi/mi^2. Granite Boulder Creek would change categories to Functioning at Risk by reducing road miles by 1.05 mi/mi^2 to a new density of 2.40 mi/mi^2. Twenty-five miles of road in RHCAs would be decommissioned under this alternative (see Table 8). Impacts would be minimized if proper design criteria and mitigation measures were implemented.

Table 170 Road Decommission ATM B

Subwatershed	Mi./Mi. in RHCA
Davis/Placer Gulch	10.01/4.87
Vinegar	12.66/4.53
Vincent	5.72/2.56
Little Boulder/ Deerhorn	12.16/4.17
Tincup/Little Butte	130.20/1.81
Butte	8.11/2.78
Granite Boulder	9.19/4.05
TOTAL	68.05/24.77

It is expected that peak and base flows will improve with this alternative and will allow better access and temperatures for TES fish in project area streams. Fish habitat and populations should begin to show benefits within 7-10 years and will likely show vast improvements from 25 years and into the future.

Potential cumulative effects are the addition of sediment sent to the Middle Fork John Day River and/or changes in flow regime associated with harvest activities that could impact fish and fish habitat.

Cumulative effects of road activities from Alternative 3 are expected to include reduced sediment loads, lower stream temperatures and greater discharge during low flow periods from project streams to the Middle Fork John Day River in the long term. This would result in benefits to fish and fish habitat in the subbasin. Chinook salmon reproduction would greatly benefit these conditions because they hold from

May through August then spawn during September in the Middle Fork John Day River. Connectivity for fluvial bull trout would also improve with this alternative.

ALTERNATIVE 4—Ground Based Systems

Alternative 4 does not propose any harvest; therefore, tractor skidding, skyline skidding, or helicopter yarding would not occur. There would be no short-term impacts associated with this alternative.

The risk of high intensity wildfire is greater with this alternative than the other action alternatives because current stocking levels will remain and controlled burning would not be completed in some areas without prior mechanical treatment. Catastrophic fire could impact fish and fish habitat by large input of sediment and reduction in riparian shade/cover associated with high intensity wildfire.

Roads (ATM-B)

Access Travel Management Plan B is associated with Alternative 4; the road miles are different from Alternatives 2 and 3, because there is no harvest and there are different access needs. The roads numbers displayed on Table 171 shows road construction by subwatershed. These roads are necessary for relocation.

Table 171 Road Construction ATM B

SUBWATERSHED	Total Miles	Miles in RHCAs
Davis/Placer Gulch	0.5	0.1
Vinegar	0.0	0.0
Vincent	0.0	0.0
Little Boulder/ Deerhorn	1.7	0.0
Tincup/Little Butte	0.0	0.0
Butte	0.0	0.0
Granite Boulder	0.0	0.0
TOTAL	**2.2**	**0.1**

Effects of road realignment/relocation, construction, reconstruction, and decommissioning were discussed for Alternative 2. Table 172 lists miles of reconstruction by subwatershed (and in RHCAs) for each alternative. Table 163 located at the end of the Alternative 1 section shows numbers of road/stream crossings existing and for each ATM plan.

Table 172 Road Reconstruction ATM B

SUBWATERSHED	Total Miles	Miles in RHCAs
Davis/Placer Gulch	29.16	3.26
Vinegar	32.41	4.73
Vincent	24.25	4.19
Little Boulder/ Deerhorn	26.19	3.89
Tincup/Little Butte	21.03	2.16
Butte	18.07	3.09
Granite Boulder	20.54	1.32
TOTAL	**171.65**	**22.64**

Total Road densities would be less than existing conditions in every subwatershed with this alternative (see Table 163 at end of Alternative 1 section). Road densities would decrease the most with this alternative because less construction is planned since no timber harvest activities are associated with this alternative.

Table 173 Road Decommission ATM B

Subwatershed	Total Miles	Miles in RHCAs
Davis/Placer Gulch	10.01	4.87
Vinegar	12.66	4.53
Vincent	5.72	2.56
Little Boulder/ Deerhorn	12.16	4.17
Tincup/Little Butte	10.20	1.81
Butte	8.11	2.78
Granite Boulder	9.19	4.05
TOTAL	**68.05**	**24.77**

Decommission projects total 68 miles with Alternative 4. Road densities in Butte Creek, Davis/Placer and Little Butte/Windlass subwatersheds, which contain steelhead, would drop from Not Properly Functioning to Functioning at Risk (NMFS standards) by going below the 3 mi/mi^2 threshold. However, road density would still be greater than 3 mi/mi^2 (considered Not Properly Functioning by NMFS) in the Vincent Creek subwatershed which contains steelhead. Vinegar Creek, which contains bull trout, would still be considered Functioning at Unacceptable Risk by USF&W after project implementation but road densities would drop by 0.91 mi/mi^2 to be 2.64 mi/mi^2. Granite Boulder Creek, which contain bull trout, would change categories to Functioning at Risk by reducing road miles by 1.05 mi/mi^2 to a new density of 2.40 mi/mi^2. Twenty-five miles of road in RHCAs would be decommissioned under this alternative. Table 1, located in the Alternative 1 section, lists pertinent road data by subwatershed for each alternative.

It is expected that peak and base flows will improve with this alternative and will allow better access and temperatures for TES fish in project area streams. Fish habitat and populations should begin to show benefits within 7-10 years and will likely show vast improvements from 25 years and into the future.

Cumulative Effects (ATM-B)

Without any harvest, fish populations and fish habitat downstream in the Middle Fork John Day could be impacted if catastrophic wildfire were to occur in the project area. Temperature, sediment, flow magnitudes and duration all have the ability to effect TES fish in the entire subbasin.

Cumulative effects of road activities from Alternative 4 are expected to include reduced sediment loads, lower stream temperatures and greater discharge during low flow periods from project streams to the Middle Fork John Day River. This would result in benefits to fish and fish habitat in the subbasin. Chinook salmon reproduction would greatly benefit these conditions because they hold from May through August then spawn during September in the Middle Fork John Day River.

ALTERNATIVE 5—Ground Based Systems

Harvest Systems

Effects of different harvest systems were summarized for Alternative 2, Direct and Indirect Effects.

Table 174 Alternative 5 Logging System Acres

Subwatershed	Tractor	Skyline	Helicopter
	Acres (Sensitive Soil Acres)	Acres	Acres
Davis/Placer Gulch	1,540 (1436)	250	190
Vinegar	1,090 (968)	780	480
Vincent	1,120 (1118)	610	230
Little Boulder/ Deerhorn	1,270 (1270)	360	550
Tincup/Little Butte	1,200 (916)	340	690
Butte	100 (100)	270	430

Subwatershed	Tractor	Skyline	Helicopter
Granite Boulder	0	0	0
TOTAL	**6,320 (5808)**	**2,610**	**2570**

There is a total of 11,500 acres harvested in Alternative 5. Harvest acres, including those on sensitive soils, are listed by subwatershed in table . These effects are discussed in more detail in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows, page 239. Risk of sedimentation is associated with concentrated flows and decreases in water absorption and storage were described. Risk of sedimentation would be expected to increase when concentrated flows increase and when water absorption and storage decrease. *Land and Resource Management Plan* Standard #126 for detrimental soil condition is expected to be met at the completion of unit activities, as described.

ROADS—(ATM-A)

Access Travel Management Plan (ATM) A is associated with Alternative 5. The total number of open and closed roads for ATM A is similar to the total for Alternative 2. ATM A constructs more roads, leaves more roads open, closes fewer roads, and decommissions only slightly fewer roads.

Table 175 ATM A Road Construction

SUBWATERSHED	Total Miles	Miles in RHCAs
Davis/Placer Gulch	2.7	0.07
Vinegar	5.3	0.03
Vincent	4.8	0.00
Little Boulder/ Deerhorn	5.8	0.30
Tincup/Little Butte	3.2	0.03
Butte	0.3	0.00
Granite Boulder	0.1	0.00
TOTAL	**23.2**	**0.43**

Effects of road realignment/relocation, construction, reconstruction, and decommissioning were discussed for Alternative 2. Table 176 lists miles of reconstruction by subwatershed (and in RHCAs) for each alternative. Table 163, page 336 shows numbers of road/stream crossings existing and for each ATM plan.

Table 176 Road Reconstruction ATM A

SUBWATERSHED	Total Miles	Miles in RHCAs
Davis/Placer Gulch	29.47	3.35
Vinegar	29.65	4.17
Vincent	24.51	4.12
Little Boulder/ Deerhorn	26.99	3.69
Tincup/Little Butte	22.56	1.83
Butte	16.81	0.65
Granite Boulder	21.03	4.24
TOTAL	**171.02**	**22.05**

Total Road densities would be less than existing conditions in every subwatershed with this alternative (see Table 163 Road Information Summarized by Subwatershed for All Alternatives, page 336). Decommission projects total 63 miles with Alternative 5 (see Table 177). Road densities in Butte Creek, Little Boulder/Deerhorn and Little Butte/Windlass subwatersheds, which contain steelhead, would drop from Not Properly Functioning to Functioning at Risk (NMFS standards) by going below the 3 mi./mi.^{2} threshold. However, road density would still be greater than 3 mi/mi^2 (considered Not Properly Functioning by NMFS) in Davis/Placer and Vincent Creek subwatersheds which contain steelhead, a threatened fish species. Vinegar Creek, which also contains steelhead (see ODF&W BIOLOGICAL Surveys, page 132), would still

be considered Functioning at Unacceptable Risk by USF&W after project implementation but road densities would drop by 0.44 mi/mi^2 to be 3.11 mi/mi^2. Granite Boulder Creek, a bull trout stream, would drop by 1.08 mi/mi^2 to 2.38 and would be considered Functioning at Risk. This alternative reduces road miles in RHCAs by 24 miles. Table 163, page 336 lists pertinent road data by subwatershed for each alternative.

Table 177 Road Decommission ATM A

SUBWATERSHED	Total Miles	Miles in RHCAs
Davis/Placer Gulch	9.06	4.61
Vinegar	11.76	4.41
Vincent	5.88	2.55
Little Boulder/ Deerhorn	10.69	4.00
Tincup/Little Butte	8.28	1.83
Butte	8.02	2.78
Granite Boulder	9.13	3.99
TOTAL	**62.82**	**24.17**

It is expected that peak and base flows will improve with this alternative and will allow better access and temperatures for TES fish in project area streams. Fish habitat and populations should begin to show benefits within 7-10 years and will likely show vast improvements from 25 years and into the future.

Cumulative Effects (ATM—A)

Potential cumulative effects of harvest are the addition of sediment to the Middle Fork John Day River and/or changes in flow regime associated with harvest activities that could impact fish and fish habitat. Another potential effect is that of the reduction in likelihood of catastrophic wildfire and resultant sediment input and temperatures on the Middle Fork John Day River as well as effects on fish habitat and fish populations contained within.

Cumulative effects of road activities from Alternative 5 are expected to include reduced sediment loads, lower stream temperatures and greater discharge during low flow periods from project streams to the Middle Fork John Day River over the long term. This would result in benefits to fish and fish habitat in the subbasin. Chinook salmon reproduction would greatly benefit from these conditions because they hold from May through August then spawn during September in the Middle Fork John Day River.

Comparison of Alternatives—Ground Based Systems

Alternative 1(ATM-A)

Alternative 1 has no short-term impacts but the greatest long-term impacts for fish and fish habitat.

No harvest or thinning activities would occur. This alternative leaves the greatest chance of catastrophic wildfire without any removal of understory vegetation in dense multistory stands.

This alternative would not modify the transportation system in the project area so no short term impacts associated with road construction, realignment, reconstruction or decommission would occur. However, roads in RHCAs and crossing streams will continue to impact fish populations and habitat in the long term.

Alternative 4 (ATM-A)

Alternative 4 has short term impacts that would be slightly greater than Alternative 1, but the greatest long term improvement is expected from this alternative.

Thinning and prescribed burning activities would occur. Prescribed fire has the potential to impact fish and fish habitat if burning does not meet expectations but wildfire has greater likelihood of damaging fish populations and habitat.

This alternative would create short term impacts associated with road realignment, reconstruction and decommission activities. In the long term this is expected to increase fish populations by improving fish

habitat. The only road construction associated with this alternative is 0.2 miles of realignment and there are no commercial harvest units.

Alternative 3 (ATM-A)

Alternative 3's short-term impacts would be slightly greater than Alternatives 1 and 4 because some commercial harvest is planned in addition to prescribed burning and thinning activities.

Prescribed fire has the potential to impact fish and fish habitat if burning does not meet expectations but wildfire has greater likelihood of damaging fish populations and habitat.

This alternative would create short-term sediment impacts associated with road realignment, reconstruction and decommission activities. In the long term this is expected to increase fish populations by improving fish habitat. There would be some road construction associated with this alternative, as there are commercial harvest units. Road construction activities are additional impacts associated with this alternative.

Alternative 2 (ATM-A)

Alternative 2's short-term impacts are greater than Alternatives 1, 3 and 4 because additional commercial harvest and road construction would occur in addition to prescribed burning and thinning activities.

Prescribed fire has the potential to impact fish and fish habitat if burning does not meet expectations but wildfire has greater likelihood of damaging fish populations and habitat.

This alternative would create short-term sediment impacts associated with road realignment, reconstruction and decommission activities. In the long term this is expected to increase fish populations by improving fish habitat. Road construction activities are additional impacts associated with this alternative.

Alternative 5 (ATM-A)

Alternative 5 has the greatest short-term impacts of all alternatives. This alternative includes more ground-based harvest and road construction activities than any other alternative.

Prescribed burning is similar in size to Alternatives 2 and 3. Prescribed fire has the potential to impact fish and fish habitat if burning does not meet expectations, but wildfire has greater likelihood of damaging fish populations and habitat.

This alternative would create short-term sediment impacts associated with road realignment, reconstruction and decommission activities. In the long term this is expected to increase fish populations by improving fish habitat. Road construction activities are additional impacts associated with this alternative.

4.3.4—ISSUE 1.4.4—EFFECTS OF HEAVY EQUIPMENT IN RHCAS

The Agency's proposal using heavy equipment within Riparian Habitat Conservation Areas (RHCAs) to create a meandering nature to stream channels, to enhance aspen stands, and to place in-stream structures may damage stream channel functioning.

BACKGROUND

Heavy equipment operating within RHCAs may compact soil, damage stream banks, and contribute sediment to streams. Access through the RHCA to the project site would also compact these sensitive soils and possibly damage vegetation and down woody material.

Alternative 2 and 5 would display the anticipated short and long-term trade-offs of using heavy equipment within RHCAs while Alternatives 3 and 4 would not use heavy equipment. Alternatives 2 and 5 would also use heavy equipment to remove conifers from RHCAs to enhance aspen stands and reduce fuel loading.

Stream channel profiles are not currently those expected for the geomorphology of the area. Width to depth ratios are elevated. Many fish bearing streams are currently lacking adequate habitat diversity. Analysis of recent stream surveys shows several very long lengths of riffle (in excess of 400 feet to over 1500 feet) in fish bearing, low gradient segments on Granite Boulder, Butte Creek and Vinegar Creek. Vinegar Creek is actively improving or "rehabilitating" by cutting new channels, building sinuosity and decreasing channel slope; pool habitat is forming and substrate composition is improving. However the upper culvert at the 618 road and Vinegar Creek is a fish passage barrier. Granite Boulder Creek and Butte Creek are maintaining current conditions but not actively recovering. Stream temperatures do not meet State standards for temperature; several streams are on the State 303d List of Water Quality Limited Streams for temperature. The water at the origin of some of these streams is commonly within 10 degrees Fahrenheit of the State standard during summer months and generally approaches the State standard for a few days each summer. Downstream water temperatures are generally warmer than but correlated with upstream ones. The current structures in Granite Boulder Creek and Butte Creek are not creating deep pool habitat, have no cover and are barriers to upstream movement by fish at low flows. An unmaintained log culvert in Butte Creek is modifying the channel profile and may cause erosion. Caribou and Vincent creeks formerly interacted with large areas of floodplain that provided cold water storage for late season base flows.

Aspen were formerly a larger component of the landscape, possibly up to 20 times as abundant. Aspen stands in riparian areas provided shade and detritus. Ground water relations in aspen stands in the Blue Mountains are not well understood. It is assumed that ground water relations would be more similar to historical ones if aspen stands were reestablished, regardless of whether the aspen actually influence ground water movement or merely serve as an indicator that ground water is present.

ALTERNATIVE 1—Heavy Equipment in RHCAs

No heavy equipment is recommended for use in RHCAs or in stream channels. Stream channel function, floodplain function, water absorption and capture, summer base flows, and fish habitat quality would not be improved along Granite Boulder Creek, Butte Creek, Vinegar Creek, Vincent Creek and along the Middle Fork at Caribou Creek and would remain as described in the Affected Environment. Current structures in Granite Boulder Creek and Butte Creek would not function as designed and would reduce habitat quality as well as connectivity for fish (particularly juvenile movement upstream). Non-functional or functional-at-risk channels would not be rehabilitated. Current degraded channel conditions would be maintained. Fish habitat (particularly pools) quality and quantity would remain degraded. Stream temperatures would remain elevated during summer low flow conditions. Temperatures would not meet state water quality standards and optimums for local fish populations. Deep pool habitat would not be improved in Granite Boulder and

Butte creeks, maintaining the current, limited winter rearing habitat for resident and anadromous salmonid populations. Fish would not be able to move upstream beyond the upper Road 618 crossing (culvert) in Vinegar Creek. Movement would continue to be limited to downstream only.

Natural restoration of habitat diversity to these disturbed and degraded systems in a Dry Forest ecosystem such as the Malheur NF may take several decades if not hundreds of years. Natural recruitment of coarse woody material is expected to occur from 50-125 years and beyond with channel adjustment to restore floodplain function following. Both processes are described in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows , beginning on page 239. Fish habitat parameters described above would improve correspondingly.

Bull trout spawning habitat and resulting productivity would remain reduced with the no action alternative because of reduced base flows and elevated stream temperatures during August and September.

Declining aspen stands would be expected to continue in this downward trend. Shade and detritus contributions would remain at current levels and decrease as stands continued to decline.

Project area streams contribute water and sediment to the Middle Fork John Day River. Water temperatures are expected to remain elevated as described in the Affected Environment and flow regimes (peak and base flow timing and magnitude) in the subbasin would remain modified. Until wood falls in the tributary streams, the lack of improvement in downstream water temperatures and flow regime would continue to negatively impact holding (summer) and spawning (fall) activities of Chinook salmon, reducing fecundity of the species in this subbasin. High water temperatures in the past have resulted in broad, large-scale mortality of these sensitive listed fish before spawning activities began; large-scale mortality would continue to occur when certain weather and hydrologic conditions occurred.

If flows in the Middle Fork John Day River subside too early or water temperatures become too high before bull trout reach spawning areas in tributaries to the Middle Fork John Day, physical or thermal barriers are created. This reduces genetic diversity shared between subpopulations by fluvial fish and further reduces fecundity of the species. Prior to fall spawning, Chinook salmon adults would continue to hold under elevated stream temperatures in the Middle Fork John Day River during the summer. The no action alternative will maintain the current situation and continue to impact these species.

ALTERNATIVE 2 and 5—Heavy Equipment in RHCAs

Displayed in Table 178 are the activities for which large equipment would be used to complete projects within stream channels or RHCAs. These alternatives would install in-stream Rosgen style structures such as vortex rock weirs, upstream log “Vs”, “J” Hooks and wing deflectors in Granite Boulder Creek, Butte Creek and Vinegar Creek (see Table 178 for numbers) to provide connectivity and habitat diversity, particularly deep pools, for threatened fish species. Hydrologic function and water storage would be improved on all streams where heavy equipment would be used in stream channels. Benefits would be expected to begin within one year of implementation and continue indefinitely.

Table 178 Stream and Channel Improvement Projects Using Large Equipment

STREAM	NEW INSTREAM STRUCTURES	IMPROVE EXISTING INSTREAM STRUCTURE	STREAM CHANNEL MODIFICATIONS	ASPEN IMPROVEMENT CONIFER REMOVAL	Culvert Removal or Replacement to Improve Fish Passage
Davis/ Placer					2
Vinegar	3 Structures			About 4-6 ac.	5
Vincent			About 2 miles	About 2 ac.	3
L. Boulder/ Deerhorn			About 1 mile	About 5 ac.	2
Tincup/ L. Butte				About 1 ac.	6
Butte	About 14 Structures	29 Instream Structures			2 Removals of Log Culverts
Granite Boulder	62 Structures	7 Instream Structures			4
TOTAL	**79**		**3 miles**	**12-14 ac.**	**24**

Improvements in width to depth ratios and water storage capacity would extend beyond the structures both upstream and downstream. Narrowing of streams and increasing water storage capacity would also contribute to better maintenance of cool stream temperatures. Less water surface would be exposed to sunlight and subsequent radiant heating. Water tables that are raised change floodplain conditions and support riparian vegetation that provide shade and hiding cover for fish.

One culvert should be modified or replaced and another removed in connection with these projects. Culvert modifications in Vinegar Creek at the upper crossing of Road 618 include installing in-stream structures that would immediately reconnect 0.5 miles of summer rearing cold-water habitat for anadromous, fluvial and resident salmonids if implmented. If needed, baffles would be installed in the culvert to enhance fish passage. The culvert is currently a barrier to upstream migration at base flow. Population viability of fish in Vinegar Creek would be improved because of increased mobility among individuals.

Effects associated with the use of heavy equipment in the RHCAs in Alternatives 2 and 5 will create short-term impacts with long-term benefits. Bringing excavators or spider hoes into the RHCAs and using them to modify existing in-stream structures or to implement other activities is likely to result in disturbance to the riparian soils and vegetation. Harassment of listed fish would occur during the short (1 day) work period at each site. However, the use of heavy equipment is expected to result in improvements to watershed function and fish habitat that could not be otherwise accomplished by natural means in human timeframes. The disturbance associated with the use of heavy equipment is expected to minimumly counter the beneficial effects of the recommended activities.

Table 179 Aquatic improvement Results of Alternatives 2 & 5

Stream	Acres of RHCA Affected	Miles of Enhanced Connectivity
Davis		
Vinegar	1 Acre	0.5 Miles
Vincent		
Caribou		
Granite Boulder	7 Acres	3 Miles
Butte	3 Acres	4 Miles

Bringing equipment into the RHCAs to modify existing in-stream structures and to access other RHCA project sites, except the aspen projects discussed below, is likely to result in less than 0.5% of the travel

way becoming detrimentally compacted. This estimate is based on design criteria that equipment would enter and exit the RHCAs on zigzag paths and would travel outside the RHCAs between clusters of sites and on the amount of compaction correlated with single and repeat passes. The effects from increasing compaction by 0.5% are expected to be negligible. Compaction is expected to be alleviated by year 50. Increases in surface erosion potential are expected to be immeasurable because mitigation requires that organic material be placed across any bare ground exposed by using heavy equipment. The increase to chronic disturbance and departure from hydrologic potential is expected to be immeasurable. It is expected that flows will generally not be concentrated under the mitigated conditions of Alternatives 2 and 5 since continuous flow paths are unlikely to develop.

It is expected that, even under the prescribed mitigation, up to 0.25 cubic yard of sediment (from streambed, banks and instream deposits) may enter streams at each new in-stream structure work site at and immediately following the time (1-2 years) that log structures are placed. Re-shaping stream banks to the natural grade and planting native riparian hardwood shrubs and sedges to provide immediate ground cover where logs are keyed in is part of the design of the project and is expected to limit disturbance of stream banks to fewer than 5 years by which time the shrubs are expected to have become established. These plantings would also provide shade to maintain stream temperatures and create hiding cover for fish in the long-term (10-25 years) where none currently exists. No short-term impacts to stream temperature are expected. Stream temperatures would be maintained more efficiently immediately after the project implementation due to the creation of deep pool habitat and changes in width to depth ratios. The modified and the newly installed structures would create self-cleaning, deep pools and improve stream connectivity at low flows in the short term (within 1 year) and improve sinuosity, provide shade to maintain stream temperatures and act as hiding cover for fish over the long term (10 years and beyond).

Projects are recommended to re-shape channels in Vincent Creek and Caribou Creek and re-connect them with floodplains. The objective of these recommended activities is to move stream channels and rebuild them in new locations with new dimensions that are in balance with the hydrologic system in order to move toward hydrologic and channel potential. Disturbance from displacement and replacement of soils and rocks is a design element and would be expected. Most of the material that would be displaced has been previously displaced by mining and post-mining activities. Much of the material to be moved is mining tailings or previously flattened tailings; rock cannot be further compacted. Mitigation is designed to limit sediment inputs to streams and to limit compaction. It is estimated that up to 20 cubic yards of sediment could enter streams directly as a result of these projects. Design elements to move the hydrologic system toward potential are expected to promote infiltration and floodplain use throughout the project areas. Compaction that exceeds *Land and Resource Management Plan* standards would be alleviated as part of project design so that *Land and Resource Management Plan* standards would be met when these activities are completed. Soil would be replaced in layers to promote soil functioning and sediment from flooding would be allowed to deposit to create typical floodplain soils. Planting hardwood shrubs, sedges and similar species would establish riparian vegetation at higher densities than currently occur, further promoting floodplain function. Down woody material imported from hill slopes in the project areas would be placed as needed. Stream channels would be moved toward Proper Functioning Condition. These projects could increase base flows improving potential for fish in these streams currently intermittent in flow regime but fish bearing. This would improve sub-population viability by improving connectivity and survival of individuals in these streams.

Skidders or forwarders would enter 12 aspen stands (up to 30 acres total) in RHCAs to remove conifer logs for commercial purposes. Generally, these RHCAs are located on seeps and springs, ephemeral channels or Category 4 streams. There are 2 sites on Category 1 streams, Vinegar Creek and Vincent Creek and 2 sites on Category 2 streams, Vincent Creek and Tincup Creek, where logs would be removed. Designated skid trails would be used to limit compaction to less than 20% so that *Land and Resource Management Plan* standards would be met. It is expected that compaction would actually be less than 20% since some trails would be used for single passes. Since skid trails would be allowed as close as 25 feet of stream

channels, the risk that erosion pathways, which commonly develop along skid trails, would reach active stream channels is increased relative to traditional logging. This risk of connection is countered by two conditions limiting the likelihood that erosion would be initiated. First, the more limited, expected use of each trail should result in less exposure of bare ground. Second, the normally more abundant ground cover found within RHCAs is also expected to reduce the amount of bare ground exposed. Additional mitigation measures such as helicopter logging or winter logging on frozen ground or when soil moisture is less than 10%, would further reduce compaction potential. A fisheries biologist or hydrologist would inspect the site before implementation and locate/delineate areas unsuitable for skidding. In balance, the risk of sediment reaching streams would be elevated in the event of high intensity, short duration rainstorms or of rapid snowmelt, proportional to the number and length of skid trails located at each site.

Cumulative Effects—Heavy Equipment in RHCAs

Project area streams contribute water and sediment to the Middle Fork John Day River.

Temperatures would be more effectively maintained in project area streams and proportionally in the Middle Fork John Day River. In the long term (10-25 years), the effects of these projects are would reduce temperatures during base flow and increase base flows in the Middle Fork John Day River. These changes would result in an upward trend for fish and fish habitat in the Middle Fork John Day River. Since project area streams contribute only a portion of water to the Middle Fork John Day River, it is unlikely these projects alone would restore historic conditions in the river but they would aid in removing it from the 303(d) List for Water Quality Impaired Streams in Oregon.

Projects improving habitat in area streams would complement channel and fencing projects on the Middle Fork John Day River planned by the Confederated Tribes of the Warm Springs on land leased from The Nature Conservancy and John Forest. In particular, connectivity to Butte Creek, Granite Boulder, Vinegar Creek, and Davis Creek would be improved by instream rehabilitation using heavy equipment on private land. The Warm Springs Tribes are building corridor fence in several locations on the Middle Fork John Day River to protect sensitive riparian areas from use by cattle and to allow recovery of streamside vegetation.

Chinook salmon, particularly adults, dependent on the Middle Fork John Day River for holding and spawning will benefit from these projects. Water temperatures are expected to remain elevated and flow regimes (peak and base flow timing and magnitude) will remain modified in the subbasin but these projects would improve conditions in the subbasin.

Fluvial bull trout depend on flows and temperature in the Middle Fork John Day River for seasonal migrations from larger rivers to smaller streams in the project area. If flows in the Middle Fork John Day River subside too early or water temperatures become too high before these threatened fish reach spawning areas, physical or thermal barriers are created. Projects associated with these alternatives are designed to improve conditions for bull trout. Genetic diversity is expected to be increased among subpopulations through contact with fluvial fish.

ALTERNATIVES 3 & 4—Heavy Equipment in RHCAs

Impacts will be minimized by using the design criteria (not including heavy equipment use) listed under Alternative 2 and 5.

The “Modification of Instream Structures” projects shown in Table 179 under Alternative 2 and 5 would be implemented without the use of large equipment. The risk of sedimentation, stream bank disturbance, and compaction resulting from use of large equipment would remain at zero since no disturbance from large equipment would occur. Conditions would remain as described in the Affected Environment and the No Action Alternative, except near existing in-stream structures in Granite Boulder Creek and Butte Creek. Existing structures would be modified by hand crews using power tools. Harassment of listed fish would occur during the short (1-3 day) work period at each site. Logs would be added to existing structures to

improve function. Modifying the structures by hand with power tools is expected to move the log weirs and shift their concrete anchors, resulting in the shifting and exposure of up to about 10 sq. ft. of bare soil per structure (5 ft. per bank). Less than 0.25 cubic yard of sediment is expected to enter streams during and for 1-2 years following handwork at each structure. Coarse wood and other organic material shifted during work would be replaced and supplemented to reduce exposed mineral soil. Planting and protecting native riparian grasses, shrubs and trees at the project sites would increase bank stability. There is also the potential for spills of volatile chemicals associated with chainsaws during project implementation; these would be minimized using mitigation measures listed under Alternatives 2 and 5. The modified structures would create self-cleaning, deep pools and improve stream connectivity at low flows in the short term (within 1 year) and improve sinuosity, decrease width to depth ratios as well as provide shade to maintain stream temperatures and act as hiding cover for fish over the long term (10-25 years). Most low flow fish passage barrier would be eliminated.

Table 180 Results of Alternatives 3 & 4

Stream	Acres of RHCA Affected By Heavy Equipment	Miles of Enhanced Connectivity
Davis	0	
Vinegar	0	1
Vincent	0	
Caribou	0	
Granite Boulder	0	3
Butte	0	4

Fish passage would be improved in Vinegar Creek with the modification or replacement of the culvert at the upper crossing of Road 618. The culvert would still likely be a barrier at some flows since in-stream structures would not be placed. The log culvert modifying channel profile and potentially causing erosion in Butte Creek would remain.

Without creating new structures, several sections of Granite Boulder Creek and Butte Creek will continue to have long riffle sections (over 400 feet) without pool habitat. Summer and winter rearing habitat for steelhead and bull trout will remain at levels lower than expected for the geomorphology of these streams. Connectivity would be improved but remain impaired compared to Alternatives 2 and 5 in those streams. Thermal barriers would likely continue to be an issue in bull trout or potential bull trout streams for the future.

Conifers would be girdled or felled where encroaching aspen stands. Logs would not be removed so there would be no additional soil disturbance. As conifers fall following girdling, fuel loading in aspen stands may increase to levels which would promote long fire residence times. Large fuels burn slowly and keep fire in the same area increasing severity and damage to vegetation and soils. Long term aspen viability may also be affected by the hazard and the distribution of fuels. The level and severity of impacts to fish depends on distance from aspen stands to stream channels and fish.

Effects from these instream projects would be supplemented by effects from other stream and riparian improvement projects. Combined effects locally and downstream on the Middle Fork John Day River would be similar to those described for Alternatives 2 and 5 except smaller in magnitude and in area since fewer streams and stream segments would be treated under these alternatives. Projects on adjoining land would complement the recommended activities as described for Alternatives 2 and 5.

Chinook salmon, particularly adults, dependant on the Middle Fork John Day River for holding and spawning will benefit from these projects. Water temperatures are expected to remain elevated and flow regimes (peak and base flow timing and magnitude) will remain modified in the subbasin but these projects

should improve conditions in the subbasin. Long term benefits would be expected to be less than Alternatives 2 and 5 since less stream channel projects would be implemented.

Fluvial bull trout depend on adequate flows and optimum water temperature in the Middle Fork John Day River for seasonal migrations from larger rivers to smaller streams in the project area. If flows in the Middle Fork John Day River subside too early or water temperatures become too high before these threatened fish reach spawning areas, physical or thermal barriers are created. Projects associated with these alternatives are designed to improve conditions beneficial for bull trout and thus increase genetic diversity shared between subpopulations by fluvial fish.

Comparison of Alternatives—Heavy Equipment in RHCAs

Alternative 1

Alternative 1 has the least short-term impacts as well as the least long-term benefits for fish and fish habitat. There are no short-term impacts as no in stream work or riparian habitat improvement projects would be completed. However, Alternative 1 only maintains the current degraded baseline conditions in project area streams. In the long term this alternative is the least beneficial to fish and fish habitat in project area streams or the Middle Fork John Day sub-basin as a whole. Subwatershed conditions may improve over 50-100 or more years. Current flow regimes are unlikely to change the current stable in degraded condition toward one of recovery. Changes would be dependent on infrequent to rare weather and runoff events.

Alternatives 2 and 5

Alternatives 2 and 5 have the greatest short-term impacts due to extensive channel improvement projects using heavy equipment in Category 1, 2 and 4 streams. These alternatives also have the greatest long-term benefits due to large-scale improvements expected within 1-5 years in stream channels, fish habitat and populations. Improvements in associated riparian areas and water storage are expected within 5-10 years.

Alternatives 3 and 4

Alternatives 3 and 4 have some short-term impacts associated with improvement of existing in stream structures in Granite Boulder Creek and Butte Creek using hand tools. These alternatives would have fewer short-term impacts than Alternatives 2 and 5 since using heavy equipment would not be used in RHCAs. However they are expected to create smaller long-term benefits for water quality, fish and fish habitat. Overall benefits would be greater than under the no action alternative since water storage and fish habitat would be improved along segments of two streams.

4.3.5—ISSUE 1.4.5—EFFECTS OF PRESCRIBED FIRE IN RHCAS

The Agency's proposal to allow prescribed fire to burn within some Riparian Habitat Conservation Areas (RHCAs) will reduce riparian vegetation, affecting aquatic and terrestrial habitat. See ***ISSUE 1.4.5—Effects of Prescribed Fire*** in RHCAs *page 32.*

Burning within RHCAs carries risk that the fire may be too intense due to existing fuel levels and ladder fuels. Fire can kill riparian vegetation.

BACKGROUND:

Riparian areas are essential to fish and stream habitat. Riparian vegetation provides cover for fish, shade to maintain stream temperatures, stream bank stability, insect prey for fish and overall maintenance of the

stream channel in a static condition (Platts 1991). See Chapter 3, Fisheries and Hydrology sections for additional description of riparian habitats.

Terrestrial wildlife species use riparian areas disproportionately more than any other habitat (Thomas et al., 1979). About 75% of the terrestrial wildlife species found in the Blue Mountains are either directly dependent on riparian habitats or utilize them more than other habitats. Wildlife use riparian habitats for water, cover, shade and food. Riparian areas often provide travel corridors for movement and dispersal of many terrestrial species. See Chapter 3, Wildlife section for additional description of riparian habitats.

Riparian vegetation is adapted to periodic fire with a return interval slightly longer than that of the upland fire regime (Olson 2000). In Dry Forests, riparian areas were probably subject to fire return intervals of 20 to 50 years, versus 10 to 35 years in the upland areas. Aquatic and terrestrial species have survived for eons of time through many burning events. Species can be considered resilient to the effects of fire, at least when they occur under fire regimes. Fire can both positively or negatively affect habitats.

The wildfire hazard and risk in RHCAs is elevated compared to historic conditions. High intensity wildfires commonly occur during dry conditions where fuels have accumulated. Historically areas of elevated fuels were probably distributed in a patchy manner along streams. Today fuels are elevated along large contiguous stream segments (see Affected Environment, Watershed and Fire sections). Consequently, risks to aquatic and terrestrial species that are dependent on riparian systems are also elevated.

RESOLUTION:

In all action alternatives, initial ignition for prescribed fire would be prohibited in RHCAs. In Alternatives 2, 4, and 5, fire would be allowed to back (or creep) into RHCAs. Design criteria directs that at least 95% of shrubs and trees be retained within RHCAs. Chapter 2 includes mitigation to keep fires within stated parameters. If it appears mortality will exceed 5%, then suppression activities will be initiated. Alternative 3 would prevent fire from burning in RHCAs by avoiding burning near riparian areas, constructing fireline, creating blacklines or using a combination of these strategies. Fires that threaten RHCAs will be suppressed. Alternative 1, the no action alternative, does not use prescribed fire.

Measures:

- RHCA acres that could potentially burn.

ALTERNATIVE 1—Prescribed Fire in RHCAs

No prescribed burning would be implemented with this alternative.

In the absence of fire, it is expected that riparian vegetation will continue to maintain soil holding capacity, stream morphology, cover, shade, browse and forage, as stated in the background statement. The riparian vegetation, particularly hardwood habitats, would remain in degraded condition as described in the Affected Environment.

Alternative 1 does little to restore natural fire regimes. Fuel accumulations in RHCAs and uplands would remain elevated or increase as described in the Fire Effects section. Consequently, risk of intense wildfire entering RHCAs would remain elevated. Fire hazard would also remain elevated. The hazard is likely to increase over time as fuels continue to accumulate.

With increased fuel loadings in the RHCAs and uplands, it is expected that uncharacteristically severe wildfire would occur as described in the Fire Effects section. Wildfire that enters RHCAs is more likely to be of a higher intensity than historically occurred. Increased fire intensity in nearby uplands would pre-dry the elevated fuels in the RHCAs, similar to that which occurred during the Summit Fire. Drying of normally moist fuels has an effect similar to increasing fuel loads, i.e., increased fire hazard. Under intense wildfire, long, contiguous stream segments and adjacent riparian areas are likely to burn. Soil and vegetation damage is expected to be moderate to severe (Forest Service Handbook 2509.13), killing over 40-100% of

the above ground vegetation. Damage to vegetation, soils, watershed, and terrestrial and aquatic species is expected to be more severe.

Loss of vegetation impacts salmonid fish and habitat. Reduced shade increases summer temperatures, decreases winter temperatures and decreases cover (Swanston 1991), proportional to the amount of vegetation lost. Experience from the Summit Fire indicates that sprouts from root systems of damaged shrubs would grow vigorously and are likely to provide shade and fish cover 5-10 years after a fire. Shade from conifers would be re-established within 20-30 years.

Loss of ground cover and other fire effects on soil increase the risk of soil erosion immediately after wildfires; effects last until both live and dead ground cover are replaced. Increased sedimentation would occur, potentially degrading spawning and rearing habitat. Roots of killed trees generally continue to hold soil for about 7-9 years after plants die, reducing the immediate risk of mass wasting. It is unlikely that roots from new vegetation would be sufficiently established to hold soil at pre-fire levels until about year 20. Consequently, reduced soil holding capacity during the 7 to 20 year period may leave RHCAs vulnerable to mass wasting.

One positive effect of wildfire to riparian habitat is that streams can be much richer in insects and aquatic life due to ash and other nutrients from the burned trees that fall into streams (Brassfield 2000).

Bull trout populations are likely to be most impacted because they live in small streams during the period when wildfires are most likely to occur. Risks to populations of anadromous fish may be lower because they spend part of their life cycle in the ocean and may not return until stream condition has improved. The generation returning to fresh water for spawning immediately after the wildfire could be impacted by modified stream condition. Pre-smolt individuals in project area streams at the time of a wildfire would also be affected. Effects to individual anadromous fish would not affect the viability of populations.

Under a catastrophic fire situation, impacts to terrestrial species could include losses in cover, forage, and travel and migratory corridors. Species that are more strongly associated with riparian habitats, and consequently less widely distributed, would be those most affected. Species strongly associated with riparian hardwoods include Lewis's woodpecker, Williamson's sapsucker, red-naped sapsucker, downy woodpecker and willow flycatcher. The Columbia spotted frog, a sensitive species, could be affected. Some terrestrial species, such as small migratory birds, small mammals, and amphibians, may begin to reuse these habitats once shrubs recover; animals that require dense forest cover may be displaced for longer periods of time.

An intense wildfire crossing several subwatersheds may increase sedimentation of fish habitat (reducing habitat diversity, particularly pools), increase summer water temperatures and decrease winter water temperatures downstream in the Middle Fork John Day River. Mass wasting events which result in modifications to the channel morphology of the Middle Fork John Day River would be more likely to occur. These changes could impact fish using the Middle Fork John Day River, particularly chinook salmon and fluvial bull trout. There would be less impact to steelhead because they use the main stem as a migration corridor when temperatures are lower and spawning activities occur in smaller subwatersheds.

If an uncharacteristically severe wildfire crosses several subwatersheds, more than one riparian corridor may be lost in one event. Adverse effects to cover, forage and travel and migratory corridors would be amplified. Species that are strongly associated with riparian habitats would be most affected. Sensitive species, such as the Columbia spotted frog, may be at high risk. Populations that depend on riparian corridors for movement and dispersal may become isolated from each other. Species that are not strongly tied to riparian habits may simply shift their use patterns.

Assumptions Common to Action Alternatives 2, 4, and 5

Prescribed burning would be implemented when weather and fuel conditions allow for reductions in ground fuels while minimizing the risk of crown fires. Spring or fall burning normally allows for optimum moisture

conditions to control fires. Riparian areas commonly contain higher moisture levels than upland areas, particularly in the spring, so there is less likelihood of fires burning out of prescription. More importantly, prescribed fire treatments in upland areas would reduce risk of crown fire over a substantial potion of the Dry Forest types including the outer fringes of RHCAs. Risks of controlled burning getting out of prescription are low due to design criteria and mitigation measures. Table 181 displays acres of uplands and RHCAs within prescribed fire areas.

Table 181 Acres of Uplands and RHCAs within Prescribed Burn Areas

Subwatershed	Alt 2		Alt 3		Alt 4		Alt 5	
	Upland	RHCA	Upland	RHCA	Upland	RHCA	Upland	RHCA
Davis/Placer	2428	332	2290	0	1218	242	2548	332
Vinegar	2680	460	3070	0	2760	460	3260	460
Vincent	2,903	597	3110	0	3123	597	3153	597
Little Boulder/Deerhorn	5857	1093	5160	0	3889	751	5927	1093
Tincup/Little Butte	4097	553	3230	0	3161	499	4097	553
Butte	1385	285	1450	0	1068	292	1385	285
Granite Boulder	885	195	880	0	885	195	885	195
Total	**20235**	**3515**	**19190**	**0**	**16,124**	**3036**	**21255**	**3515**

Experience has shown It is unlikely that total acres of RHCAs would be affected by fire during prescribed burning activities due to elevated moisture conditions. Treatments would not occur in one year; rather they would be implemented over a 10-year period, allowing ground vegetation to recover in some areas before other areas are burned.

ALTERNATIVES 2 & 5—Prescribed Fire in RHCAs

Prescribed burning would be completed on 20,235 acres for Alternative 2 and 21,255 acres for Alternative 5 in the project area, including up to 3,515 acres in both alternatives in RHCAs.

Within the RHCAs, fire would be expected to burn relatively cool, move slowly, and leave a mosaic of burned and unburned patches. Fire at the recommended intensity is not expected to kill more than 5% of mature shrubs or conifers. Individual or small groups of trees or shrubs would be killed. The majority of plant mortality is expected to occur in the outer, drier portions of RHCAs. Low intensity fire (flame lengths less than 24 inches) is likely to burn the fine and small fuels (0-3 inches), char larger dead wood and burn lower limbs of small trees and decadent shrubs as well as the finer branches of well-hedged shrubs. Because 95% of the tree and shrub vegetation is expected to remain intact, few impacts to aquatic or terrestrial wildlife would be expected.

Shade and fish cover would be maintained because fire is not likely to reach stream banks. Surface erosion rates are not expected to increase since mitigation requires that an average of ¼ inch of organic material be left on the forest floor. Since less than 5% of RHCA plants would be killed, remaining vegetation would be sufficient to maintain soil stability. Even where hardwoods are burned, root strength and resulting soil stability would not change, as most vegetation below the root collar would remain alive. Shrubs would be expected to resprout vigorously up to 3-4 feet in the first year after the fire. Adverse effects to aquatic species would be unlikely.

Riparian vegetation would continue to provide cover, shade and food for terrestrial species. Prescribed fire would likely have the most effect on ground level and lower canopy vegetation. There may be some immediate, temporary loss of security/hiding cover for some terrestrial species. Spring burns often correspond to breeding and rearing seasons; birds that nest on or near the ground, for example, may be affected. Potential effects to individuals would not affect the viability of populations. Prescribed burn plans will incorporate mitigation to protect calving and fawning areas. Riparian areas would still provide sufficient cover to provide for movement and dispersal of many terrestrial species. Currently, shrub communities are

deteriorated, in part due to the loss of fire as a natural ecological component. Fires would likely improve forage and browse opportunities, although at low levels considering the recommended intensity of treatment. Several wildlife species are strongly associated with riparian hardwoods, including Lewis's woodpecker, Williamson's sapsucker, red-naped sapsucker, downy woodpecker and willow flycatcher. Low intensity fire may provide some additional snags for primary cavity excavators. Standards for large down logs would be met.

The combination of upland fuel treatments and RHCA burning would reduce the risk of catastrophic fire compared to the No Action Alternative. Within RHCA's, prescribed fire would reduce ground fuels and some ladder fuels, decreasing fire hazard. Because upland fire hazard is also reduced, any wildfire entering RHCA's from upland areas is likely to be of lower intensity. The risk of losing an RHCA to catastrophic wildfire would be reduced

Cumulative Effects

Effects of prescribed burning in outer fringes of RHCAs to aquatics would be insignificant and not measurable immediately downstream or in the Middle Fork John Day River. There are no expected impacts to fish or fish habitat in the Middle Fork John Day River.

No cumulative effects to terrestrial populations would be expected. Even if all RHCAs were entered, only 5% of the available habitat would be affected. Riparian habitat would remain intact. Wildlife corridors would be maintained across the project area.

ALTERNATIVE 3—Prescribed Fire in RHCAs

Alternative 3 proposes prescribed burning in a total of 19,190 acres in the project area and no acres within RHCAs. No burning will be allowed within RHCAs to ensure more short-term protection for stream corridors. Aquatic and terrestrial habitats would remain as described in the Affected Environment in Chapter III or the No Action discussion for this issue.

Fire hazards would remain elevated in RHCA's. However, burning activities in adjoining uplands are expected to reduce the likelihood of catastrophic wildfire. Any wildfire entering RHCAs from upland areas is likely to be of lower intensity. The risk of losing an RHCA to catastrophic wildfire would be reduced.

Cumulative Effects

Cumulative effects would be similar to those described for Alternatives 2 and 5. Risks of catastrophic fire in RHCAs are reduced, although to a lesser degree than in Alternatives 2 and 5.

ALTERNATIVE 4—Prescribed Fire in RHCAs

Prescribed burning would be completed on 16,124 acres in the project area, including up to 3,036 acres in RHCAs. This alternative proposes fewer acres of upland burning than alternatives 2 and 5, and consequently less RHCA acres are exposed to burning operations. The effects would be similar to those described under Alternatives 2 and 5 but would be smaller in spatial scale.

Cumulative Effects

Cumulative effects would be similar to those described for Alternatives 2 and 5. Risks of catastrophic fire in RHCAs are reduced, although to a lesser degree than in Alternatives 2 and 5.

Comparison of Alternatives—Prescribed Fire in RHCAs

Because 95% or the tree and shrub vegetation is expected to remain intact, few direct or indirect impacts to aquatic or terrestrial wildlife would be expected under any of the Action Alternatives. Reducing the likelihood of catastrophic fires impacting RHCAs is due more to the amount of upland burning than to allowing fire to creep into RHCAs. Accordingly, the difference in effects between burning and not burning within RHCAs becomes negligible. Alternatives 2 and 5 reduce the likelihood of catastrophic fires

impacting RHCAs most by implementing prescribed burning and/or tree removal over the most upland and RHCA acres. Alternative 3 burns fewer upland acres than 2 and 5 but more than Alternative 4. Alternative 1 (no action) would not implement any prescribed burning; this alternative would ensure short-term protection of existing habitat but forgoes the long-term goal to reduce high intensity wildfire risk.

4.3.6—ISSUE 1.4.6—INADEQUATE RHCA SIZE

The Agency's design to apply Pac Fish buffers may be inadequate in size to protect fish and their habitat.

BACKGROUND

Some RHCAs are located in areas with soils that are more susceptible to management activities e.g. Clarno soil types. Additional precautions or mitigations should be taken around Category IV streams to ensure protection from possible compaction due to skidding equipment. These impacts may create more intense overland flows and potential sediment delivery to streams.

These RHCAs, in particular the Category IV streams, may require additional widths to ensure protection from possible compaction from skidding equipment creating more intense overland flows and potential sediment delivery due to displacement. In areas containing sensitive soils, the standard RHCA for Category IV stream from Pac Fish direction should be increased for equipment from the current standard of 100 feet (200 feet total).

Alternatives 2, 4, and 5 apply standard PacFish RHCAs. Alternative 3 increases the buffers on Category IV streams by 25ft for a total RHCA plus additional buffer of 125 feet either side of the channel. This increase would be a no equipment buffer; trees may still be removed in the expanded area.

Table 182 Acres of activity in 25 feet outside of RHCA for Alternatives 2/5 and increased "No Equipment" RHCA for Alternative 3

SUBWATERSHED	Alternative 2 Acres where machine activity would occur in extended RHCA	Alternative 3 Acres of increased "No Equipment" RHCA in Tractor Units	Alternative 5 Acres where machine activity would occur in extended RHCA
Davis/Placer Gulch	3.5	3.4	3.5
Vinegar Creek	1.8	1.8	1.9
Vincent Creek	4.7	4.6	4.8
Tincup/Little Butte Creek	2.7	2.6	2.7
Little Boulder Creek/Deerhorn	4.3	4.2	4.4
Butte Creek	0.1	0.1	0.1
Granite Boulder Creek	0.0	0.0	0.0
Total	17.1	19.7	17.5

Harvest prescriptions, methods and mitigation measures were designed with the aid of fisheries and hydrology personnel and were tailored to protect riparian areas as well as fish and fish habitat. Many potential units were dropped from consideration early in the NFMA/NEPA process due to concerns about compaction, runoff, and other impacts that could affect fish or fish habitat. Key watershed designation increased RHCA size from 50 to 100 feet to further protect fish and fish habitat from disturbance. The standard RHCAs extend beyond the actual riparian areas of streams.

ALTERNATIVE 1—Inadequate RHCA Size

No timber activities would occur with this alternative. No increase in erosion in stream channels is expected.

ALTERNATIVE 2—Inadequate RHCA Size

Discussion under Undesired Conditions 1.2.3 Peak Flows and Issue 1.4.5.3 and in the Affected Environment described the natural tendency of soils in the area to concentrate surface flows, the greater tendency and increased risk of surface flow being concentrated due to past soil disturbance, and the risk of surface flows being concentrated following recommended activities when standard PACFISH RHCAs are applied to Category IV (intermittent) streams. There is also greater risk of interactions occurring among these three factors; the increased magnitude of concentrated flows resulting from such interactions increases the risk that dry swales or ephemeral draws would channelize and become intermittent channels, increasing the drainage network. It is estimated that there are about 50 segments of intermittent streams, based on the number of intermittent segments located on clayey soils, where erosion potential would be increased. Erosion of these channels would allow concentrated surface flows, turbidity and sediment to reach streams. Water concentrated from overland flow in uplands would reach streams more rapidly, increasing peak flows. More importantly, more rapid runoff tends to decrease base flows later in the year. These trends would not change until the addition of coarse woody material or similar events interrupted the concentrated flows, enhancing infiltration and sediment trapping. Generally, coarse woody material is not expected to enter channels for over 150 years since most of these areas were railroad logged in the early 1900s.

Table 183 Harvest on Sensitive Soils

Harvest Method	Alternative 2 Acres (Disturbance acres)	Alternative 3 Acres (Disturbance acres)	Alternative 5 Acres (Disturbance acres)
Tractor	2079 (413)	2021 (400)	2110 (419)
Skyline	549 (77)	468 (68)	806 (103)
Helicopter	1585 (81)	336 (16)	1581 (81)
Total	4213 (571)	2825 (484)	4497 (603)

Adequate base flows are critical to survival of ESA listed fish species in the project area and downstream in the Middle Fork John Day River. Bull trout would be impacted during low flows because available spawning habitat would be reduced and temperatures would be more likely to rise above lethal thresholds for fish during spawning activities in September. Fish populations could be impacted at sub-lethal elevated temperatures; spawning behavior can be modified and egg mortality increased reducing fecundity.

According to Burroughs and King (1989) 150 feet is sufficient to trap sediment under conditions of concentrated flow on granitic soils with high to very high erosion risk. Extending these findings to the conditions of the project area where erosion risks are elevated for the reasons listed, it is expected that the risk of concentrated flows and soil particles (either turbidity or sediment) would reach Category IV (intermittent streams) is higher under the existing disturbed conditions, which tend to accelerate erosion. Standard RHCAs would likely trap sediment if activities were recommended on undisturbed soils. Consequently, the risk that sediment would reach streams with standard RHCA protection is increased because the width of standard RHCAs would not be adequate to absorb the increased concentration of water and sediment contributed from previously disturbed areas. The increase in risk varies by site, depending on the particular mix of soils, past soil disturbance, and recommended disturbance.

Erosion and sediment input to streams reduce quality of fish habitat. The risk that pool depth, pool riffle ratios and available spawning substrate would be reduced is higher when more sediment is available for transport to streams. Pool to pool spacing, cobble embeddedness and amounts of fine substrate would also be increased with additional sediment. Width to depth ratios could be increased or recovery of stream channel profiles could be retarded. Habitat quantity, complexity and quality necessary for all life stages of threatened and sensitive fish species in the project area would be reduced.

Cumulative Effects

Many of the streams classified as Category IV streams are ephemeral in flow regime. They are classified as Category IV (intermittent) streams based on the PACFISH definition which relies on "evidence of annual scour or deposition." Other classification systems would consider these streams to be damaged ephemeral draw bottoms that do not have the channel development and stability of long-established channels. Consequently, it is expected that, if concentrated flows reached these channels more frequently, as would be expected with the increased risk associated with activities occurring along standard RHCAs, erosion in these previously degraded channels would increase. Extending the drainage network would also increase the chronic disturbance of the area, further increasing the rate at which water leaves the hill slopes and decrease base flows.

The risk that fish and fish habitat in the Middle Fork John Day River would be affected by water yields and sediment is expected to increase proportional to the increase in drainage network. There is also increased risk that chinook salmon spawning habitat in the Middle Fork John Day River would be reduced in quantity and quality with addition of sediment and reduction of base flows.

ALTERNATIVE 3—Inadequate RHCA Size

Alternative 3 increases the protection on Category IV streams with sensitive, clayey soils by 25% to 125 feet from either side of the channel in units that would be harvested using ground based systems. Alternative 3 proposes tractor harvest on about the same amount of sensitive, clayey soils as Alternative 2. Impacts from tractor logging would be reduced on about 17 acres of sensitive soils. Impacts from ground based logging would shift from skidding to winching as no equipment would enter the additional 25 feet Trees would be removed from the area, but no heavy equipment would be allowed within it. Winching over current ground cover may create small, isolated openings, generally estimated to be less than a square foot in area, in the ground cover but would not be expected to cause compaction or other soil disturbance which would result in the concentration of surface flows and the initiation of erosion. The likelihood of rilling or gullying connecting to about 50 segments of intermittent streams (PACFISH) would be reduced.

While only a small amount of ground would be protected compared to the total subwatershed or unit, the selected areas are considered key to improving aquatic conditions. Bull trout and steelhead matrix standards (from USF&W and NMFS) for drainage network increase, sediment, large woody debris, pool frequency and quality, large pools, wetted width/maximum depth ratio and temperature would be better protected with the increased buffer. This could potentially help move parameters toward "Properly Functioning" or "Appropriately Functioning" watershed condition. While the risk of impacting TES fish species or habitat would not be removed with this alternative, it would be reduced relative to Alternative 2 or 5.

Cumulative Effects

As described for Alternative 2, many of the channels classified as Category IV streams have ephemeral flow regimes. They are actually damaged ephemeral draw bottoms that do not have the channel development and stability of long-established channels. It is expected that, since fewer concentrated flows are expected to reach these channels, the risk of erosion in these channels would be reduced. Also, the chronic disturbance of the area would be increased to a lesser extent than under Alternatives 2 and 5.

Changes in water yield and sediment from harvest activities on sensitive soils could affect fish and fish habitat in the Middle Fork John Day River even with increased "No Equipment" buffers. However, risk would be decreased compared to Alternatives 2 and 5. Chinook salmon spawning habitat could be reduced in quantity and quality with addition of sediment and reduction of base flows.

ALTERNATIVE 4—Inadequate RHCA Size

No harvest activities would occur with this alternative. No increase in erosion in these stream channels is expected due to activities.

ALTERNATIVE 5—Inadequate RHCA Size

Effects are expected to be similar to those described for Alternative 2 except for a slight increase in magnitude. About 100 more acres of sensitive, clayey soils would be harvested with ground based systems than under Alternative 2. It is estimated that the potential for rilling or gullying to connect with about 2 more intermittent channels or degraded ephemeral draw bottoms would increase.

Cumulative effects are expected to be similar to those described for Alternative 2 except that erosion risk in about 2 (4%) more intermittent channels or degraded ephemeral draw bottoms would increase, contributing to a further increase in the chronic disturbance of the area. Risks to fish habitat would increase proportionately.

Comparison of Alternatives—Inadequate RHCA Size

Alternative 1 and Alternative 4 do not have any harvest associated with them and consequently have no change in the direct/indirect or cumulative effects associated with harvest.

Alternative 3 has more risk than Alternatives 1 and 4 because harvest activities would take place on sensitive soils. Increasing “No Equipment” buffers by 25 feet on Category 4 streams and reducing tractor skidding on sensitive soils reduces but does not entirely remove risk. Alternative 2 has more risk than alternatives 1 and 4 associated with impacts from harvest activities on sensitive soils. Alternative 5 has the most risk as it contains the greatest amount of harvest on sensitive soils near PacFish RHCAs.

4.3.7—ISSUE 1.4.7—BLOW DOWN IN VINCENT/VINEGAR RHCAS

The Agency's recommended action to remove material from within RHCAs may adversely impact the riparian resource. Harvest, associated activities, and new stream crossings may reduce riparian functioning. See ***ISSUE 1.4.7—Blow down in Vincent/Vinegar*** RHCAs *page 32.*

BACKGROUND

This issue is two-fold: 1) The removal of dead material within Pac Fish buffers in the area known as the "Banner Blow-Down" area of Vinegar Creek, and removal of live conifers in RHCAs of several subwatersheds with units designated for aspen regeneration; and 2) The removal of material within new stream crossings. Management activities within these RHCAs may decrease current and future coarse woody debris, decrease shade to streams, and increase risk of sedimentation from logging-related activities. Alternatives 2 and 5 propose to remove 50-80% of the blow down material within the outer one-half of the Pac Fish buffers only in the Vinegar Creek headwaters. Alternatives 3 and 4 would not remove any material in the outer one-half of the Pac Fish buffers. Alternatives 2 and 3, propose one new stream crossing, in Alternative 4, no new stream crossings would occur, and Alternative 5 has two new stream crossings.

ALTERNATIVE 1 AND ALTERNATIVE 4—BLOW DOWN IN VINCENT/VINEGAR RHCAS

Under these alternatives no down wood would be removed from the Area where the "Banner" wind event occurred. Fuel loading would remain high in the area, increasing the risk of high intensity wildfire. The fire hazard is high because of the fuel loading. Hazard would be expressed both as long resident burn times, probably over 12 hours and as magnitude of fire. Wildfire would likely result in fire-damaged soils. Fuel conditions would support spread of fire throughout contiguous RHCAs, including those of tributaries. Fire damaged soil is more likely to result in sediment inputs to the streams both from surface erosion in the first three years after the fire, and from mass movement about 7 to 20 years later as roots become available to bind soil. This results in a temporary decline before recovering. Potential for insect infestation is also higher by not removing the large amount of dead wood in the Banner area where the wind event occurred. If uncharacteristically severe wildfire occurred in the RHCA, then Large Woody Debris most likely would be reduced below standards in the headwaters of Vinegar Creek, a stream with threatened fish species. These impacts could reduce viability of the subpopulation of threatened bull trout that may presently be re-colonizing Vinegar Creek (see Bull Trout, page 127).

Leaving aspen stands as they are would reduce viability of the clones and vegetative diversity of riparian areas. This would not be expected to have any short or long term effect on fish or fish habitat.

Cumulative Effects

Should an uncharacteristically severe wildfire take place in the area where the "Banner" wind event occurred, there is a risk of a sediment flush moving downstream through Vinegar Creek which would reach the Middle Fork John Day River. This would be similar to the debris torrent from upper Badger Creek that happened two years after the Summit Fire. Pool habitat quality and quantity would be reduced and banks would be destabilized, modifying channel profile and potential. Channel modifications following such events may result in increased wetted width to depth ratios that result in increased base flow temperatures. Warmer water would be contributed to the Middle Fork John Day. The degree to which this is possible is currently unknown and would be dependent both on the severity of the soil damage and subsequent

weather events after an uncharacteristically severe wildfire. Impacts from uncharacteristically severe wildfire could reduce overall population viability and genetic diversity of threatened bull trout in the Middle Fork John Day River sub basin, by directly impacting individuals that may presently be re-colonizing Vinegar Creek.

ALTERNATIVE 2—Blow down in Vincent/Vinegar RHCAs

Mitigation for removal of logs in the blow down area includes (mitigation for aspen enhancement project is listed under Issue 4):

A fisheries or hydrology specialist will identify and protect any logs in the portion of the RHCA where logs can be removed that have potential to become in-stream LWD.

- Logs will not be bucked if a portion of the log extends into the "no removal" part of the RHCA.
- Logs on the ground will not be moved. Only "stacked" logs will be removed from the site in the Banner Area.
- Landings would be located outside RHCAs.

Mitigation to remove only the upper pieces of jackstrawed wood in the outer half of RHCAs by helicopter, leaving in place the material in contact with the ground, is expected to result in undetectable soil disturbance, movement and stream sedimentation on about 72 acres. Logs would not be removed from the stream or immediate riparian area (as defined by obligate riparian vegetation) but rather from the outer half of the PacFish RHCA. No short-term (5 years or less) impacts to stream channels would likely be measurable with this prescription. The *Land and Resource Management Plan* Standard of 15-20 pieces of down woody debris per acre (for wildlife) will be met before anything is removed from the RHCAs. It is expected that there will be a decrease in soil organic matter and in soil nutrients proportional to the volume of wood recommended for removal. No additional long-term impacts (10, 25 or 50 years) are expected. No increases in water yield are expected because all wood to be removed is already dead.

Effects of landings located outside RHCAs are discussed in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows, page 239; and in 4.3.3—ISSUE 1.4.3—Effects of Ground Based Systems, page 333.

The wood recommended for removal along Vinegar and Vincent creeks and their tributaries currently is not providing shade or current or future, potential instream large woody debris (LWD). Removing it is not expected to affect these parameters. The minimum size class is too small to become acting wood in area streams.

Only a small portion of Vinegar Creek stream channels included in the recommended activity area are fish bearing streams (Category 1) with 300 foot buffers on either side. Down wood could be removed from the outer 150 foot portion of the buffer with no wood removed from the 150 foot portion of the RHCA nearest the stream. No impacts to fish habitat or fish (such as harassment) are expected. Most of the removal would occur in the outer 75 ft. of Category 2 (non fish-bearing perennial streams) RHCA, leaving a 75 ft. "no removal" zone near the streams. Category 3 wetlands and Category 4 wetlands would be protected with 75 ft and 50 ft, respectively, "no removal" zones. Category 4 (intermittent) streams would have a 50 foot no removal buffer from the stream. No trees are expected to be removed from riparian areas defined by obligate vegetation.

Removing fuels from the blowdown area would reduce the risk of intense wildfire entering the RHCAs and reduce the intensity and resident time with which wildfires would be expected to burn. Also, the risk that fire would enter the inner portion of RHCAs and burn (with moderate to severe soil damage) is reduced by treating the outer portions of the RHCAs. Reducing these fire parameters is expected to reduce the potential soil hazard and subsequent effects described for the No Action Alternative. Potential for bug

infestation would also be lower with treatment. In the short and long term, adequate large woody debris will remain available in the RHCA.

Table 184 Conifer Removal & Removal of logs in RHCAs & New Road Construction in RHCAs ATM A & B

Subwatershed	Aspen Area with Conifer Removal in RHCAs	Acres in Banner Blowdown with Down Log Removal in RHCAs	New Road Construction in RHCAs ATM B		New Road Construction in RHCAs ATM A	
	Acres	Acres	Miles	Acres	Miles	Acres
Davis/Placer	3.0		0.07	0.25	0.07	0.25
Vinegar	9.5	71.5	0.02	0.07	0.03	0.11
Vincent	4.5		0	0	0	0
Little Boulder/ Deerhorn	11.75		0	0	0.3	1.1
Tincup/ Little Butte	0.75		0.03	0.11	0.03	1.1
Butte	0		0	0	0	0
Granite Boulder	0		0	0	0	0
Total	**29.5**	**71.5**	**0.12**	**0.43**	**0.43**	**2.56**

Conifers would be removed in RHCAs associated with aspen enhancement. Riparian vegetation diversity will be increased in the long term. This is unlikely to have any impact or benefit to fish or fish habitat in the area. Short-term impacts to fish and fish habitat will be minimized if mitigation measures are implemented.

Removing pieces of down wood from within the prism of recommended new roads in RHCAs is expected to reduce organic material and soil nutrients proportionately to the volume of the segments removed. Table 184 lists amount of road construction disturbance in RHCAs by subwatershed. It is important to note that only 0.12 miles (0.43 acres) of disturbance in RHCAs would be contributed due to road building under ATM B and these roads are replacing roads with greater lengths in RHCAs that are planned for decommission as part of this project. It is expected that soil disturbance greater than that caused only by road building would occur in RHCAs because logs would likely be skidded prior to the construction of the road prism. Disturbance includes locations at or near stream banks. Skid trails would increase likelihood of erosion paths developing and their location in the RHCA, near streams, would increase the risk that sediment and concentrated surface flows would reach streams. Some of these areas are located on sensitive soils with clayey surface or subsurface soils further increasing the risk due to the surface erosion potential of these soils. The use of designated skid trails is expected to meet *Land and Resource Management Plan* standards for detrimental soil disturbance. Felling trees in the road prism has additional effects on coarse woody debris recruitment and shade but the removal of the log lengths lying in the prism are not expected to affect these parameters because of the mitigation for felling of trees in RHCAs and because the log lengths lying in the road prism are not providing shade. Felling trees to construct new roads is expected to remove shade and modify coarse woody material recruitment. These effects are discussed in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows, page 239; and in 4.3.3—ISSUE 1.4.3—Effects of Ground Based Systems, page 333.

Cumulative Effects

Removing currently available fuel would reduce fire intensity and is described in the Fire Effects section. The risk that sediment flushes would develop and move downstream through Vinegar Creek into the Middle Fork John Day River, modifying channels, would be reduced proportionately to the reduced fire intensity as compared to the No Action Alternative. Some, reduced risk would still be present that adverse effects described for the No Action Alternative would occur. Landings would add to the chronic disturbance of the area as described in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows page239 and in 4.3.3—ISSUE 1.4.3—Effects of Ground Based Systems, page 333.

The skidding and landings necessary to remove the segments of trees lying in the prism of the recommended road would add to the chronic disturbance of the area. This is expected to increase risk of cumulative sedimentation but at an undetectable level. The construction of new stream crossings has other,

cumulative effects, additional to the removal of the woody material as discussed in Section 4..2., Water Quantity Needs (Peak flows) and in Section 4.3.3, Issue 3 Harvest Effects on Soils.

ALTERNATIVE 3—Blow down in Vincent/Vinegar RHCAs

No removal of wood from the Area where the "Banner" wind event occurred would occur. Conifers in aspen improvement units would be girdled or felled but left onsite. Effects would be similar to those described for the No Action Alternative except fuel loading would increase in alder stands. Effects of removing wood from within the prism of new roads are similar to those described above for Alternative 2.

Cumulative Effects

Cumulative effects are similar to the No Action Alternative, Alternative 4 and Alternative 2 except that chronic disturbance would be increased incrementally and at undetectable levels due to the removal of wood from road prisms only. There would be no increase due to the construction of landings for removal of Blowdown material. However, the risk of large-scale events that would contribute sediment to streams and modify channel profiles would be elevated as described for the No Action Alternative and Alternative 4.

ALTERNATIVE 5— Blow down in Vincent/Vinegar RHCAs

Effects of removal of wood from the blowdown area and aspen units would be similar to those described for Alternative 2. Effects of removing wood from within the prism of new roads are similar to those described above for Alternative 2 except that they would occur in more locations and total 0.43 miles or 2.56 acres . The additional locations would also be on sensitive soils with clayey surface and subsurface soils. At least one is located on a greater than 30% slope. The risk of sedimentation or concentrated flows reaching streams is increased more because of the higher surface erosion potential associated with these soils.

Cumulative Effects

Cumulative effects of removing wood from the blow down area aspen units are similar to those described for Alternative 2. Cumulative effects of removing logs from road prisms are similar to those described for Alternative 2 except greater in magnitude due to the increased number of locations, types of soils, and slope. Chronic disturbance and erosion risk would be increased in proportion to the amount of skidding and landings required, particularly on sensitive or steep soils.

4.3.8— ISSUE 1.4.8—EFFECTS OF TOXIC CHEMICALS

The Agency's proposal to use chemicals to control competing vegetation, pocket gopher populations and noxious weeds, may pose harmful risks to aquatic and terrestrial wildlife and humans using the area. See ***ISSUE 1.4.8—Effects of Toxic Chemicals*** *page 32.*

4.3.8.1—Competing Vegetation

BACKGROUND:

Competing vegetation is often the most important factor limiting conifer regeneration in the Inland Northwest. Competition between vegetation for site resources can result in reduced growth and survival of forest trees, in some cases limiting reforestation success. Early seral shrubs and forbs have the ability to rapidly occupy open sites caused by fire or other disturbances. They seed in or sprout from roots to quickly occupy the site and their rapid growth rates develop crown volumes that far exceed that of young conifers. Pinegrass (Calamagrostis rubescens) and elk sedge (Carex geyeri) are early seral plants that have the capacity to rapidly colonize disturbed sites and they can provide serious competition to tree seedlings. Sod forming grasses compete very effectively for moisture in the upper soil layers and adversely impact both growth and survival of tree seedlings.

RESOLUTION:

Alternative 1, the No Action alternative, and Alternative 4 do not propose any reforestation; therefore there is no need for controlling competing vegetation. Alternatives 2, 3, and 5 propose varying amounts and types of reforestation, which include treatments to decrease vegetative competition to tree seedlings. Alternatives 2 and 5 utilize both manual methods and herbicides to control competing vegetation. Alternative 3 uses only manual methods, i.e., non-chemical methods, to control competing vegetation.

Measures:

- Acres treated with herbicides for control of competing vegetation.

Herbicide toxicity and exposure levels.

Project Design

The Vegetation Management Plan (an Appendix to the *Integrated Fuels and Silvicultural Report*, "Silvicultural Diagnosis"—Southeast Galena Restoration, Analysis File) discusses the need for control of competing vegetation, the various control methods, and predicted acres of each treatment. Treatment acres are summarized by alternative in Table 185, page 367. Manual methods could include scalping, mulch mat placement and subsoiling. Chemical treatments could include application of the herbicides glyphosate or hexazinone. Table 186, page 367 displays recommended herbicide treatment acres by subwatershed.

Predicted amounts of each treatment method were based on the areas that are expected to exceed competition thresholds in the predicted year of planting. Areas planted immediately after harvest will have a greater range of treatment options, with an emphasis on preventative and early treatment. Where planting is delayed following harvest, treatment will require a higher proportion of corrective treatments, such as subsoiling and herbicides for sod control.

Application would be by hand within a 4-foot radius of tree seedlings (approximately 35% of the unit); the balance of the area (65%) would not be treated. Herbicide application would be required once during the average five-year tree establishment period; manual treatments might require multiple treatments. Herbicides would not be applied within RHCAs.

Effectively controlling competing vegetation would help reforestation units meet or exceed the historical 65% seedling survival rate average on the Blue Mountain Ranger District and help ensure reforestation success. The effects of competing vegetation control are generally short-term. They would occur during the 5-year reforestation period, and persist a few years past that time frame.

Herbicides Recommended for Use

Glyphosate (Accord formulation) would be used to control sod-forming grasses. It is a broad-spectrum herbicide, meaning that it kills nearly all vegetation, except broadleaf woody shrubs. Glyphosate is applied to foliage and is absorbed by the leaves. It prevents the plant from producing amino acids essential to growth. Application is by spot spraying a 1-2 percent solution at a rate of 20 gallons (1-2 lb. of active ingredient) per acre.

Hexazinone (Pronone 25-G formulation) would be used where control of both grasses and shrubs is needed. It is selective, killing only certain plant types. It is readily absorbed by plant roots and leaves and moves up through the plant and kills it by inhibiting photosynthesis. It remains in the soil and controls vegetation for up to three years. Application is in granular form (hexazinone coated clay particles, 25% by weight) in spot application at the rate of approximately 20 pounds (2-3 lb. of active ingredient) per acre.

Additional information may be obtained in the *Pacific Northwest Region Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation*, Appendix C, Herbicide Use and Efficacy.

Predicted and Maximum Treatment Needs

All treatments that may be used are shown in the table below, which is the maximum for use in determining effects. The most effective treatment method will be based on individual site evaluation at the time the sites

become available for planting. Site availability depends on when harvest is complete and the treatment will depend on funding and other operational constraints.

Table 185 Acres of Competing Vegetation Treatments by Alternative

Treatment	Alt. 2 Acres	Alt. 3 Acres	Alt. 4 Acres	Alt. 5 Acres
No Treatment	844	508	0	1259
Subsoiling	193	193	0	266
Large Scalps or Mulch Mats	897	741	0	1318
Herbicides (Glyphosate & Hexazinone)	897	0	0	1318

Table 186 Acres of Chemical Treatment by Subwatershed

Subwatershed	Alt. 2 Acres	Alt. 3 Acres	Alt. 4 Acres	Alt. 5 Acres
Davis Ck/Placer Gulch	139	0	0	139
Vinegar Ck.	138	0	0	348
Vincent Ck.	131	0	0	342
L. Boulder/Deerhorn	129	0	0	129
Tincup/L. Butte	199	0	0	199
Butte Ck.	161	0	0	161
Granite Boulder Ck.	0	0	0	0
Totals	**897**	**0**	**0**	**1318**

ALTERNATIVE 1—Toxic Chemicals—Competing Vegetation

Alternative 1 does not propose reforestation activities, making site preparation and control of competing vegetation unnecessary.

Direct and Indirect Effects

Soil, Water Quality, and Fisheries

There would be no effects to threatened, endangered, or sensitive (TES) aquatic species.

Wildlife

There would be no effects to Threatened, Endangered, and Sensitive (TES) species, Management Indicator Species (MIS), or Species of Interest (SOI).

Sensitive Plants

There would be no effects to sensitive plant species.

Worker and Public Health & Safety

There would be no effects to worker and public health and safety.

Cumulative Effects

Under the *2000 Malheur National Forest Noxious Weed Environmental Assessment* (referred to as the *Noxious Weed EA* throughout the remainder of this section), approximately 200 noxious weed sites on 65 acres will be treated using both chemical and non-chemical methods. Effects to aquatic and terrestrial wildlife are disclosed in the *Noxious Weed EA*.

County Road crews would also spray herbicides along State Highways 7 and 26, and County Highway 20. Portions of these highways are located within the RHCAs for the Middle Fork John Day River and its

tributary streams. Highway maintenance crews spray herbicides along the right-of-ways to control roadside vegetation.

These herbicide applications were not expected to have adverse effects on aquatic or terrestrial species, or humans.

ALTERNATIVE 2—Toxic Chemicals—Competing Vegetation

In the Recommended Action, approximately 1,934 acres would be planted. As discussed above, about 897 acres of the total are expected to be over threshold for grasses. Site preparation and control of competing vegetation by all methods listed in Table 185, page 367 would be considered for use.

Direct and Indirect Effects

Soil, Water Quality, and Fisheries

Application will be by spot treatment around seedlings, there will be no aerial application of chemicals. The environmental issue with upland treatment is the potential for chemical transport through permeable soils to streams.

Glyphosate does not have herbicidal properties once it contacts soil, and is not absorbed by plant roots. Glyphosate has a very low potential for leaching into groundwater because it is strongly held by soil particles. It is broken down by soil microorganisms and remains in the soil from 3-249 days. It does not easily evaporate. It is slightly toxic to fish and is essentially non-toxic to aquatic invertebrates.

Hexazinone is moderately persistent in the soil, remaining in low concentrations for up to three years, until soil microorganisms break it down. It has a higher leaching potential than glyphosate, because it is not adsorbed well by the soil. It does not easily evaporate. It is practically non-toxic to fish and aquatic invertebrates.

Neither of these herbicides has been shown to have significant or long-term effects on mycorrhizae populations. In most instances, soil microbes are substantially responsible for eliminating these substances from the soil. There may be some reduction in soil microbial activity, but these microbes eventually degrade these herbicides over time. Decomposition is more rapid under the warmer conditions expected in the harvested area openings due to the reduction of shade. No sustained adverse effect on soil productivity is anticipated as a result of the recommended use of these herbicides.

The herbicides will be applied under dry conditions, outside of RHCAs, when soil water movement is limited. Under these conditions, it is unlikely that a herbicide will be transported to live stream water when the herbicide is at its highest toxicity level. Hexazinone has a longer period of persistence and may be moved by soil water while persisting in the soil at low concentrations, generally below the level of toxicity to aquatic organisms.

The potential impact of chemicals on fish and other aquatic organisms is a function of two factors: (1) the toxic characteristics of the compound, and (2) the concentration to which the organism is exposed. These two factors are used to determine the risk analysis for aquatic organisms.

The first part of the risk analysis is to determine toxicity levels for aquatic species. Glyphosate and hexazinone are characterized by relatively low aquatic toxicity. Toxicity levels can be quantified using the 96 hour-LC50. The 96-hour LC50 refers to the concentration that is lethal to 50 percent of the fish exposed at that level for 96 hours. The smaller the LC50, the more sensitive a given species is to the herbicide. Table 187 displays the 96-hour LC50 of glyphosate and hexazinone for various aquatic species.

Although the LC50 is frequently used as a toxicity standard, fifty percent fish mortality is generally not desirable. For this reason, a better parameter to evaluate effects is the "No Observable Effect Level" (NOEL). A NOEL is the highest dose in a particular test that did not result in adverse health impacts to the

test organism. None of the herbicides recommended for use have established NOELs. In the absence of long-term test results that provide safe concentrations or NOELs for many pesticides or herbicides, the EPA has recommended that the 96-hour LC50 be divided by 10 to set a standard for concentrations to protect aquatic species (U.S. EPA 1986). This calculation was used for glyphosate and hexazinone, which have no established NOELs for aquatic species. Table 187 displays the NOELs of glyphosate and hexazinone for various aquatic species.

Table 187 Levels of Herbicide Effects on Aquatic Species

Herbicide	Use Rate[1] (lbs/ac.)	Soil Adsorption	Half Life[2] (Days)	Toxicity to Aquatic Organisms	96-hour LC50[3] (parts per million-ppm)	NOEL[4] (parts per million-ppm)
Glyphosate (Accord)	1-2	Strong	3-249	Slight	86 ppm (rainbow trout) 780 ppm (Daphnia)	8.6 ppm EPA
Hexazinone (Pronone 25G)	2-3	Low	30-180	Slight	320 ppm (rainbow trout) 1686 ppm (salmonids)	32.0 ppm EPA 168.6 ppm EPA

[1] Use Rate is the amount of active ingredient of the chemical

[2] Half-life – Time required for the concentration of a chemical to decrease by one half.

[3] A Lethal Concentration 50 (LC50) is the dose that is lethal to 50 percent of the fish exposed at that level for 96 hours.

[4] A No Observable Effect Level (NOEL) is the highest dose in a particular test that did not result in adverse health impacts to the test organism.

Recent studies in the Columbia River's Hanford Reach have shown that levels as low as 1/100 of the LC50 have lead to acute affects to some species of fish (i.e., changes in hormone levels in female fish caused males to not breed with them). Other non-fatal affects being studied by the Natural Environmental Research Council, European Union include reproductive function of fish, including effects on steroidogenesis, fecundity, fertilization rate, and sperm quality.

The second part of the risk analysis is to evaluate potential exposure levels, given the recommended herbicide applications. A "worst case" scenario approach is used. "Maximum Allowable Acreage" (MAA) was calculated for each subwatershed based on toxicity levels (i.e., NOELs), stream flows and chemical application rate. MAA calculations were determined using the NOELs for rainbow trout because this species is the most sensitive to chemicals. MAA calculations also used the NOELs for glyphosate because this herbicide has the highest toxicity to aquatic species. Analysis assumes that if the MAA for glyphosate and rainbow trout is not exceeded, then this species as well as all other fish species, including threatened, endangered, and sensitive species, would not be harmed.

An alternative way to assess exposure thresholds is using a NOEL ratio. A NOEL ratio is derived by dividing the recommended treatment acres by the MAA. A NOEL ratio less than 1 indicates that NOEL thresholds will not be exceeded.

Table 188 lists the total acres recommended for treatment, the Maximum Allowable Acres that could be treated, and the NOEL ratios by subwatershed. For the complete discussion of methods, assumptions, calculations, and results refer to the *Malheur National Forest Noxious Weed Environmental Assessment,* Appendix H (pp. 18-21) and the Soil, Water and Fisheries Reports for this project.

Table 188. Alternative 2 Glyphosate Chemical Treatment for Competing Vegetation vs. Maximum Allowable Acres

Subwatershed or Drainage	Alt 2 Acres	Maximum Allowable Acres	NOEL Ratio
Placer Gulch	139	420	0.3310
Vinegar Ck.	138	2100	0.1657
Vincent Ck.	131	2100	0.1629
Deerhorn	107	2100	0.0510
L. Boulder	22	2100	0.0148
Murdock	51	420	0.1214
Windlass	148	420	0.3524
Butte	161	2100	0.0767
Totals	**897**	**Not Applicable**	

In no case did the rate of application exceed the NOEL or EPA guidelines for rainbow trout. No effects to threatened, endangered or sensitive species would be expected. See the Aquatic Biological Evaluation in Appendix B. The main risk of chemical contamination of fish habitat is from spills that could occur during transport of equipment and chemicals or while filling equipment. Design criteria and mitigation measures are incorporated in the recommended action to minimize these risks. See the *Noxious Weed EA*, Appendix H for additional detail on existing conditions.

Wildlife

Direct effects primarily relate to chemical use and can occur when terrestrial wildlife is exposed to herbicides. Direct exposure can occur if the animal:

- Is sprayed directly,
- Comes in contact with contaminated vegetation, soil or water,
- Inhales sprays mists, droplets or vapors,
- Drinks contaminated water, or
- Ingests residues or contaminated feathers of hair during grooming.

Indirect effects can occur from both chemical and non-chemical methods and relates to habitat loss. Vegetation provides food, cover, and nesting materials for some wildlife species.

Glyphosate has been tested on a variety of wildlife birds and mammals in both laboratory and wildland environments (SERA, 1996). Data on hexazinone has been primarily derived from experimental mammals in the laboratory (SERA, 1997). Studies generally indicate that glyphosate and hexazinone are characterized by relatively low toxicity to mammals and birds. These herbicides do not bioaccumulate in tissues of exposed animals, but rather are rapidly excreted in urine or feces (USDA 1992 and 1997).

As with aquatic species, the potential impact on terrestrial animals is a function of two factors: 1) the toxic characteristics of the compound, and 2) the concentration to which the organism is exposed. Effects can be quantified using LD50 values, i.e., the lethal dose at which 50% of test animals will die. The smaller the LD50, the more sensitive a given species is to the herbicide. A sampling of LD50 values for glyphosate and hexazinone are displayed in Table 189. Values reflect acute exposure; i.e., a single exposure or multiple exposures occurring within a short period of time, generally 24 hours or less. Values may not be as applicable in assessing chronic or long-term exposures.

As with aquatic species, a better parameter to evaluate effects is the "No Observable Effect Level" (NOEL). NOEL values have not been quantified for all chemicals or all species. In the absence of long-term test results that provide NOEL's, the EPA has recommended setting NOEL's for terrestrial animals at 1/5th of

LD50 values (U. S. EPA 1986), which are shown in Table 189. For threatened and endangered species, the EPA recommends setting NOEL's at 1/10th of LD50 values (U.S. EPA 1986).

Table 189 Levels of Herbicide Effects on Terrestrial Animals

Herbicide	Use Rate[1] (lbs/ac.)	Soil Adsorption	Half Life[2] (Days)	Toxicity to Terrestrial Animals	LD50[3] (milligrams per kilogram—mg/kg)	NOEL[4] (parts per million)
Glyphosate (Accord)	1-2	Strong	3-249	No more than slightly toxic to mammals and birds.	4320 mg/L (rat) - EPA 3800 mg/L (rabbit) 1500 mg/L (mouse) 1075 mg/L (bee) 1000 mg/L (quail)	864 ppm (rat) 760 ppm (rabbit) 300 ppm (mouse) 215 ppm (bee) 200 ppm (quail)
Hexazinone (Pronone 25G)	2-3	Low	30-180	Slightly toxic to mammals; practically non-toxic to birds	530 mg/L (rat) 1075 mg/L (bee) 2250 mg/L (quail)	106 ppm (rat) 215 ppm (bees) 450 ppm (quail)

[1] Use Rate is the amount of active ingredient of the chemical

[2] Half-life – Time required for the concentration of a chemical to decrease by one half.

[3] A Lethal Dose 50 (LD50) is the dose of a chemical calculated to cause the death of 50% of a defined experimental population over a specified observation period. The observation period is typically 14 days.

[4] A No Observable Effect Level (NOEL) is the highest dose in a particular test that did not result in adverse health impacts to the test organism.

Risk to terrestrial animals can be analyzed by comparing likely exposure rates to the LD50 and NOEL values. Sensitivity to herbicides varies from species to species. For glyphosate and hexazinone, smaller animals appear to be more sensitive than larger animals (SERA 1996, 1997). Consequently, exposure rates were estimated only for small mammals, those with a body weight of 20 grams, i.e., the approximate body weight of mice, voles, shrews and small bats (SERA 1996 and 1997). In addition, a small mammal is a good animal for characterizing risk because, in general, they will receive higher doses of an herbicide, compared with larger animals, at fixed levels of exposure.

As discussed previously, animals can be exposed to herbicides by more than one pathway. The SERA studies assumed "worst-case" dose scenarios for each exposure pathway and totaled values.

For example: At glyphosate application rates of 2 pounds of active ingredient per acre, a small mammal could receive a dose of 140 mg/kg if subjected to all avenues of exposure. This dose estimate is applicable to an exposure scenario in which an animal is sprayed directly with glyphosate, consumes a day's worth of water immediately after spraying, eats highly contaminated vegetation or prey, and remains in the area for one 24-hour period in contact with contaminated vegetation. A dose of 140 mg/kg is substantially below the acute LD50 and NOEL values in Table 189. This is not recommended as a plausible scenario; rather, its purpose is to illustrate that even with very conservative assumptions, the levels of glyphosate that terrestrial mammals and birds are likely to encounter are not likely to constitute a hazard (SERA 1996).

A similar worst-case analysis was conducted for hexazinone. For a hexazinone application rate of 3 pounds of active ingredient per acre, a small mammal could receive a dose of 91 mg/kg if subjected to all avenues of exposure (SERA 1997). Again, this dose level falls below the LD50 and NOEL thresholds displayed in Table 189.

Limited research and monitoring has been done to examine the effects of chemical herbicides on non-mammalian and non-avian species. Toxicology studies on glyphosate and hexazinone suggest insects, snails, and newts are no more sensitive than mammals (USDA 1997, SERA 1996, McComb 1990, SERA 1997).

The effects of "inert" ingredients on wildlife have not been well researched or documented. Inert ingredients are used in the formulations as surfactants, flow conditioners, emulsifiers, etc. and are protected from

disclosure as proprietary information belonging to the commercial manufacturer. The 1998 Regional *FEIS for Managing Competing and Unwanted Vegetation* requires formulations used contain only inert ingredients which are: 1) recognized as generally safe by the Environmental Protection Agency (EPA) or 2) of a low priority for testing by the EPA because no evidence from data or similarity of structure to other chemicals support a concern for toxicity or risk. The formulations recommended for use in this EA fall into one or the other of these categories (FEIS 1988, USDA Forest Service Herbicide Profiles 1992 and 1997).

The effects of herbicides on wildlife are addressed in further detail in the 1988 Pacific Northwest Regional *FEIS for Managing Competing and Unwanted Vegetation*, on pages IV-81 to IV-97 and in Appendix J. The 1988 *Record of Decision to the Regional FEIS* determined that the two herbicides recommended for use to control competing vegetation are among those that could be used with acceptable risk as long as precautions and mitigations included in the FEIS are applied. All of these mitigation measures would be complied with, as well as additional, more restrictive mitigation measures designed for this recommended project.

Both chemical and non-chemical treatments would indirectly affect terrestrial wildlife by reducing habitat for those animals that rely on early seral vegetation – grasses, forbs, and shrubs – for foraging, cover and nesting materials. Alternative 2 would treat 897 acres of reforestation units. The 4-foot radius competing vegetation treatments would reduce vegetation on 35% of each site (314 acres total); the balance of the area (65%) would not be treated. Ground vegetation would likely recover within 1 to 5 years depending on site and treatment method. Grasses usually reoccupy a site within 1 year following manual treatments and 2 to 3 years following herbicide treatments. The indirect effects of habitat loss on terrestrial species would be minimal.

Based on the available toxicity data and estimated levels of exposure, there is very little indication that herbicide application would likely cause adverse effects to Management Indicator Species (MIS) or Species of Interest (SOI). No effects to endangered or threatened wildlife species would be anticipated. No impacts to sensitive wildlife species would be anticipated. See the Wildlife Biological Evaluation in Appendix B.

Worker and Public Health & Safety

Risks to workers are associated with exposure to chemicals during transportation and application. Herbicide application, by law, will be under the direct supervision of a trained and licensed applicator, who must follow the label directions. Label directions prescribe the proper application rates and conditions, personal protection methods for workers, spill protection and response, and disposal procedures. When followed, these directions reduce risk to humans and the environment to acceptable levels.

The public may be exposed to herbicides through spray drift, an accident in transit, or dermal contact with treated plants. Spray drift would be very limited with the use of backpack sprayers. Treatment areas would be signed.

The effects of herbicides on humans is addressed in detail in the *Pacific Northwest Region Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation*, pages IV-123 to IV-160, and in Appendices D and H of that document, and are incorporated into this document by reference. The Record of Decision found that 12 herbicides, including glyphosate and hexazinone, could be used with acceptable risk if precautions and restrictions were applied.

In summary, the two herbicides recommended for possible use in the project area have low to moderate potential toxic effects. Studies have shown that exposure levels remain far below the toxic levels for workers. Exposure to the public is expected to be much less.

Cumulative Effects

Under the *2000 Malheur National Forest Noxious Weed EA*, approximately 200 noxious weed sites on 65 acres will be treated using both chemical and non-chemical methods. Effects to aquatic and terrestrial wildlife are disclosed in the *Noxious Weed EA*.

County Road crews would also spray herbicides along State Highways 7 and 26, and County Highway 20. Portions of these highways are located within the RHCAs for the Middle Fork John Day River and its tributary streams.

Under this project, 1.5 acres of noxious weeds would be treated by herbicide application.

Under this project, pocket gophers will be strychnine baited on 1,439 acres, as analyzed in 4.3.8.2—Animal Damage, page 378.

Table 190 assesses cumulative effects of chemical applications to aquatic resources. Both herbicides and pesticides are considered. NOEL ratios (see Soil, Water Quality, and Fisheries, page 368 for description on how NOEL ratios were developed) have been calculated for each activity which introduces chemicals into the system: 1) noxious weed treatment identified in the *Noxious Weed EA*, 2) competing vegetation treatment recommended in this project; 2) noxious weed treatment recommended in this project, and 4) strychnine treatment of pocket gophers recommended in this project. Detailed calculations are in the *Noxious Weed EA* and Fisheries Specialist Report for this project.

NOEL ratios for these four activities were totaled for each subwatershed (see the "Cumulative Effects NOEL Ratio" column in Table 190). To ensure no effects to aquatic species, the "Cumulative Effects NOEL Ratio" should be less than 1.

Table 190—Cumulative Effects Multi-Chemical NOEL Ratio for Alternative 2

Stream	WEED EA Multi-Chemical NOEL Ratio	SE Galena NOEL Ratio for Glyphosate (competing Veg)	SE Galena NOEL Ratio for Glyphosate (Noxious Weeds)	SE Galena NOEL Ratio for Strychnine (Gopher Control)	Cumulative Effects NOEL Ratio
Placer Gulch	0.0017	0.3310	0.0002	0.3493	0.6822
Davis	0.0017			0.0940	0.0957
Vinegar	0.0086	0.0657		0.0860	0.1603
Vincent	0.0425	0.0624		0.0503	0.1552
L. Boulder	0.0320	0.0105		0.0387	0.0812
Deerhorn	0.0320	0.00510		0.0533	0.1363
Tincup	0.1984		0.0002		0.1986
Murdock	0.1984	0.1214		0.0680	0.3878
Windlass	0.1984	0.3524		0.2773	0.8281
Butte	0.0010	0.0767	0.0006	0.1023	0.1806
Beaver/Ruby	0.0120		0.0026		0.0146
Dry/Sunshine	0.0427		0.0026		0.0453

No subwatersheds in the Southeast Galena area exceeded 1 for the cumulative effects NOEL ratio. The concentrations of chemicals calculated for the worst-case scenario would be below NOEL levels. Only one subwatershed in the Middle Fork John Day Basin had a NOEL ratio exceeding a value of 1, i.e., the Idaho/Summit drainage which lies several miles upstream of the project area (this subwatershed is not displayed on the chart due to distance from project area).

At the treatment levels recommended , it is unlikely that any chemical would be detected in stream water. Application of site-specific Best Management Practices (BMPs) and mitigation measures (listed in Chapter 2, page 90) would further reduce the likelihood of chemicals being detected in stream waters, and the risk to water quality from recommended chemical treatments would be low in all subwatersheds. Risk to water quality, fish and fish habitat would likely be low in the Middle Fork John Day River.

Risks to terrestrial wildlife species would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels. No adverse cumulative effects would be expected to terrestrial wildlife, including Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). Cumulatively, the treating of noxious weed sites would have beneficial effects to wildlife by restoring native plant communities in existing noxious weed sites.

The total cumulative effects of these projects are considered to be not large enough to cause adverse impacts to aquatic or terrestrial species, sensitive plant species, or public safety or health.

ALTERNATIVE 3—Toxic Chemicals—Competing Vegetation

In this alternative, approximately 1,442 acres would be planted. About 741 acres are expected to be over threshold for grasses after the third growing season. Site preparation and control of competing vegetation by all mechanical or hand methods, ***except chemical herbicides***, would be considered for use.

Direct and Indirect Effects

Vegetation

Herbicides will not be used with this alternative. The use of manual methods as a corrective action will be increased since the option of using herbicides is not available. The effect on vegetation is that average third year survival could be reduced 50 percent, or less, due to increased vegetative competition. Cost of successful treatment of competing vegetation would be increased an average of approximately $75 per acre because of the need to use more expensive treatment methods and because there will be additional replanting and seedling protection costs.

There would be no impacts to sensitive plant populations, because no sensitive plants occur close to reforestation sites.

Soil, Water Quality, and Fisheries

No direct or indirect effects to aquatic species would be expected from manual treatments. Effects on fish would be the same as Alternative 1 -No Action. There will be no effects to aquatic TES species. See the Aquatic Biological Evaluation in Appendix B.

Wildlife

No direct effects to terrestrial species would be expected from manual treatments.

Manual treatments would indirectly affect terrestrial wildlife by reducing habitat for those animals that rely on early seral vegetation – grasses, forbs and shrubs – for foraging, cover and nesting materials. In reforestation units, competing vegetation treatments would reduce vegetation on 35% of each site; the balance of the area (65%) would not be treated. Ground vegetation would likely recover within 1 to 5 years depending on site and treatment method. Grasses usually reoccupy a site within 1 year following manual treatments, compared to 2 – 3 years following herbicide treatments. The indirect effects of habitat loss on terrestrial species would be minimal.

Effects to Management Indicator Species (MIS) and Species of Interest (SOI) would be minimal. No effects to threatened or endangered species would occur. No impacts to sensitive species would occur. See the Wildlife Biological Evaluation in Appendix B.

Worker and Public Health & Safety

Scalping and mulch mat installation would be done to a greater extent under this alternative than the other action alternatives. The effects to worker health would be the potential for more injuries due to the increased amount of hard, arduous work compared to the recommended action alternative. There would be no effects to public health and safety, the same as for the No Action alternative.

Cumulative Effects

Herbicides are not used to control competing vegetation with this alternative; therefore the effects on aquatic and terrestrial species would be the same as Alternative 1 -No Action. Chemicals are used on other projects within the project area; cumulative effects are discussed under Alternative 1 – Cumulative Effects. Chemical applications were not expected to have adverse effects on aquatic or terrestrial species, or humans.

ALTERNATIVE 4—Toxic Chemicals—Competing Vegetation

Alternative 4 does not propose reforestation activities, making site preparation and control of competing vegetation unnecessary.

Direct and Indirect Effects

The effects on this issue would be the same as for the No Action Alternative (Alternative 1). No direct or indirect effects to aquatic or terrestrial wildlife species would be expected. There would be no effects to Threatened, Endangered, and Sensitive (TES) species, Management Indicator Species (MIS), or Species of Interest (SOI). See Biological Evaluations in Appendix B.

Cumulative Effects

Cumulative effects are as described for Alternative 1 – No Action.

ALTERNATIVE 5—Toxic Chemicals—Competing Vegetation

In this alternative, approximately 2843 acres would be planted. As discussed above, about 1318 acres are expected to be over threshold for grasses after the third growing season. Site preparation and control of competing vegetation by all methods listed above would be considered for use.

Direct and Indirect Effects

Soil, Water Quality, and Fisheries

The effects of Alternative 5 on aquatic species would be similar to Alternative 2. Since there is an increase of 421 acres, there would be a proportional increase in the effects of Alternative 2. The expected amounts of herbicides to be used are still considerably below the Maximum Allowable Acres NOEL threshold for rainbow trout. NOEL ratios do not exceed the threshold of 1.

Table 191 Alternative 5 Glyphosate Chemical Treatment for Competing Vegetation vs. Maximum Allowable Acres

Subwatershed or Drainage	Alt 5 Acres	Maximum Allowable Acres	NOEL Ratio
Placer Gulch	139	420	0.3310
Vinegar Ck.	348	2100	0.1657
Vincent Ck.	342	2100	0.1629
Deerhorn	107	2100	0.0510
L. Boulder	22	2100	0.0148
Murdock	51	420	0.1214
Windlass	148	420	0.3524
Butte	161	2100	0.0767
Totals	1318	Not Applicable	

In no case did the rate of application exceed the NOEL or EPA guidelines for rainbow trout. No effects to threatened, endangered or sensitive species would be expected. See the Aquatic Biological Evaluation in Appendix B. The main risk of chemical contamination of fish habitat is from spills that could occur during transport of equipment and chemicals or while filling equipment. Design criteria and mitigation measures are incorporated in the recommended action to minimize these risks.

Wildlife

The effects of Alternative 5 on wildlife would be similar to Alternative 2. Since there is an increase of 421 acres being treated, there would be a proportional increase in the effects due to implementation of Alternative 5. The change in number of acres treated is negligible given the total number of acres in the Southeast Galena project acre.

Based on the available toxicity data and estimated levels of exposure, there is very little indication that herbicide application would likely cause adverse effects to Management Indicator Species (MIS) or Species of Interest (SOI). No effects to endangered or threatened wildlife species would be anticipated. No impacts to sensitive wildlife species would be anticipated. See the Wildlife Biological Evaluation in Appendix B.

Sensitive Plants

There would be no impacts to sensitive plant populations, because no sensitive plants occur close to herbicide application sites.

Worker and Public Health & Safety

There would be a moderate increase in the potential effects to worker health compared to Alternative 5, due to the increased chance of exposure, but would still be at acceptable levels. The effects to public health and safety would be also be moderately increased, but well within acceptable levels.

Cumulative Effects

Cumulative effects would be similar to those stated for Alternative 2.

Table 192 assesses cumulative effects of chemical applications to aquatic resources. Both herbicides and pesticides are considered. NOEL ratios (see Soil, Water Quality, and Fisheries, page 368 for description on how NOEL ratios were developed) have been calculated for each activity which introduces chemicals into the system: 1) noxious weed treatment identified in the *Noxious Weed EA*, 2) competing vegetation treatment recommended in this DEIS; 2) noxious weed treatment recommended in this DEIS, and 4) strychnine treatment of pocket gophers recommended in this DEIS. Detailed calculations are in the *Noxious Weed EA* and Fisheries Specialist Report for this project.

NOEL ratios for these four activities were totaled for each subwatershed (see the "Cumulative Effects NOEL Ratio"column in Table 192). To ensure no effects to aquatic species, the "Cumulative Effects NOEL Ratio" should be less than 1.

Table 192—Cumulative Effects Multi-Chemical NOEL Ratio for Alternative 5

Stream	WEED EA Multi-Chemical NOEL Ratio	SE Galena NOEL Ratio for Glyphosate (Competing Vegetation)	SE Galena NOEL Ratio for Glyphosate (Noxious Weeds)	SE Galena NOEL Ratio for Strychnine (Gopher Control)	Cumulative Effects NOEL Ratio
Placer Gulch	0.0017	0.3310	0.0002	0.3493	0.6822
Davis	0.0017			0.1413	0.1430
Vinegar Ck.	0.0086	0.1657		0.2830	0.4573
Vincent Ck.	0.0425	0.1629		0.2830	0.4884
L. Boulder	0.0320	0.0105		0.0387	0.0812
Deerhorn	0.0320	0.0510		0.0533	0.1363
Tincup	0.1984		0.0002		0.1986
Murdock	0.1984	0.1214		0.0680	0.3878
Windlass	0.1984	0.3524		0.2773	0.8281
Butte	0.0010	0.0767	0.0006	0.1023	0.1806
Beaver/Ruby	0.0120		0.0026		0.0146
Dry/Sunshine	0.0427		0.0026		0.0453

No subwatersheds in the Southeast Galena area exceeded 1 for the cumulative effects NOEL ratio. Within all sub-watersheds, the concentrations of herbicides calculated for the worst-case scenario would be below NOEL levels. Risk to water quality, fish and fish habitat would likely be low in the Middle Fork John Day River.

Risks to terrestrial wildlife species would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels. No adverse cumulative effects would be expected to terrestrial wildlife, including Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). Cumulatively, the treating of noxious weed sites would have beneficial effects to wildlife by restoring native plant communities in existing noxious weed sites.

The total cumulative effects of these projects are considered to be not large enough to cause adverse impacts neither to aquatic or terrestrial species nor to public safety or health.

4.3.8.2—Animal Damage

CONCERN:

Using chemicals (rodenticides) to control pocket gopher damage may pose harmful risks to aquatic and terrestrial wildlife and humans using the area.

BACKGROUND:

In some locations, pocket gopher damage to seedlings can adversely impact conifer regeneration survival and growth. Gophers damage or kill conifer seedlings by feeding on their root systems and girdling or clipping stems. This can result in reduced growth and survival of forest trees, in some cases limiting reforestation success. Damage can occur all year but increases in the fall and winter when herbaceous vegetation is less abundant and trees can substitute as a major food source. Increased seedling damage and mortality could reduce stocking levels below minimum levels as required by the National Forest Management Act (NFMA). Replanting could be required. Multiple plantings and additional control measures necessary to ensure full stocking could dramatically increase reforestation costs. If regeneration is left to natural seeding, the plantations may remain only marginally stocked for 20 years.

To ensure reforestation success, it is desirable to keep gopher populations at less than 2 gophers per acre. Where pocket gopher populations are at high or moderate levels, pocket gopher control is considered essential. Various control methods, both manual and chemical methods, are available to reduce gopher populations. Mechanical trapping is commonly used as a manual method. Strychnine baiting and aluminum phosphide fumigation are commonly used as chemical methods. Pocket gopher control would help protect the initial investment of tree planting.

RESOLUTION:

Alternative 1, the No Action alternative, and Alternative 4 do not propose reforestation activities, making pocket gopher control unnecessary. Alternatives 2, 3, and 5 propose reforestation, although treatment levels vary by alternative. Pocket gopher control would be used to reduce potential damage to tree seedlings. Alternatives 2 and 5 utilize rodenticides (strychnine baiting and aluminum phospide fumigation) to reduce pocket gopher populations. Alternative 3 uses manual methods (mechanical trapping) to reduce populations.

Measures:

- Acres treated with rodenticides for pocket gopher population control.
- Rodenticide toxicity and exposure levels

Project Design

Reforestation units would be surveyed the first and third years after planting. Pocket gopher control would be triggered when gopher activity (active burrows, fresh dirt mounds, winter casts, feeding plugs, or tree damage) is identified on 25 percent or more of the plots. In all alternatives, no rodenticides would be used within RHCAs.

Control Methods Recommended for Use

Strychnine baiting

The Environmental Protection Agency (EPA) registers the bait, oats coated with a 0.5% strychnine solution) for use in controlling pocket gophers. A metal probe would be used to open a hole in an active gopher burrow. The bait would then be placed underground in the burrow and the probe hole covered. Gophers consume the poisoned bait, and typically die within about two hours.

Aluminum phosphide fumigation

The EPA registers aluminum phosphide for use in controlling pocket gophers. Aluminum phosphide tablets are placed in active gopher burrows and the probe holes covered. The tablets react with moisture and decompose into phosphide gas (also called phosphine), which the animals inhale, causing chemical asphyxiation.

Application of aluminum phosphide has worked well as a pocket gopher fumigant in landscaped and agricultural areas where soil moisture is elevated (Marsh and Steele, 1992). Aluminum phosphide has not been extensively used in forested areas. The local office of USDA Animal and Plant Health Inspection Services-Wildlife Services (APHIS-WS) believes it could be used as a successful alternative to strychnine in forested areas. Timing control measures when ground moisture levels are higher should increase success.

Aluminum fumigation was added as an alternative control method in response to concerns that strychnine baiting could adversely affect non-target wildlife species. Aluminum phosphide fumigation eliminates the risk of secondary poisoning of non-target species. The estimated cost of fumigation is higher than strychnine baiting and the efficacy rate is typically lower, so it is recommended only in areas where there is an elevated wildlife concern.

Mechanical trapping

Treatment involves hand-placing traps below ground in active gopher burrows. On a site with moderate gopher activity, approximately 25-30 traps per acre would be required. The locations of the traps are flagged so that they may be relocated later. Traps would be checked within 1-3 days and the dead gophers would be buried. The traps would then collected, reset, or moved to new burrow systems as needed. One benefit this alternative has over chemical treatment is the ability to trap gophers near streams and wetlands.

Mechanical trapping is believed to be practical on small acres, in high value situations, and as a supplement or follow-up to other control methods (Crouch, 1982). Pocket gopher trapping on large areas can have a reasonable cost effectiveness if trapping is conducted before population levels reach populations of about five gophers per acre (Marsh and Steele 1992). Overall, the efficacy rate is less than strychnine baiting and aluminum phosphide fumigation and the cost is considerably more.

Predicted and Maximum Treatment Needs

Table 193 and Table 194 display acres of pocket gopher control by treatment method and alternative.

Table 193 Acres of Pocket Gopher Treatment

Treatment	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Strychnine Baiting	0	1,439	0	0	2,298
Trapping	0	0	1,197	0	0
Aluminum Phosphide Fumigation	0	250♠	0	0	300♠
Total Pocket Gopher Treatment	0	1,689	1,197	0	2,598
♠Acres are estimated as the amount of phosphide may change with additional wildlife sightings.					

Table 194 Acres of Chemical Treatment by Subwatershed

Subwatershed	Alt.1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Davis Ck/Placer Gulch	0	403	0	0	474
Vinegar Ck.	0	258	0	0	849
Vincent Ck.	0	151	0	0	398
L. Boulder/Deerhorn	0	276	0	0	276
Tincup/L. Butte	0	294	0	0	294
Butte Ck.	0	307	0	0	307
Granite Boulder Ck.	0	0	0	0	0
Totals	0	1689	0	0	2598

ALTERNATIVE 1—Toxic Chemicals—Animal Damage

Soil, Water Quality, and Fisheries

There would be no effects to Threatened, Endangered, or Sensitive (TES) aquatic species.

Wildlife

Where gophers are present, populations would continue to increase until the carrying capacity of the site is reached. Predator populations would fluctuate naturally with change in prey populations and habitat. There would be no effects to Threatened, Endangered, and Sensitive (TES) species, Management Indicator Species (MIS), and Species of Interest (SOI).

Worker and Public Health & Safety

There would be no effects to workers or public health and safety.

Cumulative Effects

Strychnine baiting is included in several other projects located within the Middle Fork John Day subbasin. The low proportion of reforestation and pocket gopher treatments in these projects is less than the level recommended in Southeast Galena, resulting in an overall level that is insignificant. The cumulative effects of all chemical applications in the project area are described in ALTERNATIVE 1, Competing Vegetation, Cumulative Effects, page 367. Chemical applications are not expected to have significant cumulative effects on aquatic or terrestrial species, or humans.

ALTERNATIVE 2—Toxic Chemicals—Animal Damage

Alternative 2 would plant approximately 1,934 acres, of which 1,689 acres would likely require pocket gopher control (see Table 193 and Table 194, page 379). Strychnine baiting would be used on about 1,439 acres and aluminum phosphide fumigation would be used on 250 acres to respond to wildlife concerns. See Chapter 2, **2.5.6.3.2—Mitigation for Pocket Gopher Control—Pesticide** Use, page 98.

Reforestation

Pocket gopher control would result in reduced gopher damage to conifer seedlings and improved overall stocking in treated plantations. Chemical treatment would help land managers meet the purpose and need to reforest plantations and meet stocking certification requirements as required by NFMA.

Strychnine baiting is considered the most economical and effective gopher control method, with efficacy rates of 70-100 percent, averaging 90 percent (Bonar, 1995). In plantations with moderate to high activity rates, a 90 percent success rate will reduce a gopher population of 20 gophers per acre to the desired level of 2 gophers per acre. The efficacy rate for aluminum phosphide fumigation is considered somewhat lower than for strychnine baiting, but results would be sufficient to ensure tree survival.

Soil, Water Quality, and Fisheries

Strychnine baiting

No direct effects to water quality or aquatic life are expected as a result of strychnine baiting. Streamside buffers and strict handling procedures will prevent the direct application of strychnine to open or running water.

No indirect effects to water quality are expected. There is very low risk that any surface runoff across the landscape would carry poison bait from the uplands, through a riparian zone, and into area streams. Strychnine baiting is applied underground and the burrow immediately closed. Application procedures are strict and require immediate clean up of any surface spillage. Bait application may be suspended during poor weather conditions (e.g., where ¼" or more rain falls in a 24-hour period) to avoid unnecessary exposure of strychnine to water as it is being applied.

Strychnine is relatively immobile in soil systems and it is not expected to leach rapidly (USDA, 1994). Strychnine biodegrades in the soil and has a half-life of 7-28 days under aerobic conditions and 28-112 days under anaerobic conditions (Howard et al, 1991). The majority of the sites slated for baiting are considered to be in an aerobic condition and consequently the shorter of the two biodegradation periods would apply. Rapid soil degradation and low persistence would suggest migration of strychnine in soils is unlikely. Therefore, there is little risk of strychnine leaching into subsurface water (USDA, 1994).

Aluminum phosphide fumigation

Aluminum phosphide fumigation will have no direct effects to water quality or aquatic life. The same no-treatment buffers required for strychnine use will be used for fumigation operations. To further guard against accidental spillage into streams, personnel carrying aluminum phosphide tablets off of system roads will be restricted from entering wetlands or traveling across flowing streams.

No indirect effects to streams are anticipated from fumigating gopher burrows located outside no-treatment buffers. Tablets will be placed underground in gopher burrows and the probe holes covered. Aluminum phosphide placed in pocket gopher burrows reacts quickly with soil moisture to form phosphine, a hydrogen phosphide gas that is insoluble in water (Snider, 1983). Persistence in soils is low due to rapid volatility and rapid decomposition underground of the chemical particulates (2-5 days, depending on soil moisture and temperature). Aluminum phosphide is naturally abundant in soils and addition of a small amount from fumigation will have little effect on soils before it decomposes. Above ground, phosphide gas is quickly dissipated through aeration. The use of the fumigant is expected to have little effect on soils or subsurface flow before it decomposes.

Table 195 displays LC50s and NOELs for strychnine and aluminum phosphide. Terms are defined in the footnotes in Table 195 and in more detail in ALTERNATIVE 2, page 368

Table 195. Rodenticide Effects to Aquatic Species

Pesticide	Use Rate1 (lbs/ac.)	Soil Adsorption	Half Life2 (Days)	Toxicity to Aquatic Organisms	LC 503 (parts per million-ppm)	NOEL4 (parts per million - ppm)
Strychnine	0.02	Strong	7-28	High	2.3 (rainbow trout)	0.23
Aluminum Phosphide	0.02	Not Available	5-7	High	0.0041 (rainbow trout)	0.00041

1Use Rate is the amount of active ingredient of the chemical
2 Half-life—Time required for the concentration of a chemical to decrease by one half.
3A Lethal Concentration 50 (LC50) is the dose that is lethal to 50 percent of the fish exposed at that level for 96 hours.
4A No Observable Effect Level (NOEL) is the highest dose in a particular test that did not result in adverse health impacts to the test organism.

Ketron, Inc. (1979) modeled a theoretical worst case scenario estimating the effects that might occur if a pound of 0.5 percent bait placed on an acre of ground was allowed to wash into a pool following a sudden downpour of rain. Researchers estimated that the strychnine concentration level of the pool could reach 0.057 parts per million. To consume a lethal dose, a duck would have to take in 182 quarts of water at one time; a coyote, 227 quarts; a person, 1,271 quarts; a sheep, 8,172 quarts; and a cow, 87,168 quarts. The Klamath National Forest in northern California reports an average application rate of 4.5 pounds per acre; this amounts to .02 pounds strychnine per acre (4.5 lb. bait times 0.5% strychnine = .02 lb. strychnine). The Emigrant Creek Ranger District (Burns,OR), on the Malheur National Forest, reports recent application rates ranging from .2 lb. to 2 lb. of bait per acre (.001 lb. to .01 lb. of strychnine). The lower application rates on the Malheur National Forest are likely due to lower gopher densities. Given the small amounts of poison applied per acre, even if some strychnine were to inadvertently reach area streams, the dilution of the poison would be great enough that an unreasonably high amount of water would need to be consumed to be lethal.

Table 196 lists the total acres recommended for chemical treatment, the Maximum Allowable Acres (MAA) that could be treated, and the NOEL ratios by subwatershed. For the complete discussion of methods, assumptions, calculations, and results refer to the *Malheur National Forest Noxious Weed Environmental Assessment,* Appendix H (pp. 18-21) and the Soil, Water and Fisheries Reports for this project. For definitions of MAA and Noel Ratio, see text preceding Table 188, page 370 in ALTERNATIVE 2.

Table 196 Alternative 2—Rodenticide Treatment Acres, Maximum Allowable Acres and Noel Ratio by Subwatershed.

Subwatershed or Drainage	Alt. 2 Acres	Maximum Allowable Acres	NOEL Ratio
Placer Gulch	262	750	0.3493
Davis	141	1500	0.0940
Vinegar Ck.	258	3000	0.0860
Vincent Ck.	151	3000	0.0503
Deerhorn	160	3000	0.0533
L. Boulder	116	3000	0.0387
Murdock	51	750	0.0680
Gorge	35	300	0.1167
Windlass	208	750	0.2773
Butte	307	3000	0.1023
Totals	1689	Not Applicable	Not Applicable

In no case did the recommended application rates exceed the Maximum Allowable Acres or a Noel Ratio of 1. No adverse effects to freshwater fish or other aquatic species would occur. Low application rates, underground baiting, streamside buffers, spillage mitigation, and the low mobility and persistence of

strychnine in soils and water reduce risks to very low levels. No effects to threatened, endangered or sensitive species would be expected. See the Aquatic Biological Evaluation in Appendix B.

Wildlife

This wildlife effects discussion reviews the potential direct and indirect effects of pocket gopher control on terrestrial wildlife. Effects are described in regards to 1) pocket gophers and 2) non-target species (species other than gophers).

POCKET GOPHERS

The most obvious effect of implementation of any gopher control program would be the reduction in pocket gopher populations. Local gopher populations would be reduced in treated areas. However, long-term effects on populations and loss of viability of pocket gophers would not be expected. Pocket gophers naturally lose 70-75% of their population each year but these losses are regained through reproduction. Gopher populations are very resilient to large changes in numbers of individuals (Bonar 1995). Pocket gophers would not be entirely eliminated under any action alternative; rather, control measures are intended to reduce populations to a level where tree damage levels would be tolerable. The goal of the gopher control program is to reduce populations to two or less gophers per acre during the stand reestablishment period.

Changes in pocket gopher habitat, rather than the actual killing of gophers, would lead to long-term reductions in populations on the sites recommended for treatment. As young trees increase in diameter and develop more complex root systems, gophers are less likely to kill them. Well-stocked forested areas are less attractive to pocket gophers than more open areas sparsely stocked with small trees. The change in habitat that occurs when young trees succeed into older age classes renders these areas less suitable for high densities of pocket gophers. Ground vegetation used by gophers as a food source tends to disappear from the ecosystem as tree canopies close in.

NON-TARGET SPECIES

The following discussion on non-target species is divided into two sections: 1) direct effects and 2) indirect effects. Direct consumption or inhalation of a poison by an animal is typically referred to as “primary consumption” or “primary poisoning.” Non-target animal can feed on poisoned baits intended for pocket gophers and die. Indirect consumption of a poison results when a predator or scavenger feeds on another animal that has been poisoned; this is typically referred to as “secondary consumption “ or “secondary poisoning.” Non-target animals can feed on gophers or non-target animals that have died from eating strychnine bait.

Direct Effects—Primary Poisoning

Strychnine Baiting

There would be a potential threat of poisoning non-target animals that come into contact with and consume strychnine treated oats. Standard application procedures minimize the risk of contact. Strychnine baits would be applied underground and the probe holes covered with soil.

The potential threat would be limited to those seed-eating animals that search underground for food and/or use gopher burrow systems. Small mammals such as chipmunks, ground squirrels, mice, voles and rabbits would be the likely non-target candidates for poisoning (Bonar 1995, Anthony et al. 1984, Fagerstone et al. 1980, USDA APHIS 1994). There is the potential that local populations of small mammals such as ground squirrels may be reduced in the short term; however, as with pocket gophers, these populations recover rapidly.

Seed-eating animals that do not dig into gopher burrows, such as songbirds and gallinaceous birds (e.g., grouse, etc.), would be unlikely to come in contact with the grain. Therefore there would be no anticipated loss of those types of animals. Amphibians and reptiles do not normally consume grain as part of their diet;

therefore, no direct effects would be expected to occur. Direct effects to insects appear to be minimal although information is limited (USDA APHIS 1994).

Chronic toxicity of strychnine appears minimal for non-target species, as strychnine does not accumulate in the body. As with pocket gophers, sub-lethal amounts of strychnine are completely detoxified within 24 hours and are completely eliminated from the body within a few days (Bonar 1995, USDA APHIS 1994). Also, strychnine is biodegradable and has moderately low persistence, thus the bait will not remain toxic very long after application. Soil biodegradation half-life under aerobic conditions was estimated in a study to be 7-28 days (USDA APHIS 1994).

Information on the effects to embryo or young of a sub-lethal dose of strychnine being ingested by pregnant or lactating female is not available and the effects are unknown. Because strychnine does not accumulate in the body (as do some other poisons such as DDT), long-term adverse effects to reproduction would not be expected.

There would be no risk of primary poisoning of Threatened, Endangered, and Sensitive Species (TES); Management Indicator Species (MIS); or Species of Interest (SOI). Many of these species do not consume grain and are unlikely to come in contact with poison baits. Their habitats rarely coincide with reforestation areas and in addition, strychnine baits are buried underground. See the Wildlife Biological Evaluation in Appendix B.

Aluminum phosphide fumigation:

Any non-target species inhabiting pocket gopher burrows where aluminum phosphide is applied would likely be killed. Potential non-target animals that are known to use gopher burrows include chipmunks, rabbits, deer mice, jumping mice, voles, short-tailed shrews, ground squirrels, kangaroo rats, rattlesnakes and lizards. The literature is unclear as to whether the effects of aluminum phosphide to invertebrates are the same as the effects to vertebrate species. No residues of phosphine would remain in the burrow for any length of time, and consequently, no chronic exposures would be expected to result. USDA APHIS (1994) suggests that direct effects to non-target species can be reduced, although probably not eliminated, by checking burrows carefully for signs of non-target animals before application of the fumigant, and not using the poison if non-target species appear to be using the burrow. Non-target species populations could be reduced in the short-term. Long-term effects would not be expected.

There would be no risk of primary poisoning of Threatened, Endangered, and Sensitive Species (TES); Management Indicator Species (MIS); or Species of Interest (SOI). The effects of fumigation are limited to those animals that inhabit underground burrows. No TES species, MIS, or SOI inhabit burrows. Consequently, no direct effects would occur to these species. See the Wildlife Biological Evaluation in Appendix B.

Indirect Effects—Secondary Poisoning

Predators of pocket gophers include badger, weasels, coyote, foxes, bobcat, skunks, marten, great-horned owl, long-eared owl, red-tailed hawk, Swainson's hawk, common barn owl, great gray owl, northern goshawk, America kestrel, bullsnake, gopher snake and rattlesnake (Teipner et al. 1983). Many of these species are potential predators of ground squirrels and other small mammals as well. The predators listed above occur on the Malheur National Forest. The American pine marten is identified in the *Land and Resource Management Plan* as a Management Indicator Species (MIS); eleven dedicated old-growth areas have been established in Analysis Area (Galena WA, Supplement—2002)for pine marten. The northern goshawk is identified as a Species of Interest (SOI) in the *Land and Resource Management Plan*; four post-fledging areas have been established in the project area. Not all potential predators are specifically addressed in this analysis; instead some representative predators for which research information is available are addressed.

There are two types of effects to secondary consumers: 2a) the effects of a reduced prey base and 2b) the effects of consuming poisoned prey or carrion.

Indirect Effects - Reduced Prey Base

Gopher control measures would, to some extent, reduce the gopher populations on the units recommended for treatment. Predators and scavengers, as listed above, do not prey exclusively on pocket gophers; rather, they are opportunistic and will take any prey that is available.

Projected reductions in gopher populations vary by the chemical used. The efficacy rate for strychnine baiting averages 90%; the efficacy rate for aluminum phosphide fumigation averages 85% or less. Reductions in prey would be limited to those acres actually treated. At lower efficacy rates, gopher populations should recover in as little time as a year.

The areas recommended for pocket gopher control likely represent a small portion of the total home range for most predators. About 1,689 acres or 3% of the 49,473-acre project area would be treated. It is unlikely that the reduction in gophers - and non-target, prey species - would result in a decline in any predator populations; rather, a predator is likely to simply shift the use areas within its home range. Some of the wider ranging species are unlikely to recognize the reduction in gopher numbers on such small portions of their home range.

Effects or a reduced prey base to Threatened, Endangered, and Sensitive Species (TES); Management Indicator Species (MIS); or Species of Interest (SOI) would be negligible or non-existent. See the Wildlife Biological Evaluation in Appendix B.

Indirect Effects—Consuming Poisoned Animals

Strychnine baiting:

Predators/scavengers can be susceptible to secondary poisoning if they were to prey upon or scavenge a pocket gopher or other small mammal that has been killed by strychnine. Whether secondary poisoning would result from baiting depends on many factors including 1) accessibility of poison-killed animals to predators, 2) number of poison-killed animals available, 3) amount of strychnine residue in each carcass, 4) tolerance of predator species and individual animals to strychnine and 5) the number of strychnine-killed animals actually consumed by an animal.

The tendency for strychnine-killed gophers to die underground reduces the risk of secondary poisoning (Lindsey and Evans 1984). The risk of a non-target mammal ingesting strychnine bait and dying above ground is also low. The Blue Mountain Ranger District found 1 golden mantle squirrel above ground on 2,500 treated acres, the Fort Rock Ranger District found 5 mice and 1 golden mantle squirrel on 3,382 treated acres (Deppmeier 1996). Pocket gophers or other small mammals that die underground still may cause secondary poisoning if an animal such as a badger were to dig up and consume the dead animals or if a snake were to find and consume the carcasses.

Even if a predator were to consume poisoned animals, it would have to ingest a sufficient quantity of strychnine to cause mortality. Strychnine levels found in pocket gopher carcasses varied from 0.11 mg to 0.23 mg with one animal containing 1.34 mg (Barnes et al. 1985). Ground squirrel carcasses contained an average of 0.35 mg of strychnine, ranging from 0.09 mg to2.88 mg (Anthony et al. 1984).

Tolerance to strychnine varies among wildlife species. The potential of acute poisoning of mature raptors consuming poisoned pocket gophers or ground squirrels appears minimal because raptors have a relatively high tolerance for strychnine. Anthony et al. (1984) clinically tested great-horned owls and red-tailed hawks and found lethal doses of strychnine to be 7.7 mg/kg and 10.2 mg/kg respectively. Using the potential low and high amounts of strychnine residue identified in the preceding paragraph, an owl (weighing 1.5 kg) would have to consume 4 to128 grounds squirrels over a short period of time to be killed; a hawk (also weighing 1.5 kg) would have to consume 5 to 170 ground squirrels to be killed. Anthony (1984) reported that sub-lethal doses in raptors caused slight nervousness and loss of coordination to convulsions, seizures and inability to remain perched on limbs. In some cases, regurgitation of contaminated prey occurred before more severe reactions developed. The effects of an adult raptor feeding strychnine-killed prey to its

young are unknown. Given that nestling birds have much less body mass than adults, it is possible that a nestling could be poisoned if its parent fed it a strychnine-killed animal, resulting in death or indirect adverse effect from loss of motor coordination or seizures (for example, it is conceivable that a nestling could fall out of the nest while convulsing). By the time young raptors fledge, they are nearly the same size as adult birds and so chances of secondary poisoning and effects of such poisoning would be the same as those described above for adult birds.

The secondary hazard to predatory mammals is greater than that for raptors because mammals have lower tolerance levels to strychnine. Barnes et al. (1985) determined that mammals such as badgers were likely to die after ingesting .33 mg/kg. A 3.6 kg badger would have to consume 1 to 11 gophers or squirrels to be killed. Anthony et al. (1984) determined that mink were likely to die after ingesting 0.60 mg/kg of strychnine. If this same toxicity level were applied to marten, then a 1 kg marten would have to consume <1 to 5 strychnine-killed animals to be killed. A larger mammal, such as a wolverine, would have to consume 5 to 50 carcasses before ingesting a lethal dose.

There is little information about the secondary affects of strychnine on reptiles and amphibians, but some research indicates that strychnine had no effect on rattlesnakes and that bullfrogs had a relatively high tolerance (toxicity level of 2.2 mg/kg) (Willamette EA).

TES, MIS, and SOI were evaluated for the risk of secondary poisoning using the same considerations discussed for wildlife species in general. Only Canada lynx, pine martin, and nesting raptors have an elevated potential for poisoning. Mitigation measures have been incorporated into treatment design to better protect these species (see Chapter 2, **2.5.6.3.2—Mitigation for Pocket Gopher Control—Pesticide** Use, page 98). For Canada lynx and pine martin, strychnine would be prohibited in the vicinity of identified habitat. For nesting raptors, seasonal restrictions would prohibit strychnine baiting during periods when adults are raising their young. Baiting below ground and following strict handling and storage procedures would also reduce the risks. Therefore, no effects are expected to TES species, MIS, or SOI. See the Wildlife Biological Evaluation in Appendix B.

Risks of secondary poisoning would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels.

Aluminum phosphide fumigation

The potential for secondary toxicity would be highly unlikely. Phosphine does not accumulate in animal tissue. Due to the mode of action - phosphine reacting within the respiratory system - and the extremely short half-life in target animals following death, residue levels present in animals directly killed by phosphine gas are not high enough to produce the same effect in a predator or scavenger. No adverse effects to predators or scavengers would occur. There would be no risk of secondary poisoning of TES species, MIS, or SOI. See the Wildlife Biological Evaluation in Appendix B.

Worker and Public Health & Safety

Strychnine baiting

The primary exposure route to induce poisoning from strychnine is ingestion. It is unlikely anyone would accidentally ingest strychnine bait; especially once it has been placed in burrows. Bait is dyed for identification, making it obvious when spilled, and it has a bitter taste.

Workers applying strychnine would have the greatest risk of exposure. Strychnine is not normally absorbed through the skin. The workers wear gloves, carry grain in covered containers, and use a respirator surgical mask when filling containers. Strychnine bait is applied in the outdoors and dust from the bait is quickly dispersed. Detailed operating requirements for use of strychnine bait are listed in the Analysis File. Field crews will be overseen by a pesticide applicator licensed by the State of Oregon.

Neither the public nor workers engaged in other activities in treated area (e.g., planting, surveys, tree netting, etc.) are expected to come into contact with strychnine. As an added precaution, treated units would be signed, warning of strychnine presence. Treatment units are located away from developed recreation areas, and consequently receive little use by the general public.

Secondary poisoning to domestic dogs or cats is possible if a pet went into a treatment unit and consumed one or more dead animals. The Malheur National Forest has never reported a dog or cat killed as a result of a strychnine application.

Aluminum phosphide fumigation

Aluminum phosphide tablets react with the moisture in air and decompose into a poisonous phosphide gas called phosphine. The primary exposure route to induce poisoning in humans is through inhalation.

Workers applying the fumigant would have the greatest risk of exposure. The reaction of aluminum phosphide with air, however, is sufficiently slow so as not to endanger an applicator when applying the toxicant outside in open air. A garlic warning odor added to the toxin makes concentrated gas accumulation noticeable. Tablets are carried in tightly sealed containers and workers wear gloves. Tablets are placed below ground and the holes are covered. The tablets are dispensed into the hole through a 4-5 foot long pipe or tube to prevent direct exposure to the gas. Above ground, phosphide gas is quickly dissipated through aeration. Fumigation will be suspended during wet weather to avoid wetting the tablets and accelerating decomposition while workers are applying them. Detailed operating requirements for use of aluminum phosphide are listed in the Analysis File. Field crews will be overseen by a pesticide applicator licensed by the State of Oregon.

No risk to the general public or workers engaged in other reforestation activities is anticipated due to the rapid volatility and decomposition of the gas. The risk of adverse direct effects is low and the probability of human poisoning from aluminum phosphide fumigation would be unlikely due to the toxin's properties, application methods, treatment area locations, and the laws and safety procedures required to protect humans, non-target species, and resources. Treated units will be signed, warning individuals of fumigant use of the sites.

Secondary poisoning to domestic dogs or cats will not occur. Phosphide gas does not accumulate in animal tissues.

Cumulative Effects

Strychnine baiting is included in several other projects located within the Middle Fork John Day sub-basin. The amount of reforestation and pocket gopher treatments in these projects is less than the amount recommended in Southeast Galena, resulting in overall effects that are less than that analyzed for the Southeast Galena project area.

No cumulative effects to soil or water quality are expected from strychnine baiting. Strychnine is not expected to accumulate in the soils between applications based on the poison's low mobility and persistence and its relatively short half-life. Risks to aquatic life are considered low or non-existent. Use of strychnine will not retard or prevent attainment of riparian management objectives. Strychnine baiting will not be conducted in floodplains; consequently, no direct, indirect, or cumulative effects to floodplains are anticipated. No cumulative effects to soil, water quality, or fisheries are expected from aluminum phosphide fumigation. Aluminum phosphide and its residues will not accumulate in the soils between applications since it is a gas and disperses within a short time. Analysis of all chemical applications, herbicides and rodenticides, recommended in the project area is discussed under Cumulative Effects, page 372.

Risks to terrestrial wildlife species would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels. No adverse cumulative effects would be expected to terrestrial

wildlife, including Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). See the Wildlife Biological Evaluation in Appendix B.

The total cumulative effects of these projects are not considered to be large enough to cause adverse impacts to aquatic or terrestrial species, nor to public safety or health.

ALTERNATIVE 3—Toxic Chemicals—Animal Damage

Alternative 3 would plant approximately 1,442 acres, of which 1,197 acres would likely require pocket gopher control (see Table 193 and Table 194, page 379). Mechanical trapping would be used to kill pocket gophers. Strychnine baiting and aluminum phosphide fumigation would be prohibited.

Reforestation

The average efficacy rate for mechanical trapping is 70%; this is lower than the average efficacy rates for strychnine baiting (90%) and aluminum phosphide fumigation (85%). Trapping in areas with *low* to *moderate* gopher concentrations would result in reduced gopher damage to conifer seedlings and improved overall stocking in treated units. Minimum required stocking levels would likely be met. Trapping in areas with *high* gopher concentrations, however, would probably not be effective in reducing populations to desired levels. It is expected that most units will require either multiple gopher control treatments over several years or replanting of acres to meet minimum tree stocking requirements. Since trapping is nearly double the cost of strychnine baiting, budgets may limit treatment areas. Replanting may be required in up to 40 percent of the plantations to increase stocking levels. Replanting of stands would cost a minimum of $300 per acre. Delays in reforestation could result in increasing levels of competing vegetation, further exacerbating reforestation problems. Additional vegetation control may be necessary.

Soil, Water Quality, and Fisheries

Effects would be similar to the No Action Alternative (Alternative 1 – No Action), as no rodenticides would be used. The use of mechanical traps would have no direct/indirect impact on water quality or fisheries. Traps are set below ground in existing burrows so disturbance of soils would be minimal. Dead animals would be buried immediately, posing no contamination risk ito waterways.

Wildlife

This wildlife effects discussion reviews the potential direct and indirect effects of pocket gopher control on terrestrial wildlife. Effects are described in regards to 1) pocket gophers and 2) non-target species (species other than gophers).

POCKET GOPHERS

The effects to pocket gopher populations would be reduced compared to Alternative 2, the Recommended Action. Because trapping has a lower efficacy rate than chemical methods, fewer pocket gophers would be killed. Pocket gopher populations would be expected to rebound more quickly than in Alternative 2. In addition, less acres would be reforested under Alternative 3.

NON-TARGET SPECIES

Direct and indirect effects to non-target animals are described below. Direct effects would occur if a non-target animal got caught in a trap set to catch pocket gophers. Indirect effects relate to reduce prey base.

Direct Effects—Pocket Gophers & Non-Target Species

The potential exists for non-target species to be killed or injured anytime kill type traps are used. Trap size is an important factor that determines what species can be caught. The distance between the pan (trigger mechanism) and the jaws (killing mechanism) is slightly greater than 3 inches. This means that animals

with a body length less than 3 inches would not likely be caught. A few of the species that fall into this category include most shrews, pocket mice, deer mouse and white-footed mice. The species with relatively long tails (deer mice, white-footed mice, and pocket mice) could sustain injury to their tails if they were to trigger a gopher trap. The jaw width of the traps is 2.5 inches. These traps are too small to catch many of the larger wildlife species. Considering that these traps, by design, exclude the largest and smallest of species, death or injury from them would be limited to species and individuals that are of comparable size to the pocket gopher.

Even with the size limitation of these traps, other factors would further exclude potential victims. Placement of traps below ground would minimize the possibility of non-target animals coming into contact with the traps. The traps would be set in active gopher burrows with the pan facing into the burrow. This means that only an animal coming out of the burrow can trigger the trap. Small predators that are trying to enter a burrow where the trap is set would only push the trap deeper into the burrow until the trap triggers itself against the burrow walls. Larger predators that attempt to dig up gophers at the trap set would simply trigger the trap in the process of digging. With the jaws down in the burrow and away from the potential predator, the trap would most likely trigger before the predator is exposed to the trap. Bait would not be used at the traps so non-target animals would not be enticed to investigate.

Trapping would have no direct or indirect effect on TES species, MIS, or SOI because most do not enter gopher burrows to search for prey. Wolverines, pine martens and fishers are the only species that might dig into a gopher burrow; the traps to be used and the manner in which they will be set pose no threat to these species. See the Wildlife Biological Evaluation in Appendix B.

Indirect Effects—Pocket Gophers & Non-Target Species

Reductions in prey for predators or scavengers would be incidental. The areas recommended for pocket gopher control likely represent a small portion of the total home range for most predators. About 1,179 acres or 2% of the project areas would be treated. It is unlikely that the reduction in gophers - and non-target, prey species - would result in a decline in any predator populations; rather, a predator is likely to simply shift the use areas within its home range.

Worker and Public Health & Safety

Direct effects to workers are considered minimal. Minor injuries, such as cuts and bruises to hands, could occur from setting traps. Workers are to wear gloves when dealing with dead animals or traps.

Indirect effects to workers are possible. The potential exists for workers to be exposed to parasites or diseases carried by animals when removing dead animals from traps and burying them. To reduce the risk of infection, the Center for Disease Control recommends that workers wear rubber or plastic gloves and respirators when handling traps or dead rodents. Traps and clothing should be washed and disinfected between uses. Field crews are to be informed of the risks and symptoms of plague and hantavirus-related illnesses as well as treatment procedures and be trained in proper application and safety procedures prior to starting work.

No risk to the general public is anticipated. Below ground placement of traps should minimize the risk that a person or pet would come in contact with a trap and set it off. Dead animals removed from the traps would be promptly buried, preventing any potential spread of disease.

Cumulative Effects

The cumulative effects of controlling gophers with trapping would be a delay in reforestation resulting in a lack of future habitat and timber volume across the project area. This is due to lower stocking levels and the loss of 5-20 years growth because of delayed establishment. The function of forest stands as wildlife

habitat and stream shading would be diminished. The intent of NFMA to reforest is unlikely to be met in units where heavy gopher activity persists.

Strychnine baiting is included in several other projects located within the Middle Fork John Day sub-basin. The low proportion of reforestation and pocket gopher treatments in these projects is less than the amount recommended in Southeast Galena, resulting in an overall level that is insignificant. Cumulative impacts to the Middle Fork John Day sub-basin are expected to be similar to the No Action Alternative (Alt. 1).

ALTERNATIVE 4—Pocket Gophers & Non-Target Species

Alternative 4 does not propose reforestation activities, making site pocket gopher control unnecessary. Direct, indirect and cumulative effects would be the same as for Alternative 1 – the No Action alternative. No adverse effects would be anticipated.

ALTERNATIVE 5—Pocket Gophers & Non-Target Species

Alternative 5 would plant approximately 2,843 acres, of which 2,598 acres would likely require pocket gopher control (see Table 193 and Table 194, page 379). Strychnine baiting would be used on about 2,298 acres and aluminum phosphide fumigation would be used on 300 acres to respond to wildlife concerns. See Chapter 2, **2.5.6.3.2—Mitigation for Pocket Gopher Control—Pesticide** Use, page 98.

Reforestation

Alternative 5 would have similar effects to those described for Alternative 2, the Recommended Action. About 909 additional acres would be planted and treated for pocket gophers. Pocket gopher control would result in reduced gopher damage to conifer seedlings and improved overall stocking in treated plantations. Chemical treatment would help land managers meet the purpose and need to reforest plantations and meet stocking certification requirements as required by NFMA.

Water Quality, and Fisheries

Effects would be the same as described for Alternative 2, the Recommended Action. Even though more treatment acres are planned, it is highly unlikely that the chemicals would persist in the soil or move into streams. The effects to fish are expected to be unlikely, due to the low mobility in the soil and by not applying the chemicals within RHCAs.

Table 197 lists the total acres recommended for chemical treatment, the Maximum Allowable Acres (MAA) that could be treated, and the NOEL ratios by subwatershed. For the complete discussion of methods, assumptions, calculations, and results refer to the *Malheur National Forest Noxious Weed Environmental Assessment,* Appendix H (pp. 18-21) and the Soil, Water and Fishereies Reports for this project. For definitions of MAA and Noel Ratio, see text preceding Table 188 page 370 in ALTERNATIVE 2.

Table 197 Alternative 5 - Rodenticide Treatment Acres, Maximum Allowable Acres and Noel Ratio by Subwatershed.

Subwatershed or Drainage	Alt. 5 Acres	Maximum Allowable Acres	NOEL Ratio
Placer Gulch	262	750	0.3493
Davis	212	1500	0.1413
Vinegar Ck.	849	3000	0.2830
Vincent Ck.	398	3000	0.1327
Deerhorn	160	3000	0.0533
L. Boulder	116	3000	0.0387
Murdock	51	750	0.0680
Gorge	35	300	0.1167
Windlass	208	750	0.2773
Butte	307	3000	0.1023
Totals	**2598**	**Not Applicable**	

In no case did the recommended application rates exceed the Maximum Allowable Acres or a Noel Ratio of 1. No adverse effects to freshwater fish or other aquatic species would occur. Low application rates, underground baiting, streamside buffers, spillage mitigation, and the low mobility and persistence of strychnine in soils and water reduce risks to very low levels. No effects to Threatened, Endangered or Sensitive species (TES) would be expected. See the Aquatic Biological Evaluation in Appendix B.

Wildlife

Effects would be similar to those described for Alternative 2, the Recommended Action. Alternative 5 treats 2,598 acres or 5% of the project area. Even though more treatment acres are planned, the difference in acres treated is considered negligible given the size of the project area.

The effects to TES, MIS, and SOI are essentially the same as discussed for Alternative 2, the Recommended Action. Since 909 more acres are planned for treatment, there is a slightly elevated chance for exposure, but it is still considered to be highly unlikely that there would be adverse effects (see the Wildlife Biological Evaluation in Appendix B). .

Worker and Public Health & Safety

Effects would be similar to those described for the Alternative 2, the Recommended Action. Since 909 more acres are planned for treatment, there is a slightly increased chance of exposure. The total effect is still considered to be insignificant.

Cumulative Effects

Strychnine baiting is included in several other projects located within the Middle Fork John Day sub-basin. The low proportion of reforestation and pocket gopher treatments in these projects is less than the amount recommended in Southeast Galena, resulting in overall concentrations that are less than that analyzed for the Southeast Galena project area.

No cumulative effects to soil or water quality are expected from strychnine baiting. Strychnine is not expected to accumulate in the soils between applications based on the poison's low mobility and persistence and its relatively short half-life. Risks to aquatic life are considered low or non-existent. Use of strychnine will not retard or prevent attainment of riparian management objectives. Strychnine baiting will not be conducted in floodplains; consequently, no direct, indirect, or cumulative effects to floodplains are anticipated.

No cumulative effects to soil, water quality, or fisheries are expected from aluminum phosphide fumigation. Aluminum phosphide and its residues will not accumulate in the soils between applications since it is a gas and disperses within a short time.

Analysis of all chemical application in the project area (from the *Malheur National Forest Noxious Weed EA*) is discussed under ALTERNATIVE 5, Competing Vegetation, Cumulative Effects, page 376.

There are no cumulative risks to wildlife since other projects within the rest of the Middle Fork sub-basin treat a small proportion of the area than is recommended in the Southeast Galena project area. The application of strychnine or aluminum phosphide tablets below ground is not expected to cause cumulative effects with respect to public health or safety.

4.3.8.3—Noxious Weeds

CONCERN:

Using herbicides, specifically glyphosate, to control noxious weeds may pose harmful risks to aquatic and terrestrial wildlife and humans using the areas.

BACKGROUND:

Noxious weeds are aggressive, non-native plants introduced from Europe and Asia. These weeds pose a threat to native pant communities and wildlife that depend on them. Because noxious species are not native to the area, natural controls to limit population sizes do not exist, and their competitive advantage allows them to overtake native plant communities. Noxious weeds can increase fire hazards, replace valuable forage with non-palatable or less nutritious forage for both wildlife and cattle, cause economic losses to adjacent farming and ranch communities, and reduce the diversity of native plant and animal communities.

The *2000 Malheur National Forest Noxious Weed Environmental Assessment* identified approximately 200 noxious weed sites on 65 acres in the Southeast Galena project area. These sites are slated for treatment, using both manual and chemical methods.

Ten new noxious weed sites have been identified in Southeast Galena during this analysis. The ten sites are small, totaling only 1.9 acres. Noxious weeds identified are Canada thistle (*Cirsium arvense*), diffuse knapweed (*Centaurea diffusa*), spotted knapweed (*Centaurea maculata*), tansy ragwort (*Senecio jacbea*), St. Johnswort (*Hypericum perforatum*) and common toadflax (*Linaria vulgare*).

Several of these sites occur in quarry sites that may be used as rock sources for road surfacing. Some of the quarries are located in subwatersheds outside of the Southeast Galena area, but the rock from them would be used on roads within the Southeast Galena project area.

RESOLUTION:

Alternative 1, No Action, does not treat the ten new noxious weed sites. Alternatives 2 and 5 use a combination of manual and chemical methods to kill noxious weeds at ten new sites. Alternatives 3 and 4 use manual methods, i.e., non-chemical methods, to kill noxious weeds.

Measures:

- Acres treated with chemicals for noxious weed control.

PROJECT DESIGN

The action alternatives use a combination of manual and/or chemical methods to control noxious weeds on all ten sites (see Table 198, page 394)for treatment acres by alternative). Chemical application typically provides better control efficacy than non-chemical methods.

Manual Removal of Noxious Weeds: Manual methods available include hand pulling, lopping, digging, and grubbing (i.e., using a hoe or similar tool to break the plant free just below the ground surface). Manual methods are most effective where treatment sites are small and existing weeds have shallow or non-persistent roots. Roots of knapweeds, for example, are easily pulled by hand. Certain weeds, such as leafy spurge and Canada thistle, have deep or persistent roots that can sprout new foliage if the entire root is not removed or destroyed.

Control of Noxious Weeds with Herbicides: At the noxious weed sites, herbicide would be applied only on the noxious weeds themselves. Herbicide application would be permitted within RHCAs. Glyphosate is recommended for use. Information about glyphosate is listed in Section 4.3.8.1—Competing Vegetation.

Table 198 Acres of Noxious Weed Control by Alternative and Control Method.

Treatment Acres	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Manual Treatments	0	.4	1.9	1.9	.4
Chemical Treatments	0	1.5	0	0	1.5
Total Control Acres	0	1.9	1.9	1.9	1.9

ALTERNATIVE 1—Toxic Chemicals—Noxious Weeds

Vegetation

As weeds spread, cover vegetation could decrease in diversity as well as in moisture and soil-holding capacity, and run-off and sedimentation rates could increase. As soil horizons are lost following a decrease in root structure, so is the likelihood of restoring the native species.

Lack of effective containment leads to expansion of both numbers and size of infestations, resulting in a "snowball" effect on both expense and inefficacy of future treatments. The time scale of this trend is unpredictable, as it involves numerous variables. Long-term productivity of non-forest lands, as well as biodiversity, will probably decrease as exotic species increase. Failure to eradicate the existing new weed populations within this project area could offset the effects of treatments under the *Noxious Weed EA*, allowing untreated populations to re-infest the treated areas. In the long run, this could offset the effort and expense of eradication efforts within the watershed, and add to the burden of off-forest weed seed that will inevitably initiate new infestations.

Soil, Water Quality, and Fisheries

The only chemical treatment of weeds would occur associated with those listed in the *Noxious Weed EA*. The approximately 1.9 acre of new noxious weed-infestations of diffuse knapweed, spotted knapweed, St. John's Wort, Canada thistle, tansy ragwort and common toadflax would not be treated with this alternative.

Impacts of not controlling weeds can be loss of vegetation species that have better soil-holding characteristics than invading species. This can increase sedimentation and decrease stream bank stability.

Wildlife

None of the 10 new noxious weed sites would be treated. Weed infestations would likely persist, enlarge, and/or spread to new locations. The ten sites are small, totaling only 1.9 acres, a negligible amount in a 49,000-acre analysis area. Direct and indirect impacts to wildlife species would also be negligible or non-existent in the short-term. Nevertheless, noxious weeds tend to spread rapidly in the absence of natural controls. Alternative 1 could result in increased negative effects to wildlife though a decrease in native

vegetation. Over time, there is the potential for loss or degradation of habitat with new and expanding weed locations.

No immediate effects to Threatened, Endangered, and Sensitive (TES) species, Management Indicator Species (MIS) or Species of Interest (SOI) would be expected. See the Wildlife Biological Evaluation in Appendix B.

Worker and Public Health & Safety

There would be no effects to workers, or public health and safety.

Cumulative Effects

Cumulative effects would be as described in section 4.3.8.1.1 – Competing Vegetation, Alternative 1 – Cumulative Effects, page 372. Analysis addressed herbicide treatment of sites identified in the *Noxious Weed EA* and County spraying of highway right of ways.

These herbicide applications were not expected to have adverse effects on aquatic or terrestrial species, or humans.

ALTERNATIVE 2—Toxic Chemicals—Noxious Weeds

Approximately 1.9 acres of noxious weeds would be treated by a combination of manual and chemical methods. Where chemical treatment is prescribed, the herbicide glyphosate would be applied directly to noxious weeds using wick or spot application methods.

Vegetation

The noxious weed populations slated for herbicide treatment will no longer act as seed sources for spread or start of new infestations after 2001. These populations could be eliminated by 2008, or sooner. Because glyphosate is a broad-spectrum herbicide, it has the potential to decrease grass cover. Because the recommended action is for wick or spot application to individual plants, adverse effects to surrounding vegetation would be minimal to non-existent.

Soil, Water Quality, and Fisheries

Glyphosate would be applied to noxious weeds on 1.9 acres, of which 1.5 acres is in RHCAs. There will be no aerial application of chemicals due to the need for site-specific placement. Glyphosate will be applied under dry conditions, when soil water movement is limited. Under these conditions, it is unlikely that the herbicide will be transported to live stream water during its active period when concentrations are near the application rate.

Detailed information on the properties of glyphosate and its potential application effects is described in Section 4.3.8.1.2—Competing Vegetation, Alternative 2—Soil, Water Quality, and Fisheries, page 368. Table 199 displays recommended treatment acres, Maximum Allowable Acres for treatment, and NOEL ratios by subwatershed. Terms are defined in Section 4.3.8.1.2 page 368.

Table 199 Alternative 2 Chemical Treatment (Glyphosate) vs. Max. Allowable Acres and NOEL Ratio.

Subwatershed	Alt. 2 Acres (within RHCAs)	Maximum Allowable Acres	NOEL Ratio
Tincup	0.1(0.1)	420	0.0002
Butte	1.2(1.1)	2100	0.0006
Beaver/Ruby	0.1	38	0.0026
Dry/Sunshine	0.1(0.1)	38	0.0026
Totals	**1.5(1.3)**	**Not Applicable**	

Alternative 2 has some risk associated with spills during application. This is because application rates and location are not expected to have impacts on fish or fish habitat. The main risk is that spills could occur during transport of equipment and chemicals or while filling equipment. Following BMPs listed in Chapter 2 of this document and the *Malheur NF Noxious Weed Environmental Assessment* would minimize these risks.

Wildlife

Effects to wildlife would be as described In ALTERNATIVE 2, page 368. Application of glyphosate on an additional 1.9 acres would have negligible effects.

Glyphosate application would not create any substantial hazard to terrestrial animals, including Threatened, Endangered, and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). Under prescribed application rates, toxic exposure levels would not likely occur. Chemicals have low to no bioaccumulation rates. Noxious weeds would be reduced. There is some risk that noxious weeds would invade newly disturbed sites, but overall, native species are expected to revegetate most sites. See the Wildlife Biological Evaluation in Appendix B.

Worker and Public Health & Safety

Risks to workers and the general public would be as described in Worker and Public Health & Safety, page 372. Application of glyphosate on an additional 1.9 acres would not increase risks. Glyphosate has low to moderate potential toxic effects. Studies have shown that exposure levels remain far below the toxic levels for workers. Exposure to the public is expected to be much less.

Cumulative effects

Cumulative effects would be as described in section 4.3.8.1.2 Cumulative Effects, page 372. Analysis addressed the following treatments: 1) noxious weed treatment identified in the *Noxious Weed EA*, 2) competing vegetation treatment recommended in this project; 2) noxious weed treatment recommended in this project, and 4) strychnine treatment of pocket gophers recommended in this project.

At the treatment levels recommended , chemicals would be below thresholds for adverse effects. It is unlikely that any chemical would be detected in stream water. Application of site-specific Best Management Practices (BMPs) and mitigation measures (listed in Chapter 2) would further reduce the likelihood of chemicals being detected in stream waters, and the risk to water quality from recommended chemical treatments would be low in all subwatersheds. Risk to water quality, fish and fish habitat would likely be low in the Middle Fork John Day River.

Risks to terrestrial wildlife species would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels. No adverse cumulative effects would be expected to terrestrial wildlife, including Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). Cumulatively, the treating of noxious weed sites would have beneficial effects to wildlife by restoring native plant communities in existing noxious weed sites.

The total cumulative effects of these projects are considered to be not large enough to cause adverse impacts neither to aquatic or terrestrial species nor to public safety or health.

ALTERNATIVE 3—Toxic Chemicals—Noxious Weeds

Alternative 3 restricts control of noxious weeds on 1.9 acres to manual methods, i.e., non-chemical methods. Hand pulling, lopping, digging, and/or grubbing would be used to remove noxious weeds on 1.9 acres.

Vegetation

The use of only manual control methods will reduce the ability to control the known noxious weed sites not covered by the *Noxious Weed EA*, compared with the Recommended Action (Alternative 2).

Soil, Water Quality, and Fisheries

No chemicals are recommended for use to control the ten new noxious weed sites. Effects would be the same as for the No Action Alternative (Alternative 1)

Wildlife

All 10 noxious weed sites would be treated by manual methods. Because manual treatment methods are not always effective, some of the weed infestations would likely persist, enlarge, and/or spread to new locations. The 10 sites are small, totaling only 1.9 acres, a negligible amount in a 49,000-acre analysis area. Direct and indirect impacts to wildlife species, including TES species, MIS and SOI, would also be negligible or non-existent. See the Wildlife Biological Evaluation Appendix B

Worker and Public Health & Safety

Manual methods are unlikely to pose any safety risks to workers. There would be no effects to public health and safety.

Cumulative Effects

Alternative 3 would have the same cumulative effects as the No Action Alternative (Alternative 1), the only difference is the additional 1.9 acres of manual treatment which is very insignificant. Ground disturbance is less than the Recommended Action (Alt. 2). Analysis of all chemical application in the project area (from the *Malheur National Forest Noxious Weed EA*) is discussed under Section 4.3.8.1.3 (Alternative 3, Cumulative effects in the Competing Vegetation Section) of this document.

ALTERNATIVE 4—Toxic Chemicals—Noxious Weeds

Noxious weed eradication on 1.9 acres would use manual methods; no herbicides would be applied at these sites. Direct, indirect and cumulative effects would be as described for Alternative 3.

ALTERNATIVE 5—Toxic Chemicals—Noxious Weeds

Approximately 1.9 acres of noxious weeds would be treated by a combination of manual and chemical methods. Where chemical treatment is prescribed, the herbicide glyphosate would be applied directly to noxious weeds using wick or spot application methods. Treatment of these sites is identical to recommended treatment in Alternative 2.

Vegetation

The noxious weed populations slated for herbicide treatment will no longer act as seed sources for spread or start of new infestations after 2001. These populations could be eliminated by 2008, or sooner. Because glyphosate is a broad-spectrum herbicide, it has the potential to decrease grass cover. Because the recommended action is for wick or spot application to individual plants, adverse effects to surrounding vegetation would be minimal to non-existent.

Soil, Water Quality, and Fisheries

Effects are as described for the Recommended Action (Alternative 2), since the same amount of herbicide will be used to control the same noxious weed infestations.

Wildlife

Effects are as described for the Recommended Action (Alternative 2), since the same amount of herbicide will be used to control the same noxious weed infestations.

Cumulative Effects

Cumulative effects would be as described in section ALTERNATIVE 5, Cumulative Effects, page 376 Analysis addressed the following treatments: 1) noxious weed treatment identified in the *Noxious Weed EA*, 2) competing vegetation treatment recommended in this project; 2) noxious weed treatment recommended in this project, and 4) strychnine treatment of pocket gophers recommended in this project.

At the treatment levels recommended , chemicals would be below thresholds for adverse effects. It is unlikely that any chemical would be detected in stream water. Application of site-specific Best Management Practices (BMPs) and mitigation measures (see page 90) would further reduce the likelihood of chemicals being detected in stream waters, and the risk to water quality from recommended chemical treatments would be low in all subwatersheds. Risk to water quality, fish and fish habitat would likely be low in the Middle Fork John Day River.

Risks to terrestrial wildlife species would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels. No adverse cumulative effects would be expected to terrestrial wildlife, including Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). Cumulatively, the treating of noxious weed sites would have beneficial effects to wildlife by restoring native plant communities in existing noxious weed sites.

The total cumulative effects of these projects are not considered to be large enough to cause adverse impacts to aquatic or terrestrial species, sensitive plant species, or to public safety or health.

4.3.9— ISSUE 1.4.9—INADEQUATE AMOUNT OF TREATMENT—FOREST SUSTAINABILITY AND RESILIENCY

Current forest stand composition and structure predispose the forest toward a risk of uncharacteristically severe insect infestations, disease infections, and fire. The Agency's recommended action does not manage enough forest stands to adequately meet the purpose of this action of returning this area to the historic range of variability for stand composition and density.

BACKGROUND:

Dry Forests were once forested by open park-like stands of large early seral tree species (ponderosa pine and western larch). Lightning and Native Americans ignited fires that burned frequently; consuming ground fuel, reducing the amount of shade tolerant understory trees, and scorching the lower branches. With little fuel on the ground, the fire intensity was low, and since the height of the bottom of the live crown was high enough to keep the ground fire from reaching the crowns, crown fire occurred infrequently. The thick bark on the trees insulated the cambium from the heat of the frequent, low intensity ground fires that occurred. The low stand densities allowed the trees to grow with good vigor and to withstand bark beetle attacks and to outgrow mistletoe infections. The relative lack of shade tolerant late seral species (Douglas-fir and grand fir) reduced the amount of host species for tussock moth and spruce budworm, maintaining these damaging insects at low levels.

Moist forests were historically a mixture of open park-like stands and denser forests that included both early-seral and late-seral tree species, reflecting the variability caused by a mixture of fire regimes and other disturbances. Fires would burn patches up to 2000 acres in size, of which 80% would be an

underburn, and 20% would be stand replacement intensity. The patchwork of structural stages and the higher proportion of early-seral species reduced the amount and distribution of host species (Douglas-fir and grand fir) for spruce budworm and Douglas-fir tussock moth, restricting the size and intensity of defoliating insect outbreaks. These are the same host species that are susceptible to the more damaging root and stem diseases. The result was that the stands were able to withstand periodic disturbances from fire, insects, and disease; exhibiting good resiliency and long-term sustainability.

RESOLUTION:

The alternatives propose mechanical treatments and prescribed fire designed to reduce stand densities and to shift the species composition towards early seral species. Fuel treatments are included to reduce the amount of fuel on the ground resulting from harvest and thinning activities.

"In pure second-growth pine stands, thinning will reduce the probability of beetle attack." (Johnson et al 1995). The thinning will reduce the stocking levels in the overstory and understory, while prescribed fire will reduce the amount of natural in-growth, reduce dead fuel loading, and scorch the lower live limbs, reducing the torching potential. Thinning the overstocked stands improves tree vigor, which will improve forest resiliency, and burning reduces the fuel loading and crown fire potential, which will reduce fire severity and size. "Active management can help recreate the historical mosaic of stands in different conditions that offers natural firebreaks and less concentrated food sources for insects." (Johnson, et al 1995)

The No Action Alternative (Alt. 1) does not propose any mechanical stand treatment or prescribed fire to alter the present condition. The other alternatives (Alts. 2, 3, 4, and 5) propose differing amounts of mechanical stand treatments and prescribed fire.

Table 200 -Acres of Mechanical Treatment by Alternative

Treatment	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Commercial Thinning	0	5721	4390	0	7062
Comm. Thin in Connectivity Corridors	0	1228	899	0	221
Understory Removal	0	879	552	0	1216
Shelterwood	0	1689	1242	0	2598
Salvage	0	245	245	0	245
Harvest Total	**0**	**9762**	**8207**	**0**	**11342**
Precommercial Thinning	0	2158	1830	2094	3076
Precommercial Thin in Connectivity Corridors	0	948	820	635	38
Precommercial Thin Total	**0**	**3107**	**2650**	**2729**	**3114**
Total Mechanical Treatment♠	**0**	**10641**	**8207**	**2729**	**12221**
♠Total acres treated are less than the sum of the individual treatments because in some areas both commercial and precommercial thinning is prescribed.					

Species conversion will reduce the amount and distribution of late-seral species in the planning area. That will reduce the severity and extent of insect outbreaks, and reduce the incidence and spread of disease. Thinning will reduce the stocking levels in the overstory and understory, improving tree vigor, which will improve forest resiliency. Prescribed fire will reduce the amount of natural in-growth, reduce dead fuel loading, and scorch the lower live limbs, reducing the torching potential and crown fire potential, which will reduce fire severity and size.

Table 201 Acres of Prescribed Fire Treatment by Alternative

Subwatershed	Alt 2 Outside Units	Alt 2 Within HTH, SPC Units	Alt 2 Within Ref Units	Alt 3 Outside Units	Alt 3 Within HTH, SPC Units	Alt 3 Within Ref Units	Alt 4 Outside Units	Alt 4 Within SPC Units	Alt 5 Outside Units	Alt 5 Within HTH, SPC Units	Alt 5 Within Ref Units
Davis Ck/ Placer Gulch	549	1504	79	686	1446	0	1017	451	516	1537	79
Vinegar Ck	1746	1309	172	1794	1309	124	2630	597	1321	1283	623
Vincent Ck	2010	1563	151	2177	1445	102	3503	221	1726	1430	568
Little Boulder/ Deerhorn Ck	5315	1561	282	5100	1032	71	4864	0	5095	1781	282
Tincup/ Little Butte Ck	2585	1450	507	2686	724	253	3553	110	2289	1727	526
Butte Ck	774	540	60	1004	310	60	1066	308	702	612	60
Granite Boulder Ck	1077	0	0	1077	0	0	1077	0	1077	0	0
Total	14056	7927	1251	14524	6266	610	17710	1687	12726	8370	2138
Grand Total		23234			21400			19397		23234	

Note: Outside Units means prescribed burning outside units with mechanical treatment recommended by this EIS.
Within HTH, SPC Units means prescribed burning planned where thinning or precommercial thinning are planned.
Within Ref Units means prescribed burning planned where reforestation is scheduled including understory removal units

Prescribed burning will be done to stands that are stocked with a majority of species including ponderosa pine, western larch, and Douglas-fir and which may contain understories of grand fir or western juniper that have become established as a result of fire exclusion. A low intensity ground fire is planned to meet the objectives of fuel reduction, vegetation treatment and resource protection. Burn intensities should be varied on a site specific basis depending on weather, fuel, topographic, and tree characteristics that would result in no more than 30 percent crown scorch of the dominant and co-dominant trees. The scorching of the lower live branches up to 20 feet above the ground is desirable to reduce ladder fuels and the chance of the trees from being ignited by a future wildfire. Mosaic burning including some unburned areas is desirable in order to have diversity in ground vegetation stages and retain desirable tree regeneration.

Measures:

- Acres of fire hazards that are reduced, including acres treated of ground fuel reduced and acres treated of moderate and high crown fire risk.
- Acres of overstocked stands thinned.
- Acres of late seral tree species converted to early seral tree species.

PROJECT DESIGN

The young "second growth" stands of ponderosa pine, Douglas-fir, and western larch that regenerated following the railroad logging are often overstocked. Those that are overstocked are prescribed for precommercial or commercial thinning, sometimes both, depending on the size of the trees to be removed. Stands that have an overstory of larger early seral tree species and a dense understory of younger trees, either early or late seral species, are prescribed for understory removal to reduce competition and the risk of stand replacement fire. Stands that have a larger proportion of late seral tree species than occurred in the past are prescribed for species conversion by a combination of commercial thinning and shelterwood regeneration.

Prescribed burning was planned in both mechanically treated and untreated stands to reduce fuel levels, increase the lower crown height by scorching, and to remove understory trees. Up to 10% mortality is permissible in the overstory. Burns would be in both the spring and fall to better mimic the effects of natural fire.

Mechanical treatment and prescribed burning were deferred or modified in stands that were deemed necessary for wildlife habitat and to provide connectivity between habitat areas. The Malheur NF Land and Resource Management Plan, *LRMP* Amendment #2, Pac Fish, and other documents address some of the habitat needs that guide project design. In the case of Threatened, Endangered, and Sensitive (TES) species, habitat needs are guided by discussions and agreements with regulatory agencies, (i.e. Canada Lynx Conservation and Assessment and Strategy). Prescribed burning was deferred in some areas where mechanical treatment was deferred, because it cannot be done until the mechanical treatment changes the stand structure to allow safe burning.

The net result is that the area being treated by the Recommended Action (Alt. 2) is approximately half that was diagnosed as needing treatment to improve forest sustainability and resiliency. Table 202 displays the total acres that were diagnosed as needing mechanical treatment and the percentage actually recommended for treatment in each alternative. The areas within Pac Fish designated RHCAs (MA-3b), the Dixie Butte Wildlife Emphasis Area (MA-7), Designated Old Growth areas (MA-13), and the Vinegar Hill-Indian Rock Scenic Area (MA-21) were not diagnosed for treatment, and are not included.

Table 202 Percentage of Acres Needing Treatment vs. Percentage of Area Treated

Treatment	Need Acres	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Commercial Thinning	9249	0%	78%	57%	0%	79%
Pre-Commercial Thinning	3345	0%	93%	79%	82%	93%
Species Conversion	9322	0%	18%	13%	0%	28%
Understory Removal	1614	0%	54%	34%	0%	75%
Total♠	21,493	0%	50%	38%	13%	57%
♠Total acres treated are less than the sum of the individual treatments because in some areas both commercial and pre-commercial thinning is prescribed.						

Table 203 displays the change each alternative is expected to have on the crown fire hazard from the current condition.

Table 203 Effects of Treatments on Crown Fire Hazards

Crown Hazard	Existing	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
DRY FOREST						
High	66%	No Change	44%	50%	61%	40%
MOIST FOREST						
High	60%	No Change	55%	56%	59%	54%
LODGEPOLE PINE						
High	98%	No Change	No Change	No Change	No Change	No Change
COLD FOREST						
High	84%	No Change	No Change	No Change	No Change	No Change

Note: Existing Crown Fire Hazards were determined by using stand densities based on the following assumptions:

- For the Dry Forest and Moist Forest Type's, the stands indicated for treatment plus dense stands that were not recommended for treatment due to other resource objectives such as Dedicated Old Growth stands. However, information was not available on all stands and these stands were not put into the High level. Therefore, the crown fire hazard may be underestimated.
- For the Lodgepole Pine and Cold Forest Type's, the stand initiation stage was rated as low. All other stages were rated as high due to the high densities of the stands based on field observations and aerial photo interpretations.

Alternative 1—Forest Sustainability and Resiliency

Alternative 1, the No Action alternative, does not propose any mechanical stand treatment or prescribed fire to alter the present condition

Direct and Indirect Effects

Overstocked forest stands will continue to slow in growth and decrease in vigor as stand density continues to increase. Late seral species will continue to increase occupancy in mixed conifer stands. The quantity and vigor of grasses and shrubs in the understory will continue to decline due to the shading and competition for nutrients and water.

Insects

Risk of attack by bark beetles will increase as the trees lose vigor and are less able to pitch out the beetles. As more attacks become successful, the population increases to outbreak levels, killing and damaging larger pockets of trees. Risk of outbreaks of defoliating insects would continue to increase as the stand composition continues to shift to more late seral species. Large scale applications of insecticides are felt to be ineffective since the habitat for the insect remains and the natural populations are available to periodically reach outbreak levels (Mason 1998, Powell 1994). Widespread defoliation and mortality would increase the fuel loads greatly. The dense, slow growing stands would remain a high risk for fir engraver attacks; further increasing mortality and fuel loading.

Disease

Dwarf mistletoe infections can be expected to increase as trees slow in height growth and the crowns grow closer together. Stem and root diseases would continue to spread in the host fir trees, causing increasing mortality.

Fire

The primary stand attributes that control fire behavior are surface fuel condition, crown bulk density, and crown base height (Graham 1999).

The increase in stand density in ponderosa pine stands will increase the likelihood of crown fire by increasing the stand crown bulk density. Insect and disease mortality will increase the standing and down fuel loadings, increasing fire intensity and severity. Stands with an understory or live crowns that are currently close to the ground will continue to have a hazard of ground fires moving up into the crowns along the fuel ladder. They will continue to be susceptible to torching from wildfire, increasing the hazard of crown fire. Stands with no fuel treatments burn at a higher severity and with more crown scorch than similar stands that have been treated to reduce stand densities and fuel loads (Pollet 1999).

In stands with a high proportion of fir trees, there would continue to be a high hazard for large scale, high severity fires due to the high flammability of late seral species stands. The increase in stand density will increase the likelihood of crown fire by increasing the stand crown density. Insect and disease mortality will increase the standing and down fuel loadings, increasing fire intensity and severity. Stands with an understory will continue to have a hazard of ground fires moving up into the crowns along the fuel ladder created by these smaller trees.

The crown fire hazard remains at 66 percent of the dry forest type and at 60 percent for the moist forest type. The species mix does not change towards less flammable species, the density is not reduced, and the ladder fuels are not reduced. The area remains at the current high hazard for uncharacteristically large and severe fires. As trees grow and biomass increases, the crown fire hazard will continue to increase. In 50 years, almost all stands will be at a high crown fire hazard without periodic under burning that could maintain stocking where it is now appropriate, mechanical treatment that could reduce stand densities and reduce fire sensitive species or wildfires that could cause stand replacement events.

Cumulative Effects

Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effect will be to maintain a center of insect and disease activity that could spread outside the Southeast Galena project area. If the fire

risk were not reduced, fires starting in the Southeast Galena area would be more likely to escape initial attack and become large, uncharacteristically severe wildfires.

The forested PVG's cover about 86 percent of the Galena Watershed. About 53 percent of the forested PVG's contains high crown fire hazards with ladder fuels and many patches of moderate to heavy ground fuels. This is after stand replacement fires of 1994 and 1996 burned about 25 percent of the watershed. The North Fork John Day Watershed, on the north side of the Galena Watershed, also has much of the area with dense stands with ladder fuels except about 24 percent of that watershed that was burned in 1996 due to the Tower Fire. The Camp Creek Watershed to the south of the Galena Watershed has higher proportion of dense tree stocking than the above two watersheds because there has been no stand replacing fires since fire exclusion. The cumulative effect is that all of these watersheds have large areas with fuel conditions far outside the historic level of variation that result in large, severe fires that can spread into the adjacent watersheds.

Alternative 2—Recommended Action—Forest Sustainability and Resiliency

Direct and Indirect Effects

Approximately 51% of the area diagnosed for treatment is recommended for thinning and regeneration. Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. Species composition changes in mixed conifer stands will be towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires.

Insects

The additional light and warmth in thinned stands is inhospitable for bark beetles, providing an immediate degree of protection to the trees. As the trees respond over the next several after the thinning, their increased vigor will allow them to withstand attempted beetle attacks by successfully pitching out the invading insects. As fewer attacks are successful, the population outbreaks will decrease to low levels, reducing the amount or size of pockets of mortality. The reduction in the proportion of late-seral species will reduce the extent of defoliation by spruce budworm and Douglas-fir tussock moth (Mason 1998, Powell 1994).

Disease

The increased height growth rates will allow the remaining trees to outgrow dwarf mistletoe infections, gradually decreasing the amount of crown infected. The increased spacing will reduce the lateral spread of mistletoe. The removal of late seral species during the thinning operations will reduce the amount of trees susceptible to root diseases. Eventually allowing the disease to fade to a minor role in the forest.

Fire

The primary stand attributes that control fire behavior are surface fuel condition, crown bulk density, and crown base height (Graham 1999).

The risk of fire will be diminished, as thinning from below will reduce the number of smaller trees in the stand, and will remove many of the late seral species in the understory, reducing the ladder fuels that allow ground fire to climb into the crowns. Thinning and associated slash treatment will significantly lower crown bulk densities and redistribute fuel loads, decreasing fire intensities (Agee 1993, Alexander 1988, Alexander and Yancik 1977) and reducing the crown fire potential (Coulter 1980, Dennis 1983, Rothermel 1991, Schmidt and Wakimoto 1988). Thinning will also eventually increase the diameter and bark thickness, which will reduce the amount of fire damage and mortality. The reduction in insect and disease mortality will reduce the amount of standing and down fuel created, decreasing fire intensity and severity. Live crowns will be higher off the ground as a result of thinning from below and scorching from prescribed burning, reducing the risk of torching and crown fires. Mechanical fuel treatment is the most important component for reducing fire hazard. Sites

with mechanical fuel treatment appear to have drastically reduced fire severity during wildfires compared to sites treated only with prescribed fire only (Pollet 1999).

Species conversion treatments in stands with a high proportion of fir trees will decrease the risk of large scale, high severity fires since the proportion of late-seral species, which are highly flammable, will be reduced. Grand fir and other shade tolerant species tend to have long and heavy crowns, creating stands with high crown bulk densities (Brown 1978, Rothermel 1983). After treatment, it would take extreme weather conditions to sustain a crown fire in western white pine and western larch dominated stands due to their much lower crown bulk densities (Graham 1999). The risk of torching and crown fires due to presence of a fir understory with live crowns close to the ground will be greatly reduced by removing most of the fir understory.

Stands would be dominated by western larch, with lesser amounts of ponderosa pine and western white pine, depending on the site. In stands that resemble shelterwood regenerations, the primary species to be planted are western larch, ponderosa pine, and western white pine. These stands will be quite open with low crown bulk densities that are not likely to support crown fires while the regeneration is short (Graham 1999). As the stand grows, precommercial thinning the understory in the future will reduce the potential for crown fire by lowering the understory crown bulk densities.

The reduction in the amount of thin barked late seral species will reduce the amount of mortality due to bole scorch. The reduction in insect and disease mortality will reduce the amount of standing and down fuel created, decreasing fire intensity and severity.

All sub watersheds, except for Granite Boulder, have treatments that reduce the crown fire hazard in large enough areas to help prevent crown fires and to allow crown fires from adjacent untreated areas to drop back to the ground. Additional thinning will be needed in the future as described in the vegetation effects to maintain the effects of reduced crown fire hazard.

Crown fire hazard is reduced by 22 percent, or one third, for the dry forest and by 5 percent for the moist forest. The treatment areas are large enough to provide conditions where crown fires in untreated areas can become ground fires soon after entering the treated areas. This is because tree crowns are not dense enough to carry fire from crown to crown unless under extreme weather conditions, and ladder fuels are removed from treatment areas through mechanical treatment and prescribed burning. Torching of individuals and groups of trees will still be possible due to species attributes, tree size or ground fuel conditions.

With the increased opportunity for the wildfires to remain on the ground, or return to the ground if a crown fire, there will be increased safety for fire fighters due to less fire intensity and better opportunities for safety zones.

For stands thinned to 60 basal area per acre, high crown fire hazard will be reached again within 50 years. For stands thinned to 80 square feet of basal area per acre (modified thinning) and the pre-commercial thinning outside of harvest units, high crown fire hazard will be reached again within 25 years. The units with the combination thinning and shelterwood prescriptions will reach high crown fire hazard within 50 years assuming a precommercial thinning in 25 years.

Cumulative Effects

Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area, those that started outside the area would find conditions less hospitable in the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

This alternative reduces high crown, fuel ladder and ground fuel hazards on about 8 percent of the watershed through mechanical treatment and reduces ground fuels and ladder fuels through prescribed burning on an

additional 11 percent of the watershed. If the recommended future Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced by a total of about 7 percent through mechanical treatment and another 7 percent of the watershed would have reduced ground fuel and fuel ladders through prescribed burning. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of 33 percent of the watershed of which about 15 percent would be lowering of the crown fire hazard. The distribution of the treated areas would break up the continuity of the high hazard fuels. This will result in fires being lighter in severity over the treated areas, safer to suppress, and more likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within the historic range of variation. This will reduce the need to use mechanical treatment in the future for fuels reduction.

Alternative 3—Forest Sustainability and Resiliency

Direct and Indirect Effects

Approximately 36% of the area diagnosed for treatment is recommended for thinning and regeneration to improve resiliency and sustainability. Alternative 3 treats about ¾ of the area compared with the Recommended Action (Alt. 2). Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. Species composition changes in mixed conifer stands will be towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires

Insects

The effects would be approximately 25% less than the beneficial effects of the Recommended Action.

Disease

The effects would be approximately 25% less than the beneficial effects of the Recommended Action.

Fire

The risk of fire would be reduced on only about 3/4 of the stands that the Recommended Action would treat. In addition the inability to burn south of the Middle Fork in the Little Butte and Deerhorn drainages would cause a further lack of fire hazard reduction when compared with the Recommended Action.

The crown fire hazard is reduced by 16 percent and that is 6 percent less effective than Alternative 2. Otherwise, the effects are the same as described for alternative 2, except for the Little Butte Creek portion of the Tincup / Little Butte Creek subwatershed which would not be effective for reducing crown fire potential next to the large, high crown fire hazard area of the Dixie Butte roadless area.

Cumulative Effects

The effects of Alternative 3 would be to a lesser degree than Alternative 2 since it doesn't treat as many acres. Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated somewhat more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 7 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 5

percent. Prescribed burning treatments outside mechanically treated units would be about the same as with alternative 2. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of about 30 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 3 would have 3 percent more of the watershed, or 3800 acres, with a high crown fire hazard so it is less effective in reducing the threat of large fires. However, fires would be lighter in severity and safer to suppress over the treated areas. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. This will reduce the need to use mechanical treatment in the future for fuels reduction.

Alternative 4—Forest Sustainability and Resiliency

Direct and Indirect Effects

Approximately 13% of the area diagnosed for treatment is recommended for thinning to improve resiliency and sustainability. Alternative 3 treats about 1/4 of the area compared with the Recommended Action (Alt. 2). Ponderosa pine stands will increase slightly in growth and vigor as the understory stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water.

Effects on Insects

There would be a slight improvement in the resistance to bark beetles in the precommercial thinned stands, but the increase would be small compared to the other action alternatives. Experience has shown that when late seral species make up less than 25% of the stand composition, defoliation is very light with little effect to tree growth or survival. This alternative will not reach that amount in most mixed conifer stands; therefore, defoliation will not be reduced very much. The incidence of fir engraver would be reduced in proportion to the amount of fir that is reduced, and the remaining fir trees would be slightly healthier and less susceptible to attacks.

Effects on Disease

There would be little improvement, related to the amount of late seral species removed during the precommercial thinning. Stem and root diseases may be actually increased, as the cut stumps can serve as infection pathways to the remaining fir trees in the stand. Dwarf mistletoe will not be reduced to any great degree by the precommercial thinning. The burning could show gradual improvement over time, as infected overstory trees are more susceptible to torching. Regardless, infected overstory trees will remain to infect the understory trees and nearby overstory trees.

Effects on Fire

The risk of fire hazard will be slightly diminished, as thinning from below will reduce the number of smaller trees in the stand, and will remove many of the late seral species in the understory, reducing the ladder fuels that allow ground fire to climb into the crowns. The reduction in the amount of thin barked late seral species will also reduce the amount of mortality due to bole scorch. The reduced amount of burning, especially south of the Middle Fork, will result in a higher hazard for large stand replacement fires.

Alternative 4 reduces the crown fire hazard the least of any action alternative by retaining 70 percent of the area in a moderate to high crown fire hazard.

The crown fire hazard is reduced by 5 percent and that is 17 percent less effective than Alternative 2. The crown fire hazard will reach high crown fire hazard within 25 years for all treatment units. Fires would be lighter in severity and safer to suppress over the treated area but not as likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds as with Alternative 2.

Cumulative Effects

The effects of Alternative 4 would be to a much lesser degree than Alternative 2 since it doesn't include any commercial harvest. Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effect will be to maintain a center of insect and disease activity that could spread outside the Southeast Galena project area. If the fire risk were not reduced, fires starting in the Southeast Galena area would be more likely to escape initial attack and become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 2 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 5 percent. Prescribed burning treatments outside mechanically treated unit would be about 21 percent of the watershed when combined with Northwest Galena which is more than alternative 2 because there is less mechanical treatment. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of about 28 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 4 would have 11 percent more of the watershed, or about 14,000 acres, with a high crown fire hazard so it is less effective in reducing the threat of large fires. However, fires would be lighter in severity and safer to suppress over the treated area but not as likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds as with alternative 2. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to help maintain treated areas within HRV. This will reduce the need to use mechanical treatment in the future for fuels reduction but less than all the other action alternatives. This is because prescribed fire without mechanical treatment will not reduce stand densities enough to move the stands towards the historical range of variation or to reduce the crown fire hazard, other than reduce the opportunity for the fire to jump up into the crowns.

Alternative 5—Forest Sustainability and Resiliency

Direct and Indirect Effects

Approximately 59% of the area diagnosed for treatment is recommended for thinning and regeneration. Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. This alternative treats about 20% more area than the Recommended Action. Thinned ponderosa pine stands will increase in growth and vigor as the stand density is reduced, with more stands thinned to the optimal stocking level. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. This alternative treats approximately 50% more of the mixed conifer stands with the species conversion prescription than the Recommended Action. Treated stands will be more vigorous growing due to stocking level control, and the increased percentage of early seral species will be more resistant to insects, disease, and fire damage. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water.

Insects

The amount of bark beetle damage in ponderosa pine stands would be reduced on an additional 10% compared to the Recommended Action. This would be due to the increased use of the standard thinning rather than the modified thinning prescription. The host tree species for spruce budworm, tussock moth, and fir engraved will be reduced more than in the Recommended Action. Experience has shown that when late seral species make up less than 25% of the stand composition, defoliation is very light with little effect to tree growth or survival. The incidence of fir engraver would also be reduced as the proportion of fir is reduced, and the remaining fir trees would be healthier and less susceptible to attacks. Stands not treated would

benefit from the reduction of host species in nearby stands, which would lessen the severity and size of outbreaks.

Disease

Stem and root diseases will be reduced to a greater degree than the Recommended Action since about 35% more area will be treated to reduce the primary host late seral species. The removal of late seral species during the thinning operations will reduce the amount of trees susceptible to root diseases. Eventually allowing the disease to fade to a minor role in the forest. Thinning will increase height growth rates which will allow the remaining trees to outgrow dwarf mistletoe infections, gradually decreasing the amount of crown infected. The increased spacing will reduce the lateral spread of mistletoe.

Fire

The hazard of stand replacing fire will be diminished on more acres and to a greater degree, compared to the Recommended Action. The amount of mechanical treatment is increased and the amount of burning is the same as the Recommended Action.

The crown fire hazard is reduced by 26 percent and that is 4 percent more effective than Alternative 2. Otherwise, the effects are similar to those described for alternative 2.

Like Alternative 2, Alternative 5 treats all sub watersheds, except for Granite Boulder, to reduce the crown fire hazard in large enough areas to help prevent crown fires and to allow crown fires from adjacent untreated areas to drop back to the ground. A stand replacing event is least likely with this alternative because the stand conditions that reduce fire behavior are improved the most.

Cumulative Effects

The effects of Alternative would be to a greater degree than Alternative 2 since it treats more acres. Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated much more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 10 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 9 percent. Prescribed burning treatments outside mechanically treated units would be about 17 percent of the watershed which is less than Alternative 2 but would be more than made up by the increase of mechanical treated acres that are also to be prescribed burned. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of about 36 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 5 would have 4 percent less of the watershed, or about 5100 acres, with a high crown fire hazard so it is the most effective alternative for reducing the threat of large fires. The wildfires would be lighter in severity and safer to suppress over the treated areas. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. . This alternative will reduce the need to use mechanical treatment in the future for fuels reduction more than the other alternatives.

4.3.10—ISSUE 1.4.10—INSUFFICIENT PILEATED WOODPECKER HABITAT

The Agency's proposal does not adequately address needed habitat for pileated woodpeckers according to current scientific literature (i.e., according to a 1993 study by Bull and Hothausen).

BACKGROUND

The concern is twofold:

Concern 1: Dedicated old-growth areas (DOGs), replacement old-growth areas[70] (ROGs) and pileated woodpecker feeding areas (PWFAs) in the recommended action are not large enough to meet habitat requirements for pileated woodpeckers (see also Dedicated Old Growth and Connectivity, page 178). Current literature (Bull and Holthausen 1993) indicates that pileated woodpeckers may require a 900-acre home range per breeding pair rather than the 600-acre area recommended in the *LRMP* . The DOGs, ROGs and PWFAs need to be expanded to provide adequate habitat.

Concern 2: The recommended action would not retain a sufficient level of wildlife snags to meet habitat requirements for this species. Pileated woodpeckers typically require higher levels of large snag habitat than many other primary cavity species. Current literature (Bull and Holthausen 1993) recommends that pileated woodpeckers may require at least 4 large snags per acre rather than the 2.4 snags per acre recommended in the *Land and Resource Management Plan*.

CONCERN 1: MODIFYING MA-13 DOGS/ROGS/PWFAS

BACKGROUND:

LRMP , Management Area 13 (MA-13) provides for the management of old growth habitat through a system of dedicated old growth (DOG) units and replacement old growth (ROG) units. Habitat is to be composed of mature/overmature sawtimber (150 years or older). The goal of MA-13 is to provide suitable habitat for old growth dependent wildlife species, ecosystem diversity, and preservation of aesthetic qualities. Replacement old growth (ROG) areas are to be established to counter possible catastrophic damage or deterioration of the DOGs (see also Dedicated Old Growth and Connectivity, page 178).

The *LRMP* directs that pileated woodpecker areas comprise 600 acres, composed of a 300-acre DOG and a 300-acre pileated woodpecker feeding area (PWFA). ROGs are intended to be ½ the size of DOGs, i.e., 150 acres for pileated woodpecker DOGs. ROGs may overlap with the feeding areas. Management requirements are derived from the US Forest Service 1986 Minimum Management Requirements.

In Southeast Galena, four DOG units have been delineated for pileated woodpecker or a combination of both pileated woodpecker and pine marten, totaling 1,576 acres (see Table 204 below). A ROG has been established for 1 of the four DOG's. A PWFA has been established for 1 out of four DOGs Table 204.

RESOLUTION:

Alternative 1 maintains the existing condition. No new ROGs or PWFAs would be designated to meet MA-13 standards. Areas adjacent to existing DOGs/ROGs/PWFAs could be managed under other management area (MA) standards and guidelines.

Alternatives 2, 4 and 5 would result in changes and additions to pileated woodpecker DOGs, ROGs and PWFAs to meet MA-13 standards; i.e., 600 acres for pileated woodpeckers.

Alternative 3 expands DOG/ROG/PWFA areas to meet 900-acre home ranges recommended by Bull and Holthausen (1993).

Measures:

- total acres of DOG, ROG and PWFA
- # of reproducing pairs of woodpeckers DOGs, ROGs and PWFAs could support
- # of reproducing pairs project area could support

ALTERNATIVE 1—Insufficient Pileated Woodpecker Habitat

Existing DOG/ROG boundaries would not be adjusted. No new ROGs or PWFAs are designated to meet MA-13 standards. Areas adjacent to existing DOGs/ROGs/PWFAs could be managed under other Management Area (MA) standards and guidelines, potentially precluding Forest managers the ability to manage for desired levels of pileated woodpeckers.

ALTERNATIVES 2, 4 and 5—Insufficient Pileated Woodpecker Habitat

Table 204 displays the recommended pileated woodpecker DOGs, ROGs and PWFAs. Each pileated woodpecker area is intended to be about 600 acres to meet minimum *Land and Resource Management Plan* (MA-13) standards.

Table 204– Dedicated Old Growth (DOG), Replacement Old Growth (ROG) and Pileated Woodpecker Feeding Areas (PFWAs).

DOG #	Management Requirements Species	Minimum *LRMP* Acre Requirements [1]	Existing DOG Acres	Recommended DOG Acres	Existing ROG Acres	Recommended ROG Acres[2]	Additional Pileated Feeding Acres[2]	Total Recommended Acres
DOG 129	Pileated Woodpecker	600	397	443[4]	0	193 (46)[3]	137	773 (46)[3]
DOG 330	Woodpecker/ And Marten	600	340	337	0	160	173	670
DOG 332	Woodpecker/ And Marten	600	302	298 (6)[3]	0	171	140	609 (6)[3]
DOG 333	Woodpecker/ And Marten	600	366	332 (14)[3]	134	193 (8)[3]	137 (7)[3]	662 (29)[3]
DOG 433	Pileated Woodpecker	600	171	168[4]	0	146	160	474
TOTALS		3,000	1,576	1,578 (20)[3]	181	863 (54)[3]	747 (7)[3]	3,188 (81)[3]

1 Old-growth Management Area (MA-13) Minimum Management Requirements:

Pileated Woodpecker Areas = 300-acre DOG + 300-acre feeding area = *600 acres*. ROGs = 150-acres and overlap with feeding areas.

Pine Marten = 160-acre DOG + 80-acre ROG = *240 acres*

2 ROG acres also contribute towards pileated woodpecker feeding acres. "Recommended ROG Acres" and "Additional Pileated Feeding Acres" fields should total at least 300 acres for each DOG.

3 Non-forested or unsuitable inclusions (acres) are displayed in parentheses.

4 Recommended DOG 433 at 168 acres falls short of minimum size requirements for a pileated woodpecker DOG (300 acres); however DOG 129 is immediately adjacent to DOG 433 and includes 143 surplus acres. Combined, the two DOGS contain 611 acres, a sufficient number of acres to meet requirements (600 acres).

The five DOG/ROG/PWFA areas, as recommended , would meet *Land and Resource Management Plan* MA-13 size standards for pileated woodpeckers; i.e., home ranges of 600-acres for each reproducing pair of woodpeckers.

Home range for a breeding pair has been identified by different sources as ranging from 300 acres (Thomas 1979) to 550 acres (Bull 1987) to 900 acres (Bull and Holthausen 1993). LRMP standards were derived from recommendations Thomas made in 1979. Bull and Holthausen (1993) reported that pileated woodpeckers

appeared to require larger home ranges as habitat quality is reduced. For home ranges 500 acres to 1,200 acres, data suggested that at least 75% of the area be in grand fir forest types; at least 25% be in old-growth with the remainder in mature condition; and at least 50% of the area should have >60% canopy closure. Although, Bull and Holhausen's analysis suggests a range of home range sizes (500 to 1,200 acres), they recommended establishing 900-acre home ranges. Managing for minimum habitat levels of a species may be risky. Table 205 displays stand conditions in the five recommended pileated woodpecker areas.

Table 205 Conditions of Recommended Pileated Woodpeckers Areas. Each area is approximately 600 acres and includes DOG, ROG, and PWFAs.

Recommended stand conditions (Bull, et al. 1993)	*Area 129*[1]		*Area 330*[1]		*Area 332*[1]		*Area 333*[1]		*Area 433*[1]	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Grand fir Forest Types (75%)	548	71%	653	97%	598	99%	631	66%	327	64%
Old growth (25%) (OFMS, OFSS)	190	25%	462	69%	587	99%	0	0%	241	47%
Mature structure (YFMS) (75%)	456	59%	191	28%	16	1%	436	66%	86	17%
Canopy Closure 60%+ (50%)	8	1%	294	44%	281	46%	0	0%	231	45%
Canopy Closure 40% to 59%	511	66%	259	39%	318	52%	461	67%	281	55%

Pileated Woodpecker Areas 330 and 332 are in Moist Forest types, representing the highest quality habitat. Both areas are slightly below in acres recommended at 60% canopy closure, although stands with canopy closure 55% to 59% likely provide sufficient conditions. These two Areas, even at 600-acres, would each likely support a reproducing pair of woodpeckers.

Pileated Woodpecker Areas 129, 333 and 433 are predominantly in the drier grand fir sites, with inclusions of Douglas-fir and ponderosa pine types. These sites typically represent lesser habitat. Many of the recommended guidelines are not met. The number of acres with canopy closure greater than 60% is notably lacking. In Pileated Woodpecker Area 333, no acres classify as OFMS, although the YFMS stands may provide for some of the woodpecker's life needs. Bull and Holthausen concluded the percentage of forest type in ponderosa pine was the variable best able to predict home range size. As area in the ponderosa pine forest type increases, home range increases, suggesting that the ponderosa pine forest type was poorer habitat. Given Bull and Holthausen's criteria, these three areas as designated may not provided sufficient habitat to support reproducing pairs of woodpeckers. A larger home range is likely needed. Several stands adjacent to the three areas are recommended for timber harvest, further limiting available habitat.

ALTERNATIVE 3—Insufficient Pileated Woodpecker Habitat

Current scientific literature (Bull and Holthausen 1993) indicates habitat needs for pileated woodpeckers may not be adequately met by current *Land and Resource Management Plan* direction. *Land and Resource Management Plan* , Appendix G, p. G-19, recommends reviewing additional data on home range size as it becomes available and adjusting management area size accordingly. Alternative 3 increases the size of pileated woodpecker areas from 600+ acres to 900+ acres to reflect home range size recommended by Bull and Holthausen (see Table 206). MA-13 areas 129, 330, 332, 333, and 433 would be expanded. The additional 300+ acres would not be officially added to DOGs, ROGs or PWFAs, but rather, these acres would be mapped and harvest treatment would be deferred until the next round of LRMP planning determines appropriate management strategies. The 900-acre areas would include acres designated as DOG, ROG, and PWFA plus the additional 300 treatment-deferred acres.

Table 206– Expanded Pileated Woodpecker Areas

DOG #	Desired Home Range Acres	Recommended DOG Acres	Recommended ROG Acres	Additional Pileated Feeding Acres	Total Recommended Acres – Current *LRMP* Direction	Home Range Additions	New Total Acres
DOG 129	900	443[4]	193 (46)[3]	137	773 (46)[3]	302	1,075 (46)[3]
DOG 330	900	337	160	173	670	285	955 (6)[3]
DOG 332	900	298 (6)[3]	171	140	609 (6)[3]	303	912
DOG 333	900	332 (14)[3]	193 (8)[3]	137 (7)[3]	662 (29)[3]	306	968 (29)[3]
DOG 433	900	168[4]	146	160	474	309	783
TOTALS	4,500	1,578 (20)[3]	863 (54)[3]	747 (7)[3]	3,188 (81)[3]	1,505	4,693 (81)[3]

1 Home range size recommended by Bull and Holthausen (1993):

2 ROG acres also contribute towards pileated woodpecker feeding acres. "Recommended ROG Acres" and "Additional Pileated Feeding Acres" fields should total at least 300 acres for each DOG.

3 Non-forested or unsuitable inclusions (acres) are displayed in parentheses.

4 Recommended DOG 433 at 168 acres falls short of minimum size requirements for a pileated woodpecker DOG (300 acres); however DOG 129 is immediately adjacent to DOG 433 and includes 143 surplus acres. Combined, the two DOGS contain 611 acres, a sufficient number of acres to meet requirements (600 acres).

The five DOG/ROG/PWFA areas, as recommended , would exceed *Land and Resource Management Plan* MA-13 size standards for pileated woodpeckers; i.e., home ranges of 900 acres for each reproducing pair of woodpeckers, rather than the 600-acre areas prescribed in the *Land and Resource Management Plan* . Table 207 displays stand conditions in the five recommended pileated woodpecker areas.

Table 207 displays the conditions of the five recommended pileated woodpeckers areas. Each area is approximately 900 acres and includes DOG, ROG, PWFA and deferred acres.

Recommended stand conditions (Bull, et al. 1993)	*Area 129*[1]		*Area 330*[1]		*Area 332*[1]		*Area 333*[1]		*Area 433*[1]	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Grand fir Forest Types (75%)	810	75%	898	94%	787	86%	874	95%	606	74%
Old growth (25%) (OFMS, OFSS)	452	42%	685	72%	716	79%	0	0%	510	62%
Mature structure (YFMS) (75%)	456	42%	224	24%	126	14%	663	68%	119	14%
Canopy Closure 60%+ (50%)	269	25%	319	34%	521	57%	0	0%	474	58%
Canopy Closure 40% to 59%	511	48%	449	47%	326	36%	489	71%	341	42%

As expanded, the five pileated woodpecker areas likely better meet habitat needs. Although Pileated Woodpecker Areas 330 and 332 meet most criteria in Alternatives 2, 4and 5, this alternative provides additional acre of quality habitat. At 900 acres, Pileated Woodpecker Area 433 would also meet most criteria. Habitat conditions in Pileated Woodpecker Areas 129 and 333 are also improved, although some criteria are still not met. It is likely that at least 3 of the 5 woodpecker areas would support reproducing pairs.

Cumulative Effects—Insufficient Pileated Woodpecker Habitat

The SE Galena project area is expected to support five home ranges for pileated woodpeckers. Given new direction established under Forest Plan Amendment #2, managing for a system of dedicated and replacement old-growth areas may no longer be the best way to provide for the species. By managing forest landscapes for HRV, habitat should be provided regardless of whether or not habitat is specifically set aside in distinct management areas, i.e. MA-13. Currently, SE Galena is within HRV in the moist and Cold Forest types. Large contiguous blocks of OFMS likely support five home ranges, even at the 900-acre areas recommended by Bull and Holthausen.

CONCERN 2: RETAINING ADDITIONAL WILDLIFE SNAGS

BACKGROUND:

The LRMP originally required that wildlife snags be managed to provide for at least 40% of the potential populations of primary excavator species through stand rotations. It was assumed that these snag levels would be sufficient to maintain population viability of those species dependent on dead and defective habitat. Standards required that on average 1 snag be retained per every two acres. LRMP Amendment 2 increased snag retention standards to levels that would support 100% of the potential populations of primary excavator species, or 2.39 snags per acre. A study by Bull and Holthausen (1993) suggested 4.0 wildlife snags per acre.

RESOLUTION:

Under Alternative 1, new management activities are recommended; consequently existing snag densities are not at risk.

Alternatives 2, 4 and 5 strive to meet *Land and Resource Management Plan* standards for wildlife snags, as amended by LRMP Amendment 2. Required levels of snags will be retained where available. Snags in excess of 2.39 trees per acre could be harvested if they still contain merchantable timber. Mitigation is as follows:

- Retain wildlife snags at levels to provide for 100% population levels of primary cavity excavators. Within the ponderosa pine, mixed conifer, and true fir communities, retain a minimum of 2.39 dead trees per acre, 21 inches dbh or greater. If 21 inch dbh trees are not available, retain 2.39 dead trees per acre of the largest representative diameter.

Alternative 3 maintains additional wildlife snags as recommended by Bull and Holthausen (1993). Mitigation is as follows:

- Retain 4.0 wildlife snags 21 inches dbh or greater, where available, to provide additional foraging opportunities for pileated woodpeckers. If 21 inch dbh trees are not available, retain 4.0 dead trees per acre of the largest representative diameter.

ALTERNATIVE 1—Retaining Additional Wildlife Snags

No new management activities would be recommended under this project. Existing levels of snags would likely be maintained.

ALTERNATIVES 2, 4 and 5—Retaining Additional Wildlife Snags

Land and Resource Management Plan standards of 2.39 snags per acres, on average, will be maintained, where available. Snags in excess of 2.39 trees per acre could be harvested if they still contain merchantable

timber. Bull and Holthausen (1993) reported that pileated woodpeckers fed on snags and logs on 76% of their observations. Dead wood habitat may be critical for survival. In the Dry Forest types, many areas do not have the required number of snags and the majority of the available snags are likely in smaller diameter classes. Three of the five recommended pileated woodpecker areas are primarily in Dry Forest types where snags are lacking. In Moist Forest types, snag levels likely meet or exceed standards. The greatest opportunity for snag removal during harvest is in these areas. Less than 10% of the recommended harvest is in these forest types. Pileated woodpeckers may be adversely affected by reducing snag levels, in localized areas. Larger home ranges may be required to meet nesting and foraging needs. Population viability would not likely be reduced.

ALTERNATIVE 3 —Retaining Additional Wildlife Snags

Alternative 3 retains wildlife snags in excess of *Land and Resource Management Plan* standards, at 4 snags per acre rather than the requisite 2.39 snags per acre. Snags would be retained where available. Snag levels would be maintained at levels recommended by Bull and Holthausen (1993). It is likely Southeast Galena would better support nesting and foraging needs of pileated woodpeckers. Larger home ranges may not be needed.

4.3.11—ISSUE 1.3.11–EFFECTS ON CONNECTIVITY FOR WILDLIFE

The Agency's proposal needs to manage wildlife corridors for old growth dependent species (LRMP Amendment #2 connectivity) and the Key Linkage Areas (KLA)s for wide-ranging carnivores more aggressively to reach the forest stand HRV.

BACKGROUND:

The recommended action incorporated design to meet wildlife connectivity across the project area. Wildlife connectivity is being addressed via *Land and Resource Management Plan* Amendment 2 (LRMP2) corridors and Key Linkage Areas (KLAs) (see Map 20 Wildlife Connectivity—for Action Alternatives, Appendix E, this doucment). The definitions of LRMP2 corridors and KLAs are as follows:

- **LRMP Amendment 2 (LRMP2) Corridors:** LRMP2 corridors are also referred to as late and old structural (LOS) stage corridors or old growth corridors. Cover vegetation is to be provided in a quantity and arrangement to provide old growth associated wildlife species sufficient habitat for free movement between distinct old growth areas, interaction of adults, and dispersal of young. *LRMP* standards require that LOS stands be connected by corridors where trees of medium or larger diameter are common and canopy closures are within the top 1/3 of site potential. Standards require that corridors be at least 400 feet wide. Management direction for LRMP2 corridors is included in the *Land and Resource Management Plan*, as amended (USDA 1990 and USDA 1995). Although the main purpose of LRMP2 corridors is to connect blocks of old growth, the corridors also inadvertently provide connectivity for species that are not dependent on old growth.
- **Recommended Key Linkage Areas (KLA)** – The Canada Lynx Conservation Assessment and Strategy (Ruediger et al. 2000) establishes direction to identify Key Linkage Areas to provide landscape connectivity within and between geographic areas. The intent is to provide cover vegetation in quantity and arrangement to provide large, wide-ranging carnivores, such as Canada lynx, California wolverine, and gray wolf, sufficient habitat for dispersal and movement across the landscape. Connected forests allow animals to easily move long distances in search of food, cover and mates.

On the Malheur National Forest, recommended KLAs are approximately 3 miles wide. Within any perpendicular transect to the KLA, at least 1/3 (i.e., 1 mile) should provide movement and dispersal habitat at any point in time. In the project area, a KLA is recommended along the northern boundary. This KLA is intended to connect Lynx Analysis Units (LAUs) on the Malheur National Forest to LAUs on the Umatilla, Wallowa-Whitman and Ochoco National Forests. Although management direction for KLAs is included in the Canada Lynx Conservation Assessment and Strategy (LCAS) (Ruediger, et al. 2000), the LCAS does not provide specific direction on how to implement KLAs. The USFS Regional Office is currently developing a region-wide strategy for KLAs. On the Malheur National Forest, KLAs are only recommended at this time pending further direction.

Direction in the LRMP Amendment 2 and the Canada Lynx Conservation Assessment and Strategy does not specifically address tree densities and canopy structure within wildlife corridors. One could meet the 1/3rd canopy rule without retaining any understory trees. Such stand conditions may not meet the security needs of smaller dispersing animals. Examples might include pine martens, fishers and lynx, species which depend on high levels of ground cover. One study on lynx determined that animals may not cross silviculturally thinned stands that fall below 180 trees per acre (Koehler 1990). In the recommended action, timber harvest and burning prescriptions were modified to retain trees 8 feet in height or greater at a minimum of 180 tree per acre, as well as meet the 1/3 canopy closure rule.

RESOLUTION

Alternative 1 would not implement mechanical tree removal or prescribed fire operations in LRMP2 corridors or KLAs.

Alternative 2, the Agency recommended action, would apply a modified silvicultural prescription (HTH1/SPC1) in both LRMP2 corridors and KLAs by retaining canopy closure within the top 1/3rd of site potential and maintaining at least 180 trees per acre. Modified prescriptions would apply to both mechanical tree removal and prescribed burning operations.

Alternative 3 takes a conservative approach in the LRMP2 corridors; timber harvest and precommercial thinning would not be prescribed. Management would occur in the KLAs, but modified prescriptions would be applied. Prescribed burning activities would be applied in both the LRMP2 corridors and KLAs; burning prescriptions will meet modified canopy closure and tree stocking requirements.

Alternative 4 would only cut smaller trees, likely less than 7" dbh. Modified prescriptions (SPC1) would be applied to both mechanical tree removal and prescribed burning operations

In Alternative 5, greater emphasis is given to restoring stands to HRV. KLAs would receive standard silvicultural prescriptions. FPA 2 corridors would meet the 1/3 canopy rule, but tree stocking requirements of 180 tree per acre would not be required.

Measures:

- Acres treated and type of prescription applied to the KLA.
- Acres treated and type of prescription applied to connective corridors.
- Percent of KLA that meets 1/3 crown closure.

The following discussion addresses the effects of leaving additional trees in the LRMP, Amendment 2 corridors and KLAs.

Table 208 displays the total acres being treated in LRMP, Amendment 2 corridors, the number of acres with modified prescriptions (HTH1/SPC1), and the percentage of treatment acres receiving modified prescriptions.

Table 208 Treatment in LRMP2 corridors by Alternative.

Treatment	Alt 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
LRMP, Amendment 2 acres treated	0	171	0	38	220
LRMP, Amendment 2 acres treated with modified prescription	0	171	0	38	220
Percent of LRMP, Amendment 2 treated acres with modified prescription[1]	---	100%	---	100%	100%[1]

[1] Prescription requires canopy closure remain within the top 1/3 of site potential, but does not require stocking at 180 trees per acre.

Table 209 displays the total acres being treated in KLAs, the number of acres with modified prescriptions (HTH1/SPC1), and the percentage of treatment acres receiving modified prescriptions. The table also estimates the percentage of the KLA which will meet the one third canopy closure and 180 tree per acre stocking guidelines following treatment.

Table 209 Treatment in KLAs by Alternative. Percentage of KLA which meets 1/3rd canopy rule and 180 trees per acre (tpa).

Total KLA acres = 18,369 ac.	Alt 1	Alt. 2	Alt. 3	Alt. 4	Alt.5
Total acres treated in KLA	0	2,833	2,619	847	3,619
Percent of KLA treated	0	15.0%	14.0%	5.0%	20%
Treated acres with modified prescription[1]	0	1,122	1,013	511	0
Percent of treated acres w/modified prescription[2]	0	39.6%	38.6%	60.0%	0%
Percent of KLA which meets 1/3rd canopy rule and 180 tpa	75.3%	66.2%	66.5%	73.5%	55.6%

[1] Prescription requires canopy closure remain within the top 1/3 of site potential, but does not require stocking at 180 trees per acre.
[2] Example calculation for Alternative 2: (2,833/1,122) X 100 = 39.6%

ALTERNATIVE1—Connectivity for Wildlife

Management activities would be limited to ongoing activities. Alternative 1 would not conduct any additional timber harvest or prescribed burning related activities in LRMP2 corridors or KLAs.

Structural Stages

Effects to structural stages would be as described for the no action alternative in Section 4.2.4 Undesired Condition – Vegetation Outside HRV.

Resiliency and Sustainability

Effects to stand resiliency and sustainability would be as described for the no action alternative in Issue 9 – Forest Sustainability and Resiliency. Insect, disease, and wildfire risk would remain elevated.

Wildlife

Tree stocking levels and canopy closures would not be reduced in LRMP2 corridors or the recommended KLA. LRMP2 standards would be met in the LRMP2 corridors. Approximately 75% of the KLA would have stands that are in the top 1/3 of potential canopy closure. Existing dispersal and movement patterns would not be disrupted. In the absence of a major disturbance event, tree density would continue to increase, improving connectivity habitat.

Without management, the project area would remain at high risk for an uncharacteristically severe disturbance event, such as wildfire. Such an event could dramatically reduce or alter connectivity habitat at the landscape level. Fragmentation of habitat could isolate wildlife populations.

ALTERNATIVE 2—Connectivity for Wildlife

In the KLA, 1,122 of 2,833 acres (39.6%) recommended for mechanical treatment would receive the modified prescription. In the LRMP2 corridors, only 171 acres will be mechanically treated, an incidental amount of acres relative to the entire LRMP2 corridor system.

Structural Stages

It is expected that the modified thinning prescription would add approximately 20 to 40 years to the time it takes for stands to grow into the old forest structural stage, if the stands are not thinned again.

Resiliency and Sustainability

Retention of additional trees may result in less than optimal growth and increased risk of insect and disease damage to the stand and reduced risk of uncharacteristically severe wildfire.

Insects

Approximately 40% of the recommended thinning in KLAs would receive the modified prescription, resulting in moderately denser stands than the standard thinning. There would be a reduced benefit from the thinning, and the stands would need to be re-thinned within 40 years to retain a degree of protection from insects.

Disease

The effects on disease would be much the same as the standard thinning, with the main effect being the need to thin again within 40 years to maintain tree vigor and resistance to disease.

Fire

The effects on fire would be primarily the need to retain the additional understory trees that are left for wildlife cover. This may preclude prescribed burning not only the stands with a modified thinning prescription, but also surrounding stands that are in the same logical burning block.

Wildlife

Tree stocking and canopy closure will be reduced in all treatment units, likely reducing the quality of some habitats for wildlife movement and dispersal. Nevertheless, LRMP Amendment 2 standards will be met in the LRMP2 corridors. Harvest on 171 acres within LRMP2 corridors would have negligible effect on the overall corridor system. Lynx movement and dispersal guidelines would be met in the KLA. Connectivity habitat would be sufficient to provide movement and dispersal of wildlife species across the landscape.

Retention of additional trees in the understory may provide some additional protection for smaller animals using these corridors. Approximately 66% of the KLA would have stands that are in the top 1/3 of potential canopy closure, reduced by 9% from the no action alternative.

Management activities would reduce risk of uncharacteristically severe disturbance events that could reduce or alter connectivity habitat and isolate wildlife populations.

ALTERNATIVE 3—Connectivity for Wildlife

In the KLA, 1,013 of 2,619 acres (38.6%) recommended for mechanical treatment would receive the modified prescription. In the LRMP2 corridors, no acres would be treated.

Structural Stages

It is expected that the modified thinning prescription would add approximately 20 to 40 years to the time until it grows into the old forest structural stage, if the stands are not thinned again.

Resiliency and Sustainability

Insects

The approximately 20% of thinning treatments that would receive the modified prescription would result in moderately denser stands than the standard thinning. There will be a reduced benefit from the thinning, and the stands will need to be re-thinned within 40 years to retain a degree of protection from insects.

Disease

The effects on disease would be much the same as the standard thinning, with the main effect being the need to thin again within 40 years to maintain tree vigor and resistance to disease.

Fire

The effects on fire would be primarily the need to protect the additional understory trees that are retained for wildlife cover. This may preclude prescribed burning not only the stands with a modified thinning prescription, but also surrounding stands that are in the same logical burning block.

Wildlife

Tree stocking and canopy closure would be reduced in all treatment units, likely reducing the quality of some habitats for wildlife movement and dispersal. No harvest treatments would be conducted in the LRMP2 corridors. *LRMP* Amendment 2 standards will be met in the LRMP2 corridors. Prescribed burning would likely kill some but not all understory trees. Overall canopy closure would likely remain the same. Tree densities would meet or exceed 180 trees per acres where they currently exist. Lynx movement and dispersal guidelines would be met in the KLA. Connectivity habitat would be sufficient to provide movement and dispersal of wildlife species across the landscape. Retention of additional trees in the understory may provide some additional protection for smaller animals using these corridors. Approximately 66% of the KLA would have stands that are in the top 1/3 of potential canopy closure.

Management activities would reduce risk of uncharacteristically severe disturbance events that could reduce or alter connectivity habitat and isolate wildlife populations.

ALTERNATIVE 4—Connectivity for Wildlife

In the KLA, 511 of 847 acres (73.5%) recommended for mechanical treatment would receive the modified prescription. In the LRMP2 corridors, only 38 acres will be mechanically treated, an incidental amount of acres relative to the entire LRMP2 corridor system. Alternative 4 would not harvest any overstory trees, so canopy closure following treatment would be greater than would be expected under the other action

alternatives. There would be minimal change in the effects on insects, disease, or wildfire, compared to the standard precommercial thinning.

Structural Stages

It is expected that the modified precommercial thinning prescription would add approximately 20 years to the time until it grows into the old forest structural stage, if the stands are not thinned again.

Resiliency and Sustainability

Insects

The approximately 74% of the thinning that would be the modified prescription in this alternative will result in moderately denser stands than the standard thinning. There would be a reduced benefit from the thinning, and most importantly, the stands would need to be re-thinned within 40 years to retain a degree of protection from insects.

Disease

The effects on disease would be much the same as the standard thinning, with the main effect being the need to thin again within 40 years.

Fire

The effects on fire will be primarily the need to protect the additional understory trees that are retained for wildlife cover. This may preclude prescribed burning not only the stands with a modified thinning prescription, but also surrounding stands that are in the same logical burning block.

Wildlife

Treatment will not affect overstory trees; smaller trees would be thinned from below. Canopy closures would likely remain at or above the top 1/3 of site potential. Precommercial thinning and burning would reduce understory tree densities but stocking levels would remain at or above 180 trees per acres where they currently exist. Harvest on 38 acres within LRMP2 corridors would have negligible effect on the overall corridor system. LRMP Amendment 2 standards would be met in the LRMP, Amendment 2 corridors.

Lynx movement and dispersal guidelines would be met in the KLA. Approximately 74% of the KLA would have stands that are in the top 1/3 of potential canopy closure, a 1% reduction from the existing condition. Little change to lynx dispersal and movement would be expected.

Connectivity habitat would be sufficient to provide movement and dispersal of wildlife species across the landscape. Retention of additional trees in the understory may provide some additional protection for smaller animals using these corridors.

Management activities would likely do little to reduce risk of uncharacteristically severe disturbance events that could reduce or alter connectivity habitat and isolate wildlife populations.

ALTERNATIVE 5—Connectivity for Wildlife

In the KLA, no acres would receive the modified prescription. Standard silvicultural prescriptions would be used to increase tree growth rates and reduce insect, disease and wildfire risk. In the *LRMP*, Amendment 2 corridors, only 220 acres would be mechanically treated, an incidental amount of acres relative to the entire LRMP2 corridor system. LRMP2 corridors would be managed to meet the top 1/3rd of canopy closure, but tree stocking could be reduced below 180 trees per acre.

Structural Stages

It is expected that the modified thinning prescription would add approximately 20 to 40 years to the time until it grows into the old forest structural stage, if the stands are not thinned again.

Resiliency and Sustainability

Insects

The small percentage of the thinning that would receive the modified prescription in this alternative would result in moderately denser stands than the standard thinning. There will be a reduced benefit from the thinning, and the stands would need to be re-thinned within 40 years to retain a degree of protection from insects.

Disease

The effects on disease would be much the same as the standard thinning, with the main effect being the need to thin again within 40 years to maintain tree vigor and resistance to disease.

Fire

The effects on fire would be primarily the need to protect the additional understory trees that are retained for wildlife cover. This may preclude prescribed burning not only the stands with a modified thinning prescription, but also surrounding stands that are in the same logical burning block.

Wildlife

Tree stocking and canopy closure would be reduced in all treatment units, likely reducing the quality of some habitats for wildlife movement and dispersal.

LRMP Amendment 2 standards would be met in the LRMP2 corridors. Canopy closure will be maintained in the top 1/3rd or site potential. Prescribed burning would likely kill some but not all understory trees. Harvest on 220 acres within LRMP2 corridors would have negligible effect on the overall corridor system.

In the KLA, canopy closures in harvest units may fall below the top 1/3 of site potential. Tree stocking could fall below 180 trees per acre with understory densities being reduced the most. Koehler (1990) reports that lynx may not use stands that are thinned below 180 trees per acre for movement and dispersal.

Approximately 56% of the KLA would have stands that are in the top 1/3 of potential canopy closure, a reduction 20% from the existing condition.

Management activities would reduce risk of uncharacteristically severe disturbance events that could reduce or alter connectivity habitat and isolate wildlife populations.

4.3.12—ISSUE 1.4.12—EFFECTS OF MANAGING ROADLESS AREAS

Roadless areas provide large, relatively undisturbed landscapes, which are important to biological diversity and the survival of species dependent upon the "undisturbed character," of these areas. Management of the Dixie Butte and Greenhorn Mountain Roadless Areas may alter this character as well as the quality of dispersed outdoor recreation for undisturbed open space and natural settings.

BACKGROUND:

Dixie Butte and Greenhorn Mountain Roadless Areas are both LRMP "Appendix C" designated roadless areas.

The Dixie Butte Roadless Area encompasses approximately 7,865 acres. About 2,870 acres (36%) are in Dry Forest, 3,880 acres (49%) are in Moist Forest, 200 acres are in lodgepole forest, (3%), and 415 acres (5%) are in Cold Forest. The remaining acres are in natural openings, such as meadows, grasslands, shrublands, and talus slopes scattered across the area with the majority in the subalpine areas at the summit of Dixie Butte.

The areas within the Dixie Butte Roadless Area that are recommended for mechanical treatment in Alternatives 2, 4, and 5 have been previously altered by past railroad logging (1910—1940 era) that removed

most of the large trees. The stands have grown back and now support young stands of mixed conifer species. Approximately 200 acres of the area that was railroad logged was precommercial thinned in the 1960s or 1970s, the balance of the area is heavily overstocked.

The Greenhorn Mountain Roadless Area encompasses approximately 6,520 acres. About 1,145 acres (18%) are in Dry Forest, 2,655 acres (41%) are in Moist Forest, 520 acres are in lodgepole forest, (8%), and 1,150 acres (18%) are in Cold Forest. The remaining acres are in natural openings, such as meadows, grasslands, shrublands, and talus slopes scattered across the area.

The areas within Greenhorn Mountain Roadless Area recommended for burning have been previously altered by timber harvest. Logging has been relatively light with a minor amount of railroad and truck logging occurring along the edges of the roadless area, primarily in the Dry Forest types. There are no mechanical treatment activities recommended in the Greenhorn Mountain Roadless Area, some prescribed burning is planned for the Dry Forest.

The areas recommended for treatment are Dry Forests or portions of the Moist Forest that are all considered short fire return interval forests. The objective of treatment is to grow these stands into a condition that resemble and function like as they did before they were altered by harvest and suppression of fire. Objectives include improving the sustainability and resiliency of the stands by reducing stocking, shifting the species composition towards a greater proportion of ponderosa pine and western larch, and reducing fire risk reducing accumulated ground and ladder fuels.

Most of the Dry and Moist Forest types were recommended for mechanical treatment, but other resource concerns and meeting LRMP standards reduced the amount of treatment carried forward in each alternative. Treating these stands would accelerate the development of stands that replicate the historic conditions of large, fire adapted trees. Not treating these young, overstocked stands may result in reduced growth and increased risk of insect and disease damage to the stand and increased risk of uncharacteristically severe wildfire. The alternatives will be evaluated using acres of overstocked stands thinned.

The recommended treatments are consistent with the nationwide Roadless Area Conservation FEIS, which anticipates that of the 14 million acres of the short fire return interval forest type in roadless areas, over half (7.5 million) will require mechanical treatment before using prescribed fire. They are also consistent with the National Fire plan, in which hazardous fuel reduction is a key component to reverse decades of fire exclusion and lack of stocking level control.

RESOLUTION:

The following tables display mechanical and prescribed fire treatment acres within the roadless areas by alternative. None of the alternatives propose building new roads or reconstructing existing roads or railroad grades within the roadless areas. Effects discussions follow these tables.

Table 210—Acres of Treatment Within the Dixie Butte Roadless Area

Treatment	Alt. 1		Alt. 2		Alt. 3		Alt. 4		Alt. 5	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Commercial Thin	0	0	530	7	0	0	0	0	580	7
Commercial/Pre-commercial Thin	0	0	230	3	0	0	0	0	515	7
Understory Removal	0	0	110	1	0	0	0	0	165	2
Pre-commercial Thin Only	0	0	0	0	0	0	175	2	0	0
Total Mechanical	**0**	**0**	**870**	**11**	**0**	**0**	**175**	**2**	**1260**	**16**
Prescribed Burn	**0**	**0**	**780**	**10**	**295**	**4**	**255**	**3**	**780**	**10**

Note: Both mechanical and prescribed fire acres may overlap.
Note: Percentage values were calculated only for those portion of the roadless areas located within the project area. Treatment percentages would be lower if calculations were made over the entire roadless area.

Table 211—Acres of Treatment Within the Greenhorn Mountain Roadless Area

Treatment	Alt. 1		Alt. 2		Alt. 3		Alt. 4		Alt. 5	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Commercial Thin	0	0	0	0	0	0	0	0	0	0
Commercial/Pre-commercial Thin	0	0	0	0	0	0	0	0	0	0
Understory Removal	0	0	0	0	0	0	0	0	0	0
Pre-commercial Thin Only	0	0	0	0	0	0	0	0	0	0
Total Mechanical	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Prescribed Burn	**0**	**0**	**715**	**11**	**715**	**11**	**715**	**11**	**715**	**11**

Note: Percentage values were calculated only for those portion of the roadless areas located within the project area. Treatment percentages would be lower if calculations were made over the entire roadless area.

Measures:

- Acres treated by mechanical treatment within the Roadless Areas.
- Acres treated by prescribed fire.

ALTERNATIVE 1—Roadless Areas

Alternative 1 does not include any mechanical or prescribed fire treatments in roadless areas.

Structural Stages

It is expected that the areas will naturally grow into the old forest structural stages in approximately 110 years without treatment.

Resiliency and Sustainability

Insects

The dense stands will be vulnerable to insect attacks, which can result in mortality and increased fuel loadings. Stands will be recycled into earlier structural stages, increasing the time it takes to grow into the larger sizes.

Disease

The effects on disease will be much the same as for insects, as densely stocked stands are less likely to be able to resist diseases.

Fire

It would be difficult to reintroduce fire into the stands that are not first mechanically treated to reduce the total amount of fuel. The continuous, overly dense stands are at risk for uncharacteristically severe wildfire and a

threat to the nearby settlements of Greenhorn, Bates and Austin, as well as scattered homes and other private property in the vicinity.

Wildlife

Approximately half of the roadless area is in the Dixie Butte Wildlife Emphasis Area, which permits timber harvest if it benefits wildlife habitat. Habitat is minimally fragmented and well connected. About 40% of the roadless area within the project area is in OFMS or OFSS; an additional 40% is in YFMS. In the Greenhorn Mountain Roadless Area, approximately 39% of the roadless area within the project area is in OFMS or OFSS; an additional 27% is in YFMS. Four dedicated old-growth areas (DOGs) have been delineated within the Dixie Butte and Greenhorn Mountain Roadless Area boundaries.

The upper elevation Cold Forest and Moist Forest of Dixie Butte Roadless Area is essentially untouched by timber harvest or road construction. The lower elevation Moist Forest and Dry Forest has been logged; skewing structural stages towards mid- and younger-structural classes, YFMS, UR, SEOC, and SECC. Some older roads extend into the roadless area along its edges, but are currently closed.

The Greenhorn Mountain Roadless Area is bisected by Forest Road 2010, which is used for recreation and mining access. Off the 2010 Road and other Forest roads around this roadless area are a number of old road beds and mining roads that reach into this roadless area. Most are quite primitive. Forest stands are similar to that of the Dixie Butte Roadless Area, but due to the predominately southern aspects of Greenhorn, these stands tend to be more open. However, as with Dixie, due to past management practices, forest stands are skewed towards mid- and younger structural stages.

Large, relatively undisturbed areas are important for species with large home ranges that are sensitive to human activity. Upper elevations of the Dixie Butte and Greenhorn Mountain Roadless Areas provide quality habitat for species that require large contiguous blocks of old-growth forest including such species as pileated woodpeckers, pine martens, and fishers. In the Cold and Moist Forests, snag and large down wood habitat meets or exceeds *LRMP* standards, and provides quality habitat for primary cavity excavators; the Dry Forest is deficient in these habitats. Insects and diseases would continue to kill trees, providing a sustained flow of dead wood habitat. In the Dry Forest, snags and down logs are likely to be of smaller size than is preferred by many cavity excavators.

Species which are particularly sensitive to habitat alteration or disturbance, such as wolverine, marten, fisher and lynx, likely benefit from the area's relatively undeveloped condition (Ruggiero et al 1994). Elk and deer use the area for both summer and winter range; elk, in particular, favor the isolated conditions for security and low level of disturbance.

Both the Dixie Butte and Greenhorn Mountain Roadless Areas may be more important now than in the past in supporting species viability and biodiversity, due to cumulative degradation and loss of other habitat in adjacent landscapes (i.e. Summit Fire area).

Due to the lower, elevation Dry Forests changes from past management, vegetation has resulted in habitat losses for species using OFSS such as the white-headed woodpecker. Conversely, increases in OFMS and YFMS have likely expanded habitats for such species as pileated woodpecker and pine marten to what once existed.

In the Dixie Butte Roadless Area, about 180 acres currently classify as OFSS. Historically, it is estimated that as much as 1,595 acres would have been in an OFSS condition. In the Greenhorn Mountain Roadless Area, about 390 acres currently classify as OFSS. Historically, it is estimated that as much as 1,025 acres would have been in an OFSS condition. Given current vegetation conditions, it is unlikely that habitat for white-headed woodpecker would increase without management.

Increased fuels accumulations raise the risk that large areas of habitat could be lost to wildfire. In the Dry Forests, habitat for pileated woodpeckers and pine martens may not be sustainable.

ATV use on the Davis Creek Trail provides the only motorized access into the Dixie Butte Roadless Area as designated by the LRMP. Wildlife use and dispersal may be altered when the trail is in use.

Recreation

Remoteness, Solitude, and Primitive Recreation Opportunities

Both roadless areas would continue to provide moderate opportunities for solitude and outdoor recreation. There would be no effect on remoteness because the vegetation and topography in the analysis area is such that summertime recreationists in roadless areas are usually not within the road system's noise and disturbance area of influence. Harvest of stands adjacent to the roadless areas may result in indirect, short-term effects on remoteness within the area. Potential effects include increased sights and sounds of helicopter, people, and equipment adjacent to or near these areas during potential harvest activity.

Opportunities for achieving a primitive experience are limited in Dixie Butte by the roadless area's shape and size in relation to existing access outside its boundaries. Greenhorn Mountain has the same concerns along the southern boundary but has better opportunity for a remote, secluded, primitive experience due to its relationship with the North Fork John Day Wilderness on the Umatilla National Forest to the north.

This alternative would not affect existing boundaries or the level of experiencing a the remoteness, solitude, and primitive recreation opportunities as they currently exist.

Natural Integrity

Ecological processes in the roadless areas have been slightly altered by grazing, recreational use, past mining activities, past logging activities, and fire suppression. This alternative would have no effect on the natural integrity of these areas as they exist today..

Apparent Naturalness

Evidence of human use and activities are unnoticeable on the higher elevation portions of the roadless areas except for hiking trails and mining access. Past human impacts are more noticeable and scattered throughout the lower elevations include hiking trails, old railroad grades, isolated cabins, past mining activities, and old stumps. The most visible impacts are from old existing roads, past mining activities, and remains of old railroad grades.

ALTERNATIVE 2—Roadless Areas

Alternative 2 treats about 13% of the Dixie Butte Roadless Area and 11% of the Greenhorn Mountain Roadless Area by mechanical harvest or prescribed fire.

Stage in Structural Stages

It is expected that the areas thinned would grow into the old forest structural stage in approximately 50 years, 60 years sooner than if the stands are not thinned. Species composition would shift to more fire tolerant ponderosa pine and western larch, which would facilitate prescribed burning and more resemble the natural stands that once grew in the Dry Forest Type.

Resiliency and Sustainability

Insects

The dense stands that are thinned would be less vulnerable to insect attacks, reducing future mortality and fuel loadings. Stands would be able to grow into larger structural stages, decreasing the time it takes to develop into the larger sizes, compared to no action.

Disease

The effects on disease would be much the same as for insects, as less densely stocked stands are more likely to be able to resist diseases.

Fire

It would be easier to reintroduce fire into the stands that are first mechanically treated to reduce the total amount of fuel. Thinning and subsequent underburning would reduce the risk for severe wildfire behavior and threat to the nearby settlements of Greenhorn, Bates and Austin, as well as scattered homes and other private property in the vicinity.

Wildlife

Mechanical and prescribed fire treatments are concentrated in the Dry Forests and some in the Moist Forests of Dixie Butte with only prescribe fire in Greenhorn Mountain. No treatments occur in the Cold or Lodgepole Forest types.

In the Dixie Butte Roadless Area, commercial and precommercial thinning treatments on 870 acres would reduce canopy cover and stand complexity. Harvest treatment converts stands from YFMS and UR to younger structural stages, primarily UR and SEOC. Habitat would be degraded or lost for species that prefer high canopy cover and complex structure stands, e.g., pileated woodpecker and pine marten. It should be noted that these stands, even prior to treatment, are considered relatively low quality habitat for these species. Thinning treatments are less fragmenting than other harvest methods.

Treatments were specifically designed to restore habitat for white-headed woodpeckers and other species that prefer open park-like stands of old growth, even at the expense of habitat for species like the pileated woodpecker and pine marten. Following harvest treatments, stand density and canopy cover in SEOC and UR stands would be relatively low, but individual tree growth would be high. Harvest and underburning would accelerate development of large diameter trees. Stands in the SEOC and UR stage would likely take 50 years to develop into old growth versus 110 years under the no action alternative. Species viability for pileated woodpecker and pine marten would still be maintained in the project area; species viability for white-headed woodpecker would improve.

In the Dixie Butte Roadless Area, understory removal would convert 125 acres of OFMS to OFSS to the benefit of species such as the white headed woodpecker. Total acres of OFSS in the roadless area would increase from 180 acres to 305 acres.

The Roadless Area Conservation FEIS (USDA 2000) concluded that thinning from below to reduce fire risk or to enhance old growth has the least impact on fragmentation and connectivity, as compared to various other management activities.

Prescribed fires would be expected to burn in a mosaic mimicking historic patterns. Some cover would be expected to be lost, however, burning prescriptions limit overstory mortality to 10% and understory mortality to 85%. In recent prescribed burns on the Forest, mortality levels have rarely reached these thresholds.

No new roads would be constructed. Disturbance to wildlife would be limited to the times when mechanical and fire treatments are being implemented. Individual animals may be displaced or avoid areas during operations. Animals would likely move to higher elevations during operations; these areas provide the highest quality habitat. Impacts would be minimal.

In the Dixie Butte Roadless Area, logging would be conducted via tractor logging along the periphery of the roadless area and by helicopter logging elsewhere. Management activities do increase the risk of introduction or establishment of nonnative invasive species, which could degrade habitat. Mitigation described in Chapter 2 should keep risks low.

Species which are particularly sensitive to habitat alteration or disturbance, such as wolverine, marten, fisher and lynx, may use treated areas less or not all, and could essentially reduce the size of core areas being used by these species.

Elk and deer are habitat generalists, using a variety of habitats. Forage may be some what limited in the roadless areas due to elevated tree densities and canopy closures. Treatments that create or restore and

maintain a mixture of habitats and a variety of age classes are generally beneficial. The combination of opening canopies and underburning would improve forage.

Connectivity may be reduced in the lower elevation, Dry Forests; however, sufficient wildlife corridors will be maintained to meet connectivity between blocks of old growth habitat as directed by the *LRMP*.

In the Greenhorn Mountain Roadless Area, effects would be limited to those described above for prescribed burning

Mechanical treatments and prescribed fire would reduce wildfire intensity by reducing accumulated fuels in the Dry Forests. Treatments would increase the survivability of large, old growth pines following wildfire, reduce tree mortality from moisture stress, reduce insect and disease outbreaks in stressed stands, help restore fire dependent herbs and shrubs, and restore the local fire regime. The risk of losing large blocks of terrestrial habitat would be reduced.

Even though some timber harvest and prescribed fire activities are intended to mimic the effects of natural disturbances, there is little known about the long-term ecological legacies of such treatments. It is not clear how managed area would compare to areas where natural disturbance processes have played a more dominant role in controlling succession pathways, landscape mosaics, and ecosystem composition (USDA 2000).

ATV use would continue on the Davis Creek Trail. Trail reconstruction is not expected to increase use levels. Effects would be as described in Alternative 1.

Recreation

Remoteness, Solitude, and Primitive Recreation Opportunities

No new roads would be constructed. Timber harvest by thinning would be limited to the Dixie Butte Roadless Area. The increased sights and sounds of people and equipment during helicopter yarding and tractor skidding would result in direct, short-term effects on the qualities of remoteness and solitude. Old forest structure, which is a favored recreational forest type, would develop sooner. Approximately 12 miles of motorized trail is currently located within the roadless area. ATV users, snowmobilers, and some hunters utilize motor vehicles to gain access to the area utilizing closed road, old railroad grades, and associated trails as corridors for their activity.

Natural Integrity

Harvest would reduce the amount of future large woody material. Neither activity is expected to substantially alter the natural integrity of the area. Planting a mix of seral species (grown from locally collected seed) would speed up the process faster than if the area was not planted.

Apparent Naturalness

Noticeable human impacts from helicopter and tractor logging in Dixie Butte Roadless area would include stumps, marking paint, logging slash, and thinner, more open stands on the harvested acres. Following harvest treatment, the area would appear more open and would be visible as a mosaic of openings. Harvested areas would vary in shape and size. A few units may dominate the surrounding landscape, but overall, the treated stands would borrow from the naturally occurring mosaic of trees and non-forested openings visible from higher elevations.

ALTERNATIVE 3—Roadless Areas

Alternative 3 does not include any mechanical treatments in roadless areas but some prescribed fire would be implemented. Prescribed fire would be used in both Dixie Butte and Greenhorn Mountain Roadless Areas as described in the tables above. Treatment acres are reduced from 1,495 acres in Alternative 2 to

1,010 acres in this alternative. About 4% of the Dixie Butte Roadless Area and 11% of the Greenhorn Mountain Roadless Area would be treated.

Structural Stages

Effects are the same as the No Action Alternative (Alt. 1).

Resiliency and Sustainability

Insects

Effects are the same as the No Action Alternative (Alt. 1). The dense stands will be vulnerable to insect attacks, which can result in mortality and increased fuel loadings. Stands will be recycled into earlier structural stages, increasing the time it takes to grow into the larger sizes.

Disease

The effects on disease will be much the same as for insects, as densely stocked stands are less likely to be able to resist diseases.

Fire

In the future, it will be difficult to reintroduce fire into the stands that are not first mechanically treated to reduce the total amount of fuel. The continuous, overly dense stands are at risk for severe wildfire behavior and a threat to the nearby settlements of Bates and Austin, as well as scattered homes and other private property the vicinity.

Wildlife

The effects would be as described for prescribed burning in Alternative 2. ATV use would continue on the Davis Creek Trail. Trail reconstruction is not expected to increase use levels. Effects would be as described in Alternative 1.

Recreation

Effects are the same as the No Action Alternative (Alt. 1).

ALTERNATIVE 4—Roadless Areas

Alternative 4 does not include any commercial harvest treatments; there are 175 acres of precommercial thinning within the Dixie Butte Roadless Area. Prescribed fire would be used in both Dixie Butte and Greenhorn Mountain Roadless Areas as described in the tables above. Treatment acres are reduced from 1,495 acres in Alternative 2 to 970 acres in this alternative. About 5% of the Dixie Butte Roadless Area and 11% of the Greenhorn Mountain Roadless Area would be treated.

Structural Stages

It is expected that the precommercial thinning prescription will reduce approximately 10 years from the time until it grows into the old forest structural stage, if the stands are not thinned again in the future. There will be slight positive change in the effects on structural stages, insects, disease, or wildfire, compared to Alternative 1.

Resiliency and Sustainability

Insects

There will be a minor benefit from the thinning from thinning the understory. The stands will need to be re-thinned in the future to retain a degree of protection from insects.

Disease

The effects on disease will likely be negative, since the overstory is not thinned out. Mistletoe will still be able to spread to adjacent trees and infected trees will not be able to outgrow the upward spread. Root and stem diseases will be able to spread better than in an unthinned stand, since the cut stumps can be infection pathways and the precommercial thinning only not reduce the proportion of late seral species to a low enough level to reduce disease spread.

Fire

The effects on fire will be the retention of the dense overstory and not improving the access. A dense overstory with ladder fuels makes the reintroduction of fire difficult. This alternative does not improve the existing primitive access road; therefore, no prescribed burning is planned since it would be hazardous to attempt without good escape routes. This may preclude prescribed burning not only the stands with only a precommercial thinning prescription, but also surrounding stands that are in the same logical burning block.

Wildlife

By prohibiting commercial timber harvest and road construction, Alternative 4 would provide a greater likelihood that terrestrial species and habitats would be maintained at current levels. Overall effects would be similar to Alternative 3. Individual animals may be disturbed during precommercial thinning operations but effects are limited to a very small area. Thinning smaller trees would remove lower level cover, likely degrading habitat for species such as marten. Effects, however, would be considered negligible.

Alternative 4 eliminates ATV use on the Davis Creek Trail reducing potential disturbance to wildlife. Those species more sensitive to disturbance, such as wolverine, northern goshawk, and rocky mountain elk, would likely benefit. Habitat effectiveness would be greater than under any of the other alternatives including the no-action alternative.

Recreation

The effects of Alternative 4 on recreation are the same as discussed above for the No Action Alternative (Alt. 1).

ALTERNATIVE 5—Roadless Areas

In the Dixie Butte Roadless Area, Alternative 5 treats the most acres, 24% of the roadless area as compared to 13% under Alternative 2, the next most intensive alternative. There would be a proportional increase in effects. In the Greenhorn Mountain Roadless Area, Alternative 5 is identical to Alternative 2 in treatments and expected effects.

Structural Stages

It is expected that the areas thinned will grow into the old forest structural stage in approximately 50 years, 60 years sooner than if the stands are not thinned. Species composition will shift to more fire tolerant early seral species, which will facilitate prescribed burning and more resemble the natural stands that once grew in the Dry Forest Type.

Resiliency and Sustainability

Insects

The dense stands that are thinned will be less vulnerable to insect attacks, reducing future mortality and fuel loadings. Stands will be able to grow into larger structural stages, decreasing the time it takes to grow into the larger sizes compared to no action.

Disease

The effects on disease will be much the same as for insects, as less densely stocked stands are more likely to be able to resist diseases.

Fire

It will be easier to reintroduce fire into the stands that are first mechanically treated to reduce the total amount of fuel. Thinning and subsequent underburning will reduce the risk for severe wildfire behavior and threat to the nearby settlements of Bates and Austin, as well as scattered homes and other private property in the vicinity.

Wildlife

Effects would be similar to Alternative 2. In the Dixie Butte Roadless Area, effects would be proportionately increased based on increased acres treated. This alternative more aggressively manages for OFSS habitat. Species, such as the white-headed woodpecker would benefit at the expense of habitat for such species as pileated woodpecker and pine marten. Species viability for pileated woodpecker and pine marten would still be maintained; species viability for white-headed woodpecker would improve.

ATV use would continue on the Davis Creek Trail. Trail reconstruction is not expected to increase use levels. Effects would be as described in Alternative 1.

Recreation

Remoteness, Solitude, and Primitive Recreation Opportunities

No new roads would be constructed. Timber harvest will be done on 1,366 acres in the Dixie Butte Roadless Area. The increased sights and sounds of people and equipment during helicopter yarding and tractor skidding will result in direct, short-term effects on the qualities of remoteness and solitude. Removing stands of trees will result in short-term loss of vegetation screening, which may reduce opportunities for solitude until new trees become established. Once new tree seedlings and shrubs are established, the area will again provide moderate opportunities for solitude. Old forest structure, which is a favored recreational forest type, would develop sooner. Approximately 12 miles of motorized trail is currently located within the roadless area. ATV users, snowmobilers, and some hunters utilize motor vehicles to gain access to the area utilizing closed road, old railroad grades, and associated trails as corridors for their activity.

Natural Integrity:

Harvest will reduce the amount of future large woody material. Planting may produce slightly different genetic stock into the existing gene pool. Neither activity is expected to substantially alter the natural integrity of the area. Planting a mix of seral species (grown from locally collected seed) will speed up the process faster than if the area was not planted.

Apparent Naturalness

Noticeable human impacts from helicopter logging will include stumps, marking paint, logging slash, and thinner, more open stands on the harvested 1,366 acres in Alternative 5. These effects will become less visible once ground vegetation is re-established, but may continue to impact the apparent naturalness of the area until stumps have decomposed and new stands are well established. Following harvest treatment, the area will appear more open and will be visible as a mosaic of gray, and partially stocked openings. Harvested areas will vary in shape and size. A few units may dominate the surrounding landscape, but overall, the treated stands will borrow from the naturally occurring mosaic of timber and non-forested openings visible from higher elevations.

4.4—SOCIO-ECONOMIC EFFECTS

4.4.1 TIMBER-HARVEST RELATED EMPLOYMENT

Introduction

The primary effect on timber-harvest related employment would occur from recommended commercial harvesting associated with the alternatives over the next several years. Financially viable sales would be necessary to provide opportunities for timber-harvest related employment. Employment opportunities provided by recommended timber harvesting would continue to employ some residents of Grant, Umatilla and Union counties. Based on the current annual mill capacity of 401 MMBF, the mills in these counties would utilize the estimated volume from the project. Levels of harvest volume by alternative would affect employment and income in several ways:

- *Directly*—(effects attributable to employment associated with harvesting, logging, mills and processing plants for saw timber, pulp, chips, veneer and plywood)
- *Indirectly*—(effects attributable to industries that supply materials, equipment, and services to these businesses)
- *induced*— (effects attributable to personal spending by the business owners, employees, and related industries).

Employment effects from recreation and domestic-livestock grazing activities were not analyzed because the level of use was not expected to change measurably by alternative. For a comparison of the financial viability of the harvest proposals by alternative, refer to the section below on "Financial Viability of Timber Harvesting".

ALTERNATIVE 1—Timber-Harvest Related Employment

No harvest related activities would occur and therefore, no contribution to direct, indirect, or induced employment and income associated with timber harvesting would result from the project. Declining trends in timber harvesting from NFS lands would continue in the future and contribute to declines in wood products employment over the next two decades. Changes in the economic base and wood products infrastructure for the impact area would also continue to be influenced by fluctuations in market prices, international market conditions, changes in technology and industry restructuring.

ALTERNATIVE 2—Timber-Harvest Related Employment

Alternative 2 would provide 45 MMBF and support approximately 251 direct jobs associated with harvesting, logging, mills and processing plants for saw timber, pulp, chips, veneer and plywood and $7.0 million (2001$) in income over the next three years of the project. Alternative 2 would contribute four percent (15 MMBF) toward the annual mill capacity and support four percent of the lumber and woods products employment (84 jobs) annually for the next three years. Including indirect and induced effects would support 402 total jobs and $11.2 million total income over the duration of the project.

The overall employment and income effect would continue to support the wood products manufacturing component of the economic base of the impact area. The magnitude of the economic effects would be limited to three years associated with the harvesting activities. Any individual county or community in the impact area could experience greater benefits in the short-term (2-3 years) particularly the communities very highly specialized in wood products manufacturing such as John Day. For example, the annual average direct employment effects (84 jobs) would support about 26 percent of the annual average employment in the lumber and wood product manufacturing in Grant County if the local processors were successful in acquiring the majority of the offered volume.

Several factors would influence the ability of any one county or community to experience the largest extent of the harvest-related employment and income effects. Among those factors are, the financial viability of the timber sale proposals, market conditions, quality and quantity of the volume offered for sale, timing of the offerings, and financial conditions of local firms.

Additionally, Alternative 2 proposes harvesting about 31 percent of the volume with helicopter logging systems. No helicopter- based contractors currently reside in the impact area and associated equipment and skills would potentially have to be acquired outside the impact area. This would potentially reduce total employment to 277 jobs.

The distribution of economic impacts would depend on the location of the timber purchaser awarded the contracts at the time of the sale, the availability of equipment and skills in the impact area, and the location and availability of the wood processing facilities and related infrastructure. Processors outside of Grant, Umatilla and Union counties would potentially bid on the sales and distribute the jobs and income effect to other counties in the Blue Mountains or outside of the area entirely. The same factors would influence all action alternatives proportionately.

ALTERNATIVE 3—Timber-Harvest Related Employment

Economic impacts in Alternative 3 from timber harvest related employment and income would be approximately 25 percent less compared to Alternative 2. Alternative 3 would provide 34 MMBF and support approximately 188 direct jobs associated with harvesting, logging, mills and processing plants for saw timber, pulp, chips, veneer and plywood and $5.2 million (2001$) in income over the next three years of the project. Alternative 3 would contribute three percent (11 MMBF) toward the annual mill capacity and support three percent of the lumber and woods products employment (63 jobs) annually for the next three years. Including indirect and induced effects would support 301 total jobs and $8.4 million total income over the duration of the project.

ALTERNATIVE 4—Timber-Harvest Related Employment

Alternative 4 would not harvest any timber and therefore, would have similar effects as Alternative 1. Effects associated with other restoration work in the project are described below under “Restoration Opportunities for Local Communities”.

ALTERNATIVE 5—Timber-Harvest Related Employment

Economic impacts from timber harvest related employment and income would be approximately 26 percent more compared to Alternative 2. A combination of commercial thinning, shelterwood, salvage, understory removal and small tree thinning under Alternative 5 would provide 56 MMBF and support approximately 317 direct jobs associated with harvesting, logging, mills and processing plants for saw timber, pulp, chips, veneer and plywood and $8.8 million (2001$) in income over the next three years of the project. Alternative 5 would contribute five percent (19 MMBF) toward the annual mill capacity and support six percent of the lumber and woods products employment (106 jobs) annually for the next three years. Including indirect and induced effects would support 507 total jobs and $14.1 million total income over the duration of the project.

Refer to the following table for an illustration of employment and income effects from timber harvesting by alternative.

Table 212 Timber-harvest Related Employment and Income by Alternative

	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Employment					
Direct	0	251	188	0	317
Total direct, indirect and induced	0	402	301	0	507
Per cent change	0%	0%	-25%	-100%	+26%
Income					
Direct	$0	$7.0 million	$5.2 million	$0	$8.8 million
Total direct, indirect and induced	$0	$11.2 million	$8.4 million	$0	$14.1 million
% change	0%	0%	-25%	-100%	+26%

4.4.2 RESTORATION OPPORTUNITIES FOR LOCAL COMMUNITIES

Introduction

The primary effect on local communities would be in terms of employment provided by preparation, implementation and administration of restoration and enhancement activities by alternative. The alternatives provide a variety of activities that would require widely varying equipment and skills. The level of benefit to local communities would depend on the capacity of existing contractors residing in the area in terms of skills and equipment, the labor force available to these contractors, the amount of existing work they have under contract, their desire to acquire larger contracts, new contractors seeking opportunities, and other contracting requirements such as programs for small businesses. The level would also depend on the amount of funding received for activities over the next 10 years.

The cost of the anticipated activities by type of work provides a relative proxy for comparing total potential benefit by alternative over the next ten years. The estimated benefit to local communities in Grant County was determined based on the cost of the work associated with road maintenance, reconstruction and construction, culvert replacement, grapple piling, roadside brushing, fish passage, thinning, pruning, cone surveys, fencing, hand piling, and stand exams or activities requiring similar type skills and equipment.

ALTERNATIVE 1—Restoration Opportunities for Local Communities

No restoration or enhancement related activities would occur under the no-action alternatives and therefore, no employment and income in local communities would be supported.

ALTERNATIVE 2—Restoration Opportunities for Local Communities

Alternative 2 would provide for a variety of aquatic, vegetation and infrastructure activities totaling $5.8 million.

Hydrology and fisheries restoration and enhancement activities such as streamside/riparian hardwood protection, planting, channel and streamside activities, improving existing structures, and riparian planting would require hand placement of materials and planting which would be very labor intensive. These opportunities totaling $1.7 million would likely be completed with 50-70 percent volunteer labor as in the

past, however, the activities would enhance efforts to train residents in these needed skills locally for potential opportunities in the next five years. Purchasing of materials such as fencing supplies would likely benefit local businesses in Grant County.

In the next five years, some small equipment would be utilized to construct new instream structures. Channel and floodplain rehabilitation would require larger heavy equipment such as excavators, backhoes, and bulldozers to complete the work. Culvert removal would potentially require a combination of both large and small equipment. Equipment and skills are already available in the area and these activities would support continued employment in these areas.

Vegetation associated activities such as precommercial thinning, fire line construction by hand and machine for prescribed burning, hand piling and burning, subsoiling, conifer planting, gopher control measures, competing vegetation control by chemicals, yarding tops, snag protection, and aspen enhancement would require a combination of labor intensive hand work and equipment. Aspen enhancement work would provide small contracting opportunities for building fence. Noxious weed control would occur under Alternative 2 by a combination of manual and chemical treatment methods. Skilled, certified applicators would be required for this work. Some of these skills and necessary equipment are available in communities in the impact area to accomplish these opportunities totaling $1.0 million. Local efforts to train residents for stewardship restoration work would also be enhanced.

Infrastructure activities for road construction, reconstruction and decommissioning would require heavy equipment that would support locally available skills and equipment over the next 10 years. Beyond 10 years, there would be a decrease in road maintenance work due to repairing roads and reducing total road miles. Trailhead/trails/dispersed camp development would potentially provide training opportunities for local residents to become better skilled as contractors. Opportunities for potential employment related to infrastructure activities would total $2.4 million.

Approximately $4.4 million or 76 percent of the total restoration and enhancement activities would be available to maintain or enhance local skills and equipment to support local employment over the next 10 years. On an annual basis, Alternative 2 would contribute 117 percent of the average annual value acquired by local contractors in Grant and Harney counties.

ALTERNATIVE 3—Restoration Opportunities for Local Communities

Alternative 3 would reduce total aquatic, vegetation and infrastructure activities by 10percent compared to Alternative 2 for a total of $5.2 million.

Aquatic related opportunities would be reduced under Alternative 3 to $1.5 million total. The channel/floodplain rehabilitation project and new instream structures would not occur under Alternative 3. Opportunities to support small and heavy equipment and associated skills would not occur. Other opportunities to support labor intensive, handwork would continue as described for Alternative 2.

Opportunities for employment associated with vegetation activities would be reduced by 30 percent primarily due to reductions in precommercial thinning and treatment of the slash, and a lesser amount of prescribed burning. Aspen enhancement would be the same as Alternative 2 and require small opportunities for fence construction. Chemical treatment of noxious weeds would not occur under Alternative 3 and eliminate the need for certified applicators. Vegetation opportunities would total $780,000.

Infrastructure activities for road construction, reconstruction and decommissioning would be slightly reduced by 3 percent, but would continue to support locally available skills and equipment over the next 10 years. Trailhead/trails/dispersed camp development would be the same as Alternative 2 and would

potentially provide training opportunities for local residents to become better skilled as contractors. Opportunities for potential employment related to infrastructure activities would total $2.3 million.

Approximately $4.1 million or 78 percent of the total restoration and enhancement activities would be available to maintain or enhance local skills and equipment to support local employment over the next 10 years. On an annual basis, Alternative 3 would contribute 107 percent of the average annual value acquired by local contractors in Grant and Harney counties.

ALTERNATIVE 4—Restoration Opportunities for Local Communities

Alternative 4 would reduce total aquatic, vegetation and infrastructure activities by 22 percent compared to Alternative 2 for a total of $4.5 million. Aquatic related opportunities would be the same as Alternative 3.

Opportunities for employment associated with vegetation activities would be reduced by 28 percent primarily due to reductions in precommercial thinning, treatment of the slash, and a lesser amount of prescribed burning. Aspen enhancement would be the same as Alternative 2 and require small opportunities for fence construction. Chemical treatment of noxious weeds would not occur under Alternative 4 and eliminate the need for certified applicators. Vegetation opportunities would total $800,000.

Infrastructure activities for road construction, reconstruction and decommissioning would be reduced the most compared to Alternative 2 by 32 percent, but would continue to support locally available skills and equipment over the next 10 years. Trailhead/trails/dispersed camp development would also be reduced the most by 16 percent but would continue to provide opportunities for local residents to become better skilled as contractors. Opportunities for potential employment related to infrastructure activities would total $1.7 million.

Approximately $3.5 million or 76 percent of the total restoration and enhancement activities would be available to maintain or enhance local skills and equipment to support local employment over the next 10 years. On an annual basis, Alternative 4 would contribute 94 percent of the average annual value acquired by local contractors in Grant and Harney counties.

ALTERNATIVE 5—Restoration Opportunities for Local Communities

Alternative 5 would provide a similar level compared to Alternative 2 for aquatic, vegetation and infrastructure activities totaling $5.8 million.

Aquatic related opportunities would be the same as Alternative 2. Vegetation related activities would be greater in terms of total amount of work to be completed but at a lesser cost reducing the overall opportunities by 23 percent primarily associated with pre-commercial thinning, slash treatment and prescribed burning. However, road construction, reconstruction and decommissioning and opportunities associated with recreation would offset this reduction by a 10 percent increase compared to Alternative 2.

Approximately $4.4 million or 76 percent of the total restoration and enhancement activities would be available to maintain or enhance local skills and equipment to support local employment over the next 10 years. On an annual basis, Alternative 5 would contribute the same level as Alternative 2 (117 percent) of the average annual value acquired by local contractors in Grant and Harney counties.

Refer to the following Table 213 for an illustration of local restoration and enhancement activities by alternative.

Table 213 Estimate of Local Restoration and Enhancement Activities by type of work

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Hydrology	0	$891,950	$891,950	$891,950	$891,950
Fisheries	0	$101,520	$101,520	$101,520	$101,520
Vegetation	0	$846,839	$590,546	$609,770	$654,950
Roads	0	$1,964,000	$1,907,000	$1,333,000	$2,163,500
Recreation	0	$385,500	$385,500	$325,500	$385,500
Aspen Enhancement	0	$178,505	$178,505	$178,505	$178,505
Total	0	$4,368,314	$4,055,021	$3,440,245	$4,375,925

4.4.3 POPULATION CHANGES

Introduction

Assuming residents gainfully employed would continue to reside in the area, the primary effect on population in Grant County would be from potential changes in timber-harvest related employment and restoration-related employment from project related activities. Refer to the sections on "Timber-Harvest Related Employment" and "Restoration Opportunities for Local Communities" for further description of these effects.

ALTERNATIVE 1—Population Changes

For the No-Action alternative, no additional employment opportunities would be created

Population would continue to increase for northeast Oregon counties at various rates depending on location to population centers, transportation routes, employment opportunities and amenities.

Overall population density and trends would continue. Population growth in Grant County would likely continue at a slower rate than other areas of the state over the next 10 years.

ALTERNATIVES 2, 3, 4 and 5—Population Changes

Alternative 2 contributes timber-harvest related employment that supports four percent of the lumber and woods products employment annually for the next three years and would contribute 117 percent of the average annual value acquired by local contractors in Grant and Harney counties.

Alternative 3 contributes timber-harvest related employment that supports three percent of the lumber and woods products employment annually for the next three years and would contribute 107 percent of the average annual value acquired by local contractors in Grant and Harney counties.

Alternative 4 would not support lumber and woods product employment and would contribute 94 percent of the average annual value acquired by local contractors in Grant and Harney counties.

Alternative 5 contributes timber-harvest related employment that supports five percent of the lumber and woods products employment annually for the next three years and would contribute the same level as Alternative 2 (117 percent) of the average annual value acquired by local contractors in Grant and Harney counties.

Employment opportunities under all action alternatives would contribute toward sustaining population levels in the short-term (three years). Opportunities for restoration and enhancement work provided over the next 10 years by all the action alternatives would have a long-term effect on maintaining populations.

Seasonal increases in timber-harvested related employment and restoration activities would not be likely to create increases in population due to the high level of unemployment in counties with wood processing facilities.

4.4.4 RECREATION USE

Introduction

People expressed concern about how the recommended activities would affect recreational pursuits such as hunting and fishing, pleasure driving, and horn hunting in the area and corresponding social and economic effects. Changes in road access, trail access, harvesting activities, and wildfires may affect user access, settings and quality of the experience.

The project may affect recreation use by affecting access, settings, and quality of experience. Changes in access by type causes proportional changes in use by type. Wildfires displace users from areas due to closures and travel restrictions. Effects to recreation use from burning depends on fall or spring burning, duration and intensity of burns. This analysis focuses on changes in capacity for motorized and nonmotorized access, camping, vegetation treatment areas, fire hazard ratings and roadless areas.

ALTERNATIVE 1—Recreation use

Motorized and Nonmotorized Access

Current demand for recreation opportunities in the project area would continue in the next five to ten years although traditional use patterns and opportunities would be impacted. No improvements to roads would occur and overall road conditions would continue to degrade.

Safety concerns associated with the use of the Davis Creek Trail by ATVs would continue causing potential conflicts and hazards with other users. Stream crossings along this trail would continue to cause sediment concerns. Access to Blackeye Trail would continue to be limited due to the washed out road accessing the trailhead.

Camping

Continued loss of access to dispersed campsites in this area would create new sites or resource impacts on other existing sites. Dispersed camping at sites within RHCAs would continue to impact water quality and fisheries, soils, vegetation and wildlife. Deerhorn Campground would continue to degrade in condition and reduce the quality of experience for users of this site.

Vegetation Treatment

No vegetation treatment would occur and no harvesting activities would occur to displace recreation use.

Fire Hazard Ratings

Crown fire hazard would continue at a high rate on 66 percent of the area with Dry Forest and 60 percent of the Moist Forest area. Wildfires would continue to occur in the project area and potentially damaging recreation facilities, causing hazardous conditions for users, and potentially affecting the character of the roadless area. Wildfire in overstocked stand conditions would reduce quality and quantity of forage and cover, and increase the risk of losing riparian habitat potentially reducing the opportunity for recreational hunting and fishing. No management activities would occur that would change the visual quality or recreational quality of the area.

Roadless Areas

No changes in road access would occur in the roadless areas. Long-term following the sale, the area would continue to provide opportunities for remoteness and solitude.

ALTERNATIVE 2—Recreation use

Motorized and Nonmotorized Access

In the first five years, use would continue on existing roads. Road conditions would be improved by brush and tree encroachment removal by the end of ten years but would not cause increases in access to the area or draw new users due to the dispersed nature of existing use. Over the long-term (following completion of sale activities), reconstruction of existing roads would improve access for hunting, viewing scenery, fishing and other uses and improve safety on the roads. Decommissioning of existing roads would decrease motorized access for dispersed driving and camping and increase hunting experience for hikers and other users seeking nonmotorized experiences. Open road miles would be reduced by 31 percent. Average daily traffic (ADT) numbers on roads that remain open would be higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

Improvements in the safety and quality of the trail conditions and facilities associated with the Davis Creek trail and increases in access to the Blackeye Trail and other adjoining trails in the Scenic Area, would increase the quality of the dispersed recreation experience for hiking, wildlife viewing, personal mushroom collection, horn hunting, and ATV use.

Camping

Relocation of dispersed campsites or converting these sites to day use would displace some users but improvements to existing sites and new alternative campsites would reduce resource impacts and provide users a desirable setting. Some users would potentially be displaced due to the change in location and their perception of the need for change. Dispersal of current and increased use in the area would increase social encounters and decreases in quality of semi-primitive experience. Some use would potentially be displaced from the area due to this perception of change in quality. Improvements to the Deerhorn campground would discourage use of dispersed sites along the Middle Fork John Day River and reduce impacts to riparian vegetation.

Vegetation Treatment

Stands selected for treatment would include 50 percent of the area identified. In the short-term (1-6 years), harvesting and prescribed burning activities would potentially displace recreational hunters, personal use firewood gathering, pleasure driving, snowmobile use, ATV use, and dispersed camping. The appearance of the area and the recreational experience will change in short-term due to sight and sounds of harvesting activities and prescribed burning. Users of the Blackeye, Tempest, Princess, Tipton, and Mine trails would experience changes in their perception of the visual quality of the experience due to stumps, logging slash, and removal of potentially hazardous trees along the corridor. The effects to users and potential changes in their use would vary depending on the season of the activity, the amount and location of the activities. Harvest activities could temporarily displace big-game populations causing short-term changes in recreational hunting success. Due to the dispersed nature of these activities, substitute sites would be available to accommodate the existing uses in the project area. A reduction in hiding and thermal cover would potentially displace some big game populations, but the effects would likely be mitigated by road closures or decommissioning.

Prescribed burning would increase opportunities for mushroom collection for personal and subsistence uses. Prescribed burning would potentially displace users in the spring or fall depending on the season of burning. To minimize potential displacement, local notification, road signing, and announcements would be used to inform the public. Camps would be avoided to prevent effects to dispersed camping for big game hunting.

Aspen restoration would increase stands of big aspen trees and increase viewing opportunities. Treatment of noxious weeds would enhance visuals on a spot basis primarily along roadways.

Streamside fencing, riparian planting, improvement and construction of instream structures would improve and restore hydrologic conditions and fisheries habitat. Removal of roads in RHCAs would improve habitat

and reduce sediment to streams. Fish populations would improve and benefit threatened and endangered populations and enhance the quality and opportunity for recreational sport fishing.

Streamside fencing would increase forage adjacent to streams and increase turkey habitat, elk forage, increase pools in the streams and thereby create increased opportunities for small and big-game hunting and fishing, and day use wildlife viewing. Prescribed burning, and a combination of harvesting or precommercial thinning under all the action alternatives would increase transitional upland browse for both shrubs and grasses, improve forest stand health, and improve cover and stand composition. Improvements in cover, snags, and old-growth habitat would maintain and enhance populations of small and big-game species and enhance recreational opportunities and increase the quality of the experience for hunting and wildlife viewing.

Fire Hazard Ratings

Crown fire hazard would continue at a high rate on 44 percent of the area with Dry Forest and 55 percent of the Moist Forest area. A stand replacing wildlife would be less likely and would reduce the risk of potentially damaging recreation facilities, causing hazardous conditions for users, and potentially affecting the character of the roadless area.

Roadless Areas

No changes in road access would occur in the roadless areas. Harvesting 880 acres under would increase sights and sounds of helicopter logging systems, people and equipment and reduce remoteness and solitude during the sale activities (3-5 years). Long-term following the sale, the area would continue to provide opportunities for remoteness and solitude. Harvesting activities and associated planting activities would reduce the amount of standing and down logs, increase the number of stumps, marking paint, and slash. More open stands would reduce the short-term natural appearance of the area. Long-term, the area would appear as part of a naturally occurring mosaic of forest and nonforested openings.

ALTERNATIVE 3—Recreation use

Motorized and Nonmotorized Access

Similar to Alternative 2 except construction of a new OHV trail would eliminate resource damage on creek crossings, enhance safety and provide a loop experience to decrease cross-country use.

Camping

Same effects as Alternative 2.

Vegetation Treatment

Effects would be similar to Alternative 2 except only 37 percent of the total area in need of treatment would be treated. No effect to recreation users would occur from treatment activities in the untreated areas,

Fire Hazard Ratings

Crown fire hazard would continue at a high rate on 50 percent of the area with Dry Forest and 56 percent of the Moist Forest area. Wildfires would continue to occur in the project area and potentially cause damage and changes to recreation facilities and conditions for users as described for Alternative 2. Conditions would remain hazardous for crown fires in the Little Butte and Deerhorn drainages of the Middle Fork.

Roadless Areas

No changes in road access or harvesting activities would occur in the roadless area and the area would continue to provide outstanding unroaded settings although remoteness and solitude would be affected by potential increased sights and sounds of helicopter logging systems, people, and equipment in adjacent areas during harvest activities, precommercial thinning, and prescribed burning. Scenic integrity and the apparent naturalness of the area would be unchanged due to management actions. The unroaded character would not be affected.

ALTERNATIVE 4—Recreation use

Motorized and Nonmotorized Access

Use would continue on most or all of the roads that remain open, and a few roads would close as a result of encroaching vegetation and little use. Overall, open road conditions will probably have at least a slight downward trend. While conditions on the roads that have been reconstructed would improve, on many of the other roads, brush and tree encroachment would result in decreased sight distance, and road surface and drainage conditions would degrade. For these roads, the results would increase adverse impacts to water quality and riparian habitat. The magnitude of hazards to road users would increase along with the potential liability to the Forest Service. Open road miles would be reduced by 33 percent. ADT numbers on roads that remain open would be higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

Closing the Davis Creek Trail to Off Highway Vehicles (OHV) use under Alternative 4 would eliminate motorized use of the area and displace ATV users. Nonmotorized use would be enhanced for hikers, horseback riders and mountain bikers. These activities would have no effect on cross-country skiers or snowmobilers.

Camping

Same effects to recreation users as Alternative 2.

Vegetation Treatment

Commercial harvesting would not occur under Alternative 4, but visual changes would occur due to precommercial thinning and prescribed burning activities. Users would potentially be displaced depending on their tolerance and preference for changes in the visual setting.

Fire Risk Ratings

Crown fire hazard would continue at a high rate on 61 percent of the area with Dry Forest and 59 percent of the Moist Forest area. Effects to recreation users would be 30 percent less than described for the No-Action alternative.

Roadless Areas

Same effects as described for Alternative 3.

ALTERNATIVE 5—Recreation use

Motorized and Nonmotorized Access

Use would continue on all of the existing open roads in the first five years. Overall road conditions have a significant upward trend. Brush and tree encroachment removal would improve sight distance on most open roads. Road surface and drainage conditions

on most roads would improve and result in a significant reduction in road related impacts to water quality and riparian habitat. The hazards to road users would be reduced along with the potential liability to the Forest Service. Open road miles would increase by 24 percent. Average Daily Traffic (ADT) numbers on roads that remain open would be slightly lower despite a predicted moderate increase in the amount of recreational use, because the miles of open roads have increased significantly.

Trail access would be similar to Alternative 2 except construction of a new OHV trail would eliminate resource damage on creek crossings, enhance safety and provide a loop experience to decrease cross-country use.

Camping

Effects to recreation users would be the same as described for Alternative 2.

Vegetation Treatment

Stands covering 58 percent of the area in need of treatment would be treated similar to Alternative 2 that treats 50 percent of the area. Effects to recreation users would be similar as described for Alternative 2.

Fire Hazard Ratings

Crown fire hazard would continue at a high rate on 40 percent of the area with Dry Forest and 54 percent of the Moist Forest area. A stand replacing wildfire event is less likely under this alternative because vegetation treatments improve stand conditions the cause wildfires the most.

Roadless Area

No changes in road access would occur in the roadless area. Harvesting 1,370 acres and increased sights and sounds of helicopter logging systems, people and equipment and reduce remoteness and solitude during the sale activities (3-5 years) would be 55 percent higher than Alternative 2. Long-term following the sale, the area would continue to provide opportunities for remoteness and solitude. Harvesting activities and associated planting activities would reduce the amount of standing and down logs, increase the number of stumps, marking paint, and slash. More open stands would reduce the short-term natural appearance of the area. Long-term, the area would appear as part of a naturally occurring mosaic of forest and non-forested openings.

Landscape Aesthetics

Visual Quality Objectives

The visual quality objective would be met by any of the alternates recommended . Areas of concern such as the Vinegar-Hill-Indian rock Scenic Area would not be affected by recommended alternatives. The objectives of the recommended harvests would meet the visual quality.

Scenic Integrity

The suppression of fire has allowed the once open park like stands of large fire resilient trees to disappear, being choked by encroaching fir and spruce species (see 3.2.4 Vegetation by Forest Type, beginning on page 139 and 1.2.1.4 Undesired Condition: Vegetation Outside Historical Range of Variability, page 14). This has reduced the scenic integrity to moderate.

The effects to scenic integrity are initially minimal, thus maintaining the existing condition of moderate. However the indirect effects show improvement to scenic integrity where efforts to move the fore toward a sustainable, fire resilient landscape. Where minimal efforts are made to move toward HRV, the indirect effects degrade the scenic integrity by allowing existing trends to continue.

Table 214—Effects to scenic integrity

	Direct (1-25 years)	Indirect (25+ years)
Alt 1	Moderate	Low to Very Low
Alt 2	Moderate	High
Alt3	Moderate	High
Alt 4	Moderate	Low to Very Low
Alt 5	Moderate	High

Ecological Integrity

Ecological integrity is an indication of the sustainability of a landscape, which affects the long term conditions of landscape aesthetics. The existing ecological integrity is determined by considering the current condition of key resources and the current trends that exist (see 3.2.4 Vegetation by Forest Type, beginning on page 139 and 1.2.1.4 Undesired Condition: Vegetation Outside Historical Range of Variability, page 14).

Table 215 is used in determining ecological integrity based on silvicultural treatments.

Table 215 Levels of Ecological Integrity

Ecological Integrity	Forested Area Outside HRV/High Risk
Very High (VH)	0-10%
High (H)	11-20%
Moderate (M)	21-30%
Low (L)	31-40%
Very Low (VL)	41-50%
Unacceptably Low (UL)	51-60%

The effect to ecological integrity by alternatives that propose efforts to move vegetation toward HRV in a successful manner would improve the ecological integrity of the project area. Alternatives 2, 3, and 5 make an effort to change the existing trends. Therefore, these alternatives would allow the ecological integrity to continue to improve proportionate to the level of treatment. Alternatives 1 makes no effort, and Alternative 4 makes minimal effort to change the existing trends that are detrimental to the sustainability of the forest landscape. Therefore, the ecological integrity would continue to be degraded under these alternatives.

Table 216—Effects to ecological integrity by Alternative

	Direct (1-50 years)	Indirect (50+ years)
Alt 1	Unacceptably Low	Unacceptably Low
Alt 2	Moderate	Moderate to High
Alt3	Low	Low to moderate
Alt 4	Very Low	Very Low
Alt 5	Moderate	Moderate to high

4.4.5—HERITAGE RESOURCES

Direction for this analysis is provided by a corpus of authorities that deal with historic preservation, archaeology, and Native American cultural values. In addition to the National Environmental Policy Act (NEPA) which requires this present document, the National Historic Preservation Act (NHPA) as amended, the Archaeological Resources Protection Act (ARPA), and the American Indian Religious Freedom Act (AIRFA), and executive orders such as Executive Order 13007 (Indian Sacred Sites) are also applicable. Direction that is more specific can be found in the Code of Federal Regulations (36 CFR 800), the Malheur National Forest Land and Resource Management Plan (1990), and the Programmatic Agreement between Region 6 of the US Forest Service, the Advisory Council on Historic Preservation (ACHP), and the Oregon State Historic Preservation Officer (SHPO) Regarding Cultural Resources Management on National Forests in the State of Oregon [NFS No. 94-06-59-16].

4.4.5.1—Heritage Resources

The Southeast Galena Watershed Analysis area of Potential Effect (APE) for cultural elements of the environment is restricted to the area that is within the perimeter of the project area. That is to say, the effects of potential activities on cultural resource properties (CRP's) situated outside of the boundaries of the project area are not analyzed. Based on data collected from the Forest to this point, the activities that are being planned under this analysis do not have the potential to directly or indirectly alter social, visual, auditory, or biophysical aspects of CRP's that are located external to the planning area.

ALTERNATIVE 1—Commercial Thinning

If no action is taken to address overstocked stand conditions in the planning area the historic and archaeological resources of the planning area will not face the risks of disturbance associated with industrial logging operations. However, CRP's within the planning area and in adjacent areas would continue to be in jeopardy of damage or destruction by catastrophic wildfire. An example of the destructive

effect that catastrophic wildfire can have upon cultural resources can be found at the Summit Fire. The Summit Fire of 1996 destroyed or severely damaged 19 of 29 (66%) eligible or potentially NRHP eligible historic sites identified within its perimeter(see Appendix E, Map 2—Large Fire History).

ALTERNATIVES 2, 3, 4, & 5—Commercial Thinning

Activities associated with commercial thinning, such as road construction, log deck construction, and log skidding pose a minimal risk to archaeological properties with scientific values and historic sites with associative values if appropriate project design criteria are employed. It is possible that timber harvest operations could directly impact the scientific or scholarly value of archaeological deposits by disrupting the patterning present in surface or subsurface deposits of artifacts, ecofacts, and archaeological features.

Commercial thinning may directly result in visually intrusive scars on sites or landscapes that convey an association with important patterns of history such as the development of the western mining frontier or railroad logging. The value of these sites as symbols of important historic events, themes, or patterns may be diminished if these qualities are not recognized and protected.

The cultural resource properties of the Southeast Galena watershed will realize substantial benefit from thinning activities that produce forest stands that are resilient to wildfire. Reducing the accumulations of fuels through commercial thinning in the watershed will make catastrophic wildfire less likely to occur, and will therefore enhance the long-term stability of significant cultural resource properties CRPS's.

Table 217 Cultural Resource Sites in Commercial Thinning Harvest Units by Alternative.

Subwatershed	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Placer/Davis	5	3	2	6
Vincent	7	5	1	7
Vinegar	6	6	4	6
Tincup/Little Butte	4	4	0	4
Butte	2	2	0	2
Little Boulder/Deerhorn	1	1	1	1
Total	**25**	**21**	**8**	**26**

Alternative 1—Prescribed Fire

If no action is taken to address overstocked stand conditions in the planning area the historic and archaeological resources of the planning area will not face the risks of disturbance associated with prescribed fire. However, as stated in the commercial thinning effects analysis, if no action is taken to reduce the accumulation of fuels, CRP's within the planning area and in adjacent areas will face the increasing likelihood of damage or destruction by uncharacteristically severe wildfire.

Alternatives 2, 3, 4, and 5—Prescribed Fire

The deployment of prescribed fire within or near historic and archaeological sites poses negligible to minimal risks to site data potential and/or associative values. If prescribed fire is deployed without appropriate design criteria or monitoring, fire-sensitive historic sites such as structures, buildings, and remnants of such occupations may be damaged or destroyed. Excessive fire intensities may reduce the scientific data potential of lithic oriented archaeological sites by affecting rhyolitic (volcanic glass) artifacts located at or near ground surface. Indirectly, excessive fire intensities within or near an archaeological site may induce or accelerate erosion of site deposits.

In combination with forest stand thinning, the use of prescribed burning treatments will serve to alleviate the threat of stand-replacement wildfire. The archaeological record of the Southeast Galena watershed will be less likely to sustain the severe damage witnessed by the record of the adjacent Summit Fire.

4.4.5.3 Heritage effects In-Stream Hydrological Projects

ALTERNATIVE 1—In-Stream Hydrological Projects

If no action is taken, there will be no effect on significant cultural resource properties in the Southeast Galena watershed.

ALTERNATIVES 2 and 5—In-Stream Hydrological Projects

Alternatives 2 and 5 propose to restore hydrologic function within the analysis area using heavy equipment in-stream to construct channels among mining tailings. Other in-stream projects would emplace large logs within channel banks using heavy equipment. These activities would affect the lower 2-3 miles of Vincent Creek, the lower ½ mile of Caribou Creek, as well as a stretch of the Middle Fork of the John Day River that is 1/4 mile below Caribou Creek. Emplacement of logs in stream channels would occur on Vinegar, Butte, Granite-Boulder, and Davis Creeks.

Numerous mining related historic properties, including vernacular landscapes, are positioned along margins of waterways in the Southeast Galena planning area. A historic property that is eligible for inclusion to the NRHP is located within the area recommended for in-stream hydrological restoration on Vincent Creek. The historic property is related to late 19th century and early 20th century hydraulic placer mining operations and it covers an area of approximately 200 acres along both sides of Vincent Creek. Under alternatives 2 and 5 a maximum of 10 acres (roughly 5% of the total site area) within the historic property would be impacted or modified by heavy equipment as the stream channel and floodplain are rehabilitated. The District will resolve effects under Section 106 of the National Historic Preservation Act with the Oregon SHPO and the Advisory Council on Historic Preservation (ACHP). All agreements with SHPO regarding mitigation of Section 106 effects will be addressed in the Southeast Galena FEIS.

4.4.6 NON-TIMBER FOREST PRODUCTS

Introduction

Changes in access by type causes proportional changes in use by type. Wildfires displace users from areas due to closures and travel restrictions. Effects to nontimber products habitat from burning depends on fall or spring burning, duration and intensity of burns.

This analysis focuses on changes in capacity for motorized and nonmotorized access, and vegetation treatment effects on nontimber forest products to assess people's ability to continue to enjoy social and economic benefits from the collection of nontimber forest products.

ALTERNATIVE 1—Non-Timber Forest Products

Motorized and Nonmotorized Access

No new road construction or reconstruction activities, timber harvesting, or prescribed burning would occur under Alternative 1 and would have no effect on nontimber forest products.

Vegetation Treatments

Some nontimber forest products would benefit from changes in ecological conditions such as overstocked stands that would be susceptible to increased risk of wildfires. Morel fruiting abundance would be affected by fire, fire intensity, different burning seasons, levels of tree mortality, and weather patterns depending on the severity of the conditions. Nutrient flushes to soil chemistry and microorganisms from tree mortality following fires would occur benefiting reproduction. Increases in recreational and commercial picking

following these fires would deplete the resource by over-harvesting although limited data exists on long-term fruiting levels (Parks and Schmitt 1997). Based on previous episodes following large wildfires in eastern Oregon, user conflicts would likely continue between commercial and recreational interests diminishing the social values associated with cultural and recreational gathering.

Depending on wildfire effects and distribution across the landscape, huckleberry picking from reproduction of bushes following fire, firewood gathering and post and poles as salvage products could be enhanced. The quality of the products would depend entirely on fire severity and ecological conditions following the fire. High severity fires would consume nontimber forest products and associated habitat rather than provide an opportunity for increased collection.

ALTERNATIVES 2, 3, 4, and 5—Non-Timber Forest Products

Motorized and Nonmotorized Access

In the short-term (five years) all newly constructed roads or newly opened roads for project activity, that will be closed at the end of the activity will not be open to public travel between the time they are opened and closed. This eliminates the false sense of security travelers may have, or assume, that the road will be a permanent open travel way for motor vehicles.

In the long-term (10 years) Alternatives 2, 3, and 4 would decrease total open roads miles and access for collection of non-timber products by 31-33 percent miles compared to Alternative 1. Alternative 5 would increase open road miles and access for collection by 24 percent. Road construction would degrade or eliminate populations of non-timber forest products in the area of newly constructed roads.

Trail improvements would enhance safe access to populations of wild edible mushrooms and huckleberries along these routes. Pressure from over harvesting of mushrooms, berries, or snags for firewood along travel routes would be the greatest under Alternative 5 which has the highest level of overall access by open roads and trails. Alternative 5 would provide the greatest benefit to elderly populations that need motorized access to directly harvest these products for subsistence use.

Vegetation Treatments

Timber harvesting and prescribed burning would alter habitat conditions and opportunities for collection of mushrooms and huckleberries. Effects on mushrooms and huckleberry bushes from timber harvesting and prescribed burning depends on disturbance of the sites, comparative changes with natural disturbance and successive stages of plant succession. Some mushrooms like sites associated with cool, moist mature forests. Other species prefer open, drier sites. The alternatives would harvest timber and prescribe burn to achieve a variety of habitat types that would maintain or enhance non-timber forest products.

No effect to wild edible mushrooms or huckleberries from chemical treatment of noxious weeds or competing vegetation would occur due to limited wick or spot application by hand on specific sites that have been surveyed. Mitigation measures such as signing the area, local radio announcements and on-site patrols following the application would minimize any potential effects to human consumption. Opportunities for people to collect species from disturbed and non-disturbed sites would be maintained by all alternatives.

4.4.7 Special Use Permits and Claims

ALTERNATIVE 1—Special Use Permits and Claims

No changes to permitted livestock numbers would occur. The permittee's economic and social values would not change due to management actions from the project.

No changes would occur to facilities, water rights and mining claims.

ALTERNATIVE 2, 3 and 5—Special Use Permits and Claims

Improvements or increases in motorized access would provide more convenient access to the allotments possibly decreasing the amount of time needed by the permittee to access the allotment. Trail improvements would provide improved access for checking on the allotment by the permittee. Decommissioning roads used by livestock for driveways would slow herding and increase the permittee's time managing and moving livestock..

Road improvements would benefit power line right-of-ways maintenance activities, but decommissioning would potentially reduce access to some sites. Alternatives 2 and 3 would reduce overall access by 31 percent. Alternative 5 would increase open road miles by about 9 percent and benefit right-of-way access.

No roads recommended for decommissioning access any existing water rights or mining claims and therefore would not affect any existing rights or claims.

Harvest activities would cause livestock to congregate in smaller areas causing the permittee to spend more time and resources to prevent overuse. Traditionally used salting and watering areas would not be available during harvest activities also requiring more time spent by the permittee on the allotment managing livestock to ensure meeting standards for protection of endangered and threatened fish species. Disruptions in the permittee's operations would occur due to trees falling on fences from harvesting, gates being left open, and placement of helicopter landings across fence lines along ridge tops.

Reforestation activities would have minimal effects to the livestock operations. Chemical treatments for competing vegetation would occur by spot application during periods not being used by livestock. Available forage would be reduced by 35 percent for the first five years due to the area associated with reforestation sites, but in the long-term forage would increase. Alternative 3 would not reduce short-term forage because herbicides would not be used for treatment of competing vegetation. Aspen enclosures would reduce available forage but would also provide a benefit to the permittee by fencing out key areas within RHCAs to keep livestock away from stream banks.

Prescribed burning would occur in certain pastures of the allotment and improve quality of forage. There would be enough flexibility in size and distribution of burned areas to mitigate any effects to the permittee's use. Fire would decrease amounts of downed woody debris facilitating better distribution of livestock and easing the permittee's herding operations and time. During the burn periods and immediately after, forage would be reduced or unavailable for grazing causing temporary needs by the permittee to move livestock to adjacent areas of the allotment. In the long-term, forage would be improved comparably on Alternatives 2 and 5, followed by Alternatives 3 and 4. Economic and social benefits to the permittee's operations and family would occur under all action alternatives.

ALTERNATIVE 4—Special Use Permits and Claims

Effects to livestock special use permits for Alternative 4 would be similar to Alternatives 2, 3 and 5 except harvest operations would not occur and would not therefore, cause disruptions to livestock movement.

Fences or gates are less likely to be torn down or removed and not cause problems with cattle moving into other areas.

Road improvements would benefit power line right-of-ways maintenance activities, but decommissioning would potentially reduce access to some sites. Alternative 4 would be similar to Alternatives 2 and 3 by reducing overall open roads by 32 percent. No roads recommended for decommissioning access any existing water rights or mining claims and therefore would not affect any existing claims.

4.4.8 RANGELAND

ALTERNATIVE 1—Rangeland

The alternative would allow current rangeland management practices to continue with existing numbers of permitted livestock. Therefore, future grazing in the watershed would not have substantial effects on improving or worsening conditions.

No additional ground disturbance would occur, so grasses and grass-like vegetaton are not as likely to be disturbed by noxious weeds. Aspen stands would continue to degrade, as grazing would retard new growth.

If resources are left to continue within the analysis area at the present regression (no action), forage production would decline due to continued ungulate pressure and conifer encroachment, reducing the quantity of primary and secondary rangeland.

Upland forested areas would loose forage production over time if over stories are left to their present successional progressions. Lack of grazing opportunities in upland areas would likely increase the livestock pressure on the riparian areas.

No action may result in a denser tree canopy cover, which could inhibit growth of ground vegetation. This may decrease growth of grasses, which would then reduce forage for ungulate use.

ALTERNATIVES 2, 3, 4 & 5—Rangeland

Alternatives 2, 3 and 5 would increase the quantity and quality of rangeland vegetation by timber harvest and prescribed fire. Alternative 4 would do the same through the use of primarily prescribed fire. Therefore each of these alternatives can be expected to decrease the impacts of cattle grazing on riparian zones by providing cattle more suitable rangeland to use. Any road building may also tend to reduce the amount of time livestock spend in riparian zones by providing better access to suitable rangeland away from streams.

The primary effect of forest stand treatments and associated road construction on range vegetation resources is the removal and the disturbance of herbaceous cover. This affects the diversity of the herbaceous layer and the quantity and quality of available forage and depends on the location, stand prescription, fuels prescription, and current condition of the herbaceous vegetation in the recommended units.

Following commercial thinning, forest stands would open up releasing the under story vegetation that would become available as forage for big game and livestock. This vegetation is available until the tree canopy closes again and shades out the lower growing vegetation. In the short-term, harvest units would provide transitory range. Transitory range should provide more forage than occurred before the timber harvest or with the no action alternative; however, livestock grazing capacities are not based on transitory range.

Removal and thinning of trees would produce slash that would impede livestock movement and inhibit growth of ground vegetation. However after treatment of the slash through hand piling, “track-macking” and burning (usually within 5 years after harvesting) the overall ground vegetation should increase in stands that have been thinned. Livestock movement would improve with these treatments, with the exception of units that are only mechanically treated.

Reduction of, or increases in forage caused by forest stand treatments are difficult to measure. While tractor logging and feller-buncher logging may cause the most ground disturbance to a site, quantifying loss of forage without actual on the ground before and after measurements is pointless. For the most part, these units in need of silvicultural treatments receive limited use by livestock. After treatment, these units are more apt to attract livestock as the forage and access are increased. However, if far from water sources these units may not receive any use. Because of the large size of the grazing pastures in the planning area, the staggered and varied treatments of this transitory range would not have a measurable influence of the carrying capacity of the range. However, forest stand treatments that open up stands previously not accessible to livestock would redistribute the grazing pressure in a more uniform scope across the pasture.

Harvest activities, if during the grazing season, may impact the grazing system by concentrating livestock away from the activities and causing overuse of an area of the allotment. Harvest activities (if during the grazing season) would disrupt the ability of the permittee to herd cattle off of the allotment or unit that is required to maintain use standards. This is critical to the success of the grazing system in order to meet the requirements of the Grazing Biological Opinion for Steelhead and Bull trout. Also traditional salting locations in the uplands may not be available do to harvest activities.

In addition, there are a number of harvest and thinning units, which are adjacent to or include fences and create a potential conflict if directionally felled trees break the fence or the fence is cut to skid trees. The more a fence is spliced, the less effective it becomes because splices weaken the wire so it is more likely to break at a splice. This is especially a concern if harvest operations are conducted during the grazing season (theses fences need to remain intact from June 1 through October 15 in order to maintain the livestock grazing system). Another concern is the haul routes and helicopter landings that use collector roads which frequently cross unit and allotment, fence lines commonly resulting in gates being left open. Several of the helicopter landings may be located on ridge tops and may require temporary removal of sections of fence.

Reforestation activities schedule to follow timber stand treatments would not have major effects on range resources. Livestock grazing may offer reduction of competition to tree seedlings by grasses and other vegetation. There is the potential for conflicts with possible damage by livestock on the seedling through crushing and trampling. Herbicide treatments to reduce competing vegetation would reduce 35% of the forage in treated units for 3-5 years (Wunz 2001).

The aspen enhancement project would take approximately 28 acres out of livestock grazing by fencing out the stands many which are in primary range. This is acceptable do to the overall benefits to the clones and the removal of grazing from key areas within the RHCA's. Caging may be used to protect some individual plants, these often are damaged by livestock (rubbing and pushing) and may not be effective when used in areas that cattle frequent.

Under Alternatives 2, 3, 4, and 5, the non-forested rangelands would be expected to show continued improvement at a slightly higher rate than Alternative I.

Forest stand treatments have an indirect effect of promoting better livestock distribution due to improved quality of forage. Indirect effects related to management of grazing permits include loss of control if gates are left open or fences are logged over. This in turn causes loss of control of livestock, and resultant loss of effective management of the rangeland vegetation.

Table 218 Acreage available to forage production, acreage of disturbance

ALTERNATIVES	HARVEST ACRES	PRESCRIBED BURNED ACRES♠	FENCED ASPEN ACRES	FENCED RIPARIAN ACRES	EST. FORAGE IMPROVEMENT ACRES
2	9760	11370	30	28	23,825
3	7330	10640	30	28	22,825
4	0	17230	30	28	17,710
5	11340	10180	30	28	24,105

♠ Outside mechanically treated acres

4.4.9 ATTITUDES, BELIEFS AND VALUES

Introduction

People who prefer passive management approaches to restoration would generally prefer less acres of harvesting and burning compared to people who prefer active management to achieve restoration objectives. Restoration and enhancement measures for fish, wildlife and native plant species generally increase people's perceptions of the value of the resource.

This analysis focuses on the potential effects to ecological and non-commodity values based on changes in timber harvesting, prescribed burning, and road construction and reconstruction by alternative. Effects to commodity values, recreation values, and scenic quality are discussed in other sections of the Social and Economic report, and in the other environmental consequences sections of the DEIS.

ALTERNATIVE 1—Attitudes, Beliefs and Values

No timber harvesting, prescribed burning or road construction/reconstruction would occur under Alternative 1. People who believe that passive management is an appropriate response to ecological restoration would prefer this alternative. Ecological values associated with fish, terrestrial and plant habitats and associated populations of species, water quality, vegetation and fire regimes would continue in an undesirable condition. Opportunities for spiritual renewal, geographic place attachment, and existence values would be diminished by changes in the short-term and long-term due to increased risk of wildfires from overstocked stand conditions.

Road conditions would not be improved and trail conditions would continue to contribute toward degradation of water quality. Most of the unroaded areas in the roadless area would continue to provide moderate opportunities for solitude due to existing topography and vegetative screening.

Potential increases in risk of wildfire would diminish ecological, spiritual and aesthetic value of the roadless area. As a result, people who benefit from noncommodity values may experience diminished water quality, scenic quality, and sense of place attachment to the Scenic Area and the roadless area. People would experience changes in life values associated with preserving and protecting endangered species, and a reduced feeling of conserving the area for future generations would take place.

> Forest conditions which increase the risk of costly catastrophic wildfires and insect attacks threaten human values and later forest ecosystems. The forests of eastern Oregon provide a wide variety of goods and services that humans value highly including wood products, recreation, water, aquatic habitat, and the general quality of life in the region. Threats to these forests are in turn, threats to these values. **Forest Health and Timber Harvest on National Forests in the Blue Mountains of Oregon**, A Report to Governor Kitzhaber (Johnson et al, 1995)

ALTERNATIVES 2, 3, 4, and 5—Attitudes, Beliefs and Values

Under all alternatives, improvements in roads and trail conditions would increase water quality and fish habitat and would benefit people who want to protect plant and animal species. In the long-term (10 years+), the re-vegetated appearance of decommissioned roads and improvements in fish habitat and water quality would increase people's perception of the ecological value of the area.

People who prefer more primitive uses and nonmotorized settings would be negatively affected by increases in the quantity or quality of motorized access. Their perceptions of the natural appearance of the landscape and their sense of attachment would be altered by increases in prescribed burning, harvesting, and other modifications to the landscape. Moving campsites away from water would decrease people's perception and sense of value associated with a particular camping area they would have used traditionally for years.

Commercial timber harvesting and precommercial thinning would reduce the risk of high fire hazard and would lower people's perception of risk to fish and wildlife populations. Harvesting activities would decrease scenic quality in the short-term (3-5 years) due to the sights and sounds of logging equipment and activity on the landscape, but would provide long-term benefits due to more big trees and opening up view area to existing big trees. Some loss of cover to wildlife would occur but within standards. Longer-term results would be resilient stands, more future large snags, and increase in age classes which would increase noncommodity values for people who prefer active management approaches to protecting terrestrial species. Alternative 4 would not have these effects because it would not use timber harvesting as an active management approach.

Prescribed burning would create short-term negative effects for people who don't want to see scorched trees. Some people view this as burning up the future forest and would feel their existence values for protecting forests for future generations were diminished. Some people don't want to see stumps burned up, they feel these represent connections with history and uses of the land. Their spiritual and aesthetic association with a sense of renewal through tradition and history would be diminished. Alternative 2 and 5 would have the greatest effect on these values since these alternatives provide for the most acres of prescribed burning which would potentially affect more stumps.

Streamside fencing, planting and streamside improvements would decrease short-term (5 to 7 years) visual quality due to the appearance of disturbed areas and manmade materials and in the long-term would increase visuals due to growth and restoration of habitat. Perceptions of risk to threatened and endangered species associated with riparian zones would be increased by restoration activities for fish, wildlife, and water quality.

Aspen enhancement and noxious weed treatments in the long-term (10 years) would increase visual quality, improve water quality, and restore native populations increasing ecological value for people who regard ecosystem restoration as a priority. Some people hold spiritual values and sense of place attachments with unique ecosystems such as aspen and would benefit by these activities. Noxious weed treatment of rock pits would improve visual quality and increase people's perceptions of these sites as part of the landscape.

People who feel passive management approaches should be allowed to take their natural course would feel their ecological and non-commodity values were diminished as a result of the active management approaches for restoration. Based on the surveys cited above about public opinions regarding natural resource management, their sense of spiritual renewal, and preserving the area for future generations would be reduced the most by Alternative 5 would results in an increase of open road miles and treats the largest number of acres (58 percent of the project area). Alternative 2 would be similar in levels of active

management (50 percent of the project area), followed by Alternative 3 (37 percent) and Alternative 4 (13 percent).

Management approaches for restoration of aquatic, other associated vegetation activities, and recreation would be comparable for Alternatives 2, 3, and 5 and would have similar effects on people's values regarding preferences for passive management.

4.4.10 HUMAN HEALTH AND SAFETY

ALTERNATIVE 1—Human Health and Safety

Threat of Wildland Fire to Public Safety and Property

The high fire hazard area south of the Middle Fork is not treated and the poor roads in the same area are not improved to provide adequate access for fire fighting equipment. This fire hazard is adjacent to privately owned lands and structures in Bates, Austin, and Austin Junction areas.

The high fire hazard area located in the upper Vinegar Creek drainage that was the result of the 1998 blowdown consists of several hundred acres of down timber. This area would not be treated by this alternative. A fire burning in these fuels would be difficult and dangerous to control and could easily become a large fire threatening private property and structures in the vicinity of the town of Greenhorn.

Air Quality

The no treatment alternative would have the least immediate impact on air quality, as there is no prescribed burning. However, all biomass remains available for consumption by wildfires and it will continue to accumulate, increasing the potential for large amounts of smoke during the summer months, when diurnal inversions can concentrate smoke at low elevations. These smoke concentrations can have high particulate levels that can cause health problems, or violate summertime Class I air quality visibility standards for Wilderness areas.

Herbicides

There is no use of herbicides for sod control in this alternative; therefore there is no risk to human health or safety.

Rodenticides

There is no use of rodenticides for pocket gopher control; therefore there is no risk to human health or safety.

ALTERNATIVE 2—Human Health and Safety

Threat of Wildland Fire to Public Safety and Property

The high fire hazard area south of the Middle Fork is treated with a combination of treatments and the poor roads in the same area are improved to provide adequate access for fire fighting equipment. This greatly reduces the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

The high fire hazard area located in the upper Vinegar Creek drainage that was the result of the 1998 blowdown consists of several hundred acres of down timber. This alternative would treat the area by salvaging the wind thrown timber. The high hazard of a catastrophic fire destroying the private property and structures in the vicinity of the town site of Greenhorn would be greatly reduced.

Air Quality

Slash produced by commercial thinnings on tractor and skyline yarded units will be brought to landings and can be made available for chipping for fiber or as fuel for cogeneration plants. Both options have a positive effect on air quality as the smoke from burning slash on site is greater than in a clean burning power plant or when used as fiber. Slash resulting from harvesting on other units is planned to be either broadcast

burned or piled and burned and the burning will be under weather conditions that will meet air quality standards. Prescribed burning will be done in areas not harvested to reduce existing natural fuels, and will also be done in weather conditions that allow air quality standards to be met.

This alternative will reduce the total fuels in the planning area, reducing the amount available for consumption in future wildland fires. This would reduce the amount and duration of pollutants produced by a wildland fire; as well as reducing the fire intensity, allowing for faster control. The amount of smoke produced during the summer months and during inversion periods would be reduced, improving visibility and reducing health problems. The summertime Class I air quality visibility standards for Wilderness areas are more likely to be met.

Herbicides

Risks to workers are associated with exposure to chemicals, and the application process. Hand application carries many of the same risks as manual methods. Herbicide application, by law, will be under the direct supervision of a trained and licensed applicator, who must follow the label directions. Label directions prescribe the proper application rates and conditions, personal protection methods for workers, spill protection and response, and disposal procedures. When followed, these directions reduce risk to humans and the environment to acceptable levels. The public may be exposed to herbicides through spray drift, an accident in transit, or dermal contact with treated plants. Spray drift would be very limited with the use of backpack sprayers. Treatment areas would be signed.

The two herbicides recommended for possible use in the project area have low to moderate potential toxic effects. Studies have shown that exposure levels remain far below the toxic levels for workers. Exposure to the public is expected to be much less.

Rodenticides

Strychnine baiting

It is unlikely anyone would accidentally ingest strychnine bait, especially once it has been placed in burrows. Bait is dyed for identification, making it obvious when spilled, and it has a bitter taste.

Workers applying strychnine would have the greatest risk of exposure. Strychnine is not normally absorbed through the skin. The primary exposure route to induce poisoning from strychnine is ingestion. Field crews are to be trained in proper application and safety procedures prior to starting work; they are also to be informed of the risks and symptoms of accidental strychnine poisoning and treatment procedures.

The public and workers engaged in other activities in treated area (e.g., planting, surveys, tree netting, etc.) are not expected to encounter any strychnine. As an added precaution, treated units would be signed, warning of strychnine presence on the sites. Treatment units are removed from developed recreation areas, and consequently receive little use by the general public.

The application of strychnine below ground is not expected to cause cumulative effects with respect to public health or safety. Strychnine will not accumulate in the soils between applications, based on the toxin's low mobility and persistence and its short half-life.

Aluminum phosphide fumigation

The primary exposure route to induce poisoning in humans is through inhalation. Workers applying the fumigant would have the greatest risk of exposure. The reaction of aluminum phosphide with air, however, is sufficiently slow so as not to endanger an applicator when applying the toxicant outside in open air. A garlic warning odor added to the toxin makes concentrated gas accumulation noticeable. Tablets are carried in tightly sealed containers and workers wear gloves. Tablets are placed below ground and the holes are covered. Above ground, phosphide gas is quickly dissipated through aeration.

Workers engaged in other activities in treated areas would have a low probability of encountering any phosphide gas. Treated units will be signed, warning workers of fumigant use of the sites.

No risk to the general public is anticipated due to the rapid volatility and decomposition of the gas. The risk of adverse direct effects is low and the probability of human poisoning from aluminum phosphide fumigation would be unlikely due to the toxin's properties, application methods, treatment area locations, and the laws and safety procedures required to protect humans, non-target species, and resources.

The application of aluminum phosphide tablets below ground is not expected to cause cumulative effects with respect to public health or safety. Aluminum phosphide and its residues will not accumulate in the soils between applications, based on the toxin's low mobility and persistence and its short half-life.

ALTERNATIVE 3—Human Health and Safety

Threat of Wildland Fire to Public Safety and Property

Alternative 3 provides most of the hazard reduction that Alternative 2 does in the area south of the Middle Fork, reducing the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

Alternative 3 provides the same degree of fire hazard reduction as Alternative 2 does in the upper Vinegar Creek area.

Air Quality

The effects are similar to Alternative 2, except the amount of area treated is approximately 75% of that treated by Alternative 2. Therefore, the air quality benefit of Alternative 3 is expected to be only 75% of that provided by Alternative 2.

Herbicides

Herbicides are not used with this alternative; therefore the effects on human health would be the same as No Action.

Rodenticides

Rodenticides are not used with this alternative; therefore the effects on human health would be the same as No Action.

ALTERNATIVE 4—Human Health and Safety

Threat of Wildland Fire to Public Safety and Property

Alternative 4 provides only a small portion of the hazard reduction that Alternative 2 does in the area south of the Middle Fork. There is no thinning of larger trees and the access is not improved. The high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas is only slightly reduced compared to No Action.

Alternative 4 provides no fire hazard reduction in the upper Vinegar Creek area that was the result of the 1998 blowdown. The high hazard of a catastrophic fire destroying the private property and structures in the vicinity of the town site of Greenhorn is not reduced, and is identical to No Action.

Air Quality

The amount of fuels reduced through mechanical treatment and burning is the least of all the action alternatives. Only about 25% of the area treated by Alternative 2 is thinned by this alternative, and only smaller, noncommercial sized trees are cut. Prescribed burning is reduced to 84% of that planned for Alternative 2. Therefore, the air quality benefit of Alternative 4 is expected to be only 25% of that provided by Alternative 2.

Herbicides

Herbicides are not used with this alternative; therefore the effects on human health would be the same as No Action.

Rodenticides

Rodenticides are not used with this alternative; therefore the effects on human health would be the same as No Action.

ALTERNATIVE 5—Human Health and Safety

Threat of Wildland Fire to Public Safety and Property

Alternative 5 provides more hazard reduction than Alternative 2 does in the area south of the Middle Fork, reducing more of the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

Alternative 5 provides the same degree of fire hazard reduction as Alternative 2 does in the upper Vinegar Creek area. This alternative would treat the high fire hazard area that was the result of the 1998 blowdown area by salvaging the wind thrown timber. The high hazard of a catastrophic fire destroying the private property and structures in the vicinity of the town site of Greenhorn would be greatly reduced.

Air Quality

The effects are similar to Alternative 2, except the amount of area treated is approximately 16% more than that treated by Alternative 2. Therefore, the air quality benefit of Alternative 5 is expected to be 16% more than that provided by Alternative 2.

Herbicides

Effects would be the same as described for the Recommended Action alternative, but to a greater extent, as more 47% acres of competing vegetation would be treated.

Rodenticides

Effects would be as described for the Recommended Action, but to a greater extent, as 54% more acres of treatment are planned.

4.4.11 AMERICAN INDIAN TRIBES

Introduction

Motorized access is important for tribal elders to hunt, fish and gather berries. The potential effect to tribal treaty rights and interests is analyzed in terms of effects to motorized access and fish, wildlife and plant habitats.

ALTERNATIVE 1—American Indian Tribes

Under the No-Action alternative, motorized access would not change and have no effect on motorized access to traditional sites for hunting and gathering.

Aquatic habitat variables such as high water temperatures and high sediment delivery, low sinuosity, lack of woody debris and associated low frequency of pools, bank instability and lack of shade would continue and potentially affect fish populations. Reduced catch rates could have short-term and long-term effects on treaty fishing rights and subsistence fishing. Reduced consumption of fish could cause negative health effects to American Indians and subsequent effects to culture and economy of the tribes.

Cover for deer and elk would remain relatively well distributed except in the Summit Fire area and to a lesser degree the east side of the analysis area(see Appendix E, Map 2—Large Fire History). Elk and deer populations would remain out of proportion with available forage for the short-term. Native grasses, forbs and shrubs that require open, Dry Forest environments are not as numerous or vigorous as in the past and would continue to decline due to fire suppression. Noxious weed populations would continue untreated and spread to adjacent areas reducing the diversity of native plant and animal communities. These effects could potentially reduce habitat quality for sustaining treaty rights and resources.

ALTERNATIVES 2 and 3—American Indian Tribes

Improvements in motorized access would provide more opportunities for tribal members to access the area to participate in treaty rights for hunting and gathering. Reconstruction of roads and would improve fisheries resources by fixing problem areas contributing to degraded habitat conditions. Decommissioning of roads would likely eliminate motorized access to some traditional tribal hunting and gathering areas although information is not known about the location of these sites. Alternatives 2 and 3 would reduce open road access by 31 percent compared to the existing condition

Moving dispersed campsites away from riparian zones would improve fisheries and wildlife habitat and improve treaty resources. Streamside fencing, riparian planting, streamside protection measures, channel rehabilitation, and culvert removal would improve fish habitat and fisheries resource, and chokecherry habitat for berry gathering. Alternative 3 would rehabilitate the channel and floodplain only using hand crews but would not install new instream structures and would have a lesser effect on improvement of fisheries resources.

Timber harvesting would create short-term (5 years) impacts to berry crops, but improve overall habitat by creating openings in stands and reducing overstocked conditions to reduce the risk of large-scale fires and further resource impacts. Tribal members could potentially be displaced from these crops in the short-term.

Prescribed fire would potentially enhance or degrade some cultural plants that tribes collect for religious and subsistence uses depending on the extent, severity and intensity of the burn.

Spot application of chemicals on planting sites would affect shrubs, berries and roots used for food, medicine and religious practices. Three sites identified for noxious weed treatment occur near known populations of edible plants. Two sites occur within riparian areas and would be treated with direct wick or spot application that precludes any drifting of chemicals to adjacent sites. Chokecherry stands are more than 300 feet from this area and would not be affected. The other site supports biscuitroot and possibly yampah. The site would be treated by spot application and the main concentrations of edible root crops are several hundred feet from the site. Alternative 3 would not apply chemicals to any sites and would have no effect on tribal gathering of shrubs, root and berries.

ALTERNATIVE 4—American Indian Tribes

The effects to motorized access would be similar as described for alternatives 2 and 3 for road access, fisheries and wildlife habitat improvements. Timber harvesting would not occur under this alternative, and prescribed burning effects would be reduced from Alternative 2. Planting sites and noxious weed sites would not be treated by chemicals under this alternative and would have no effect on tribal gathering of berries.

ALTERNATIVE 5—American Indian Tribes

Open road access under Alternative 5 would increase by 24 percent in the long-term (10 years). The presence of more roads could potentially reduce subsistence productivity due to effects from road building. Increased competition between recreational and subsistence users would potentially create conflicts between people desiring to harvest traditionally collected species and recreational or commercial gatherers.

Habitat improvement activities for fisheries and wildlife would be similar as Alternative 2 and have the same potential to improve fisheries and wildlife resources for fishing and hunting to support subsistence and religious practices. Timber harvesting associated effects to fish and wildlife species would be the greatest under Alternative 5 due to the largest number of acres harvested. Alternative 5 would have the greatest effect on potential shrubs, roots and berries that could be sprayed by chemicals during reforestation activities to control competing vegetation as a result of the most acres identified for planting. Effects from noxious weeds spraying would be mitigated by spot application as described for Alternative 2.

4.4.12 ENVIRONMENTAL JUSTICE

Introduction

The analysis focuses on potential effects from the project to minority populations, disabled persons and low-income groups. The effects on American Indian populations are described above under "American Indians". Reference the above sections on "Nontimber Forest Products", "Human Health and Safety", and "Restoration Opportunities for Local Communities" for further discussions of effects.

ALTERNATIVE 1—Environmental Justice

All current uses of the National Forest System lands would continue including recreation, grazing, harvesting of nontimber forest products, special use permits, subsistence uses, and spiritual/aesthetic uses. Effects to minority populations, disabled persons and low-income groups would not be disproportionate with other users of the National Forest System lands.

ALTERNATIVES 2, 3, 4 and 5—Environmental Justice

The action alternatives provide a variety of opportunities for potential contracts. Refer to the discussion of "Local Communities" above for the comparison between alternatives. The alternatives would have no impact on the contracting process or the USDA Small Business Administration program for reserving contracts for minority groups for tree planting, precommercial thinning, and fire suppression to support employment and income would be available to all groups of people subject to existing laws and regulations for set asides, contract size, competition factors, skills and equipment, etc.

Set-asides for Small Business Administration Contracting opportunities would not be affected. Employment by firms that have hired Hispanic workers or other minority groups or low-income workers associated with reforestation or other potential contracting needs would not differ from those employed in the sectors as a whole. In the short-term (3-5 years) reforestation needs would potentially benefit this group due to the size of the potential need. Alternative 5 would have the greatest amount of planting (over 4,626 acres), following by Alternative 2 (over 2,264 acres), and Alternative 3 (over 2,039 acres). Alternative 4 would not reforest any acres and would not contribute toward employment of minority groups.

Changes in access due to increased improvements in road conditions and decreases in open road miles would occur in about 10 years. Alternative 5 would have the greatest increase (24 percent) and would potentially benefit disabled people, or low-income groups that require motorized access to participate in recreational activities such as hunting, dispersed camping, subsistence firewood gathering, or collection of non-timber forest products. Improvements to Deerhorn Campground would improve access for all people at that site. Universally accessible toilets at Deerhorn Campground and accessible toilets and parking sites at the Middle Fork Campground would not be affected.

Access for these groups to experience personal renewal, solitude, and visit places of importance to them would also be similarly affected. Increases in motorized access improve opportunities for mushroom collection, horn hunting, and firewood gathering which have been pursuits by lower income people. Some minority populations of Asian Americans have previously participated in commercial mushroom gathering following large fires in the area and would experience economic benefits due to increases in road access. Decommissioning of roads would limit these opportunities to potential user groups.

Alternatives 2, 3, and 4 would decrease overall open road access by 31-32 percent and would reduce accessibility for disabled or elderly populations to previously used dispersed campsites, or restrict firewood gathering for subsistence use. These effects would occur for all users of the project area and would not have a disparate impact on any particular minority groups.

A combination of timber harvesting and/or prescribed burning would alter habitat conditions and opportunities for collection of wild edible mushrooms and huckleberries depending on disturbance of the sites, similar changes with natural disturbance and successive stages of plant succession. The alternatives would maintain or enhance nontimber forest products through harvesting timber and prescribed burning to achieve a variety of habitat types. Chemical treatment of planting sites or noxious weeds would occur under all alternatives (except Alternative 4). No effect to wild edible mushrooms or huckleberries from chemical treatment of noxious weeds or competing vegetation would occur due to limited wick or spot application by hand on specific sites that have been surveyed. Mitigation measures of signing, posting bilingual information about sites affected and duration of effects, and patrolling of affected areas immediately following application would occur to ensure all forms of communication convey the appropriate information to minority populations. Opportunities for all groups of people to collect species from disturbed and non-disturbed sites would be maintained by all alternatives, and no disproportionate effect is anticipated to subsets of the general population.

None of the alternatives would have disproportionately high and adverse environmental effects on minority populations, low-income populations, or Indian tribes. The order directs federal agencies to focus attention on the human health and environment effects to ethnic minorities (American Indians, Hispanics, African Americans, and Asian and Pacific Islander Americans), disabled people, and low-income groups.

4.4.13 Financial Viability Of Timber Harvesting

Alternatives Comparison

All alternatives that harvest timber were analyzed in seven analysis areas (Tin Cup II, Blue, Austin, Bates, Gold, Ruby, and Gem). Each of the action alternatives would produce positive tentative advertised bid rates indicating that they would receive bids on the timber sale portion of the project.

Based on this analysis, Alternative 3 produces the highest tentative advertised bid rate overall at $59/ccf followed by Alternative 5 ($57.58/ccf) and Alternative 2 at $52.49/ccf. The Austin and Bates analysis areas would provide the highest bid rates and the most value per cubic foot removed whereas the Ruby and Gem analysis areas would provide the lowest value per unit. These two areas would harvest approximately 50 percent of the volume by helicopter contributing to the lower advertised bid rates. The no-action Alternative (Alternative 1) and Alternative 4 would not have bid rates since they do not propose timber harvest removal.

Revenue generated from the harvest proposals sold at tentative advertised bid rates would be the highest under Alternative 5 ($6.4 million) corresponding to the highest level of volume (56 MMBF). Alternative 2 would provide the next highest level of revenue at $4.7 million (45 MMBF) followed by alternative 3 with $3.9 million (34 MMBF).

Alternative 1 and Alternative 4 would not harvest any timber and therefore, would not produce any revenue or benefits to wood products industries.

Estimates for tentative advertised bid rates for the action alternatives fall within the range of rates experienced by the three Blue Mountain forests (Malheur, Umatilla, and Wallowa-Whitman) within the last several years (Analysis File USDA Forest Service 2002). Advertised bid rates have fluctuated over the last few years reflecting the volatility of the market for timber. Changes to prices would likely occur in the future at the time of the appraisal depending on actual market conditions at that time Table 219 illustrates the tentative advertised bid rate by alternative.

Table 219 Tentative Advertised Bid Rates in dollars per ccf. (hundred cubic feet)

Potential Sale	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Tin Cup II	0	$75	$69	0	$70
Blue	0	$58	$54	0	$58
Austin	0	$84	$79	0	$74
Bates	0	$115	$115	0	$115
Gold	0	$51	$45	0	$48
Ruby	0	$36	$70	0	$54
Gem	0	$27	$36	0	$28

Table 220— Tentative Advertised Bid Rates and Volumes

ITEM	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Bid Rate	0	$52.5/CCF	$59.0/CCF	0	$57.6/CCF
Revenue	0	$4.7 million	$3.9 million	0	$6.4 million
Cubic Ft. Volume	0	85,460 CCF	63,940 CCF	0	107, 920 CCF
Board Ft. Volume	0	45 MMBF	34 MMBF	0	56 MMBF
NOTES: ALT. = Alternative **CCF =** hundred cubic feet **MMBF =** million board feet					

4.4.14 ECONOMIC EFFICIENCY

Alternatives Comparison

Measurable and quantifiable economic market benefits identified in the Southeast Galena Restoration Project include discounted revenue from timber volume recommended for harvest. Revenue is derived from the tentative advertised bid rate for the timber multiplied by the total cubic-feet recommended for harvest and discounted to the present. Refer to the section "Financial Viability". Other nonmarket benefits that may occur as a result of the recommended 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, nonuse 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 units months, or fish population) is not well defined or measurable at the project level in terms that provide meaningful comparisons of commensurate dollar values. Refer to the previous discussion in this section on noncommodity and passive use values.

Measurable and quantifiable costs at the project level include costs to the Forest Service for preparing and administering the commercial timber and implementing other restoration activities for hydrology, aquatic, vegetation, recreation, access and noxious weeds by alternative. Some examples of activities by alternative that were included in the cost comparison include streamside hardwood plantings, channel and floodplain rehabilitation, instream fisheries structures, precommercial thinning, aspen enhancement, prescribed burning, road decommissioning, trails reconstruction, and improving dispersed campsites. The costs of these items are discussed under, Restoration Opportunities For Local Communities, page 216 and displayed in Figure 12 page 217. Refer also to Chapter 2 - Comparison Summary of Alternatives, for a complete list of activities.

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 (Alternative 1) and Alternative 4 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. Alternative 1 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 shown in the table.

Because present net values are negative, the comparison of alternatives is an illustration of the figures bearing in mind that the highest numbers demonstrate the greatest overall costs compared to benefits. Alternative 3 would produce the greatest present net value (-$2.7 million), followed by Alternative 5 (-$3.7 million) and Alternative 4 (-$3.8 million). Alternative 2 would produce the smallest present net value (-$4.0 million). . Figure 10 illustrates the discounted benefits and costs, and present net value by alternative.

Figure 13 Present Net Value

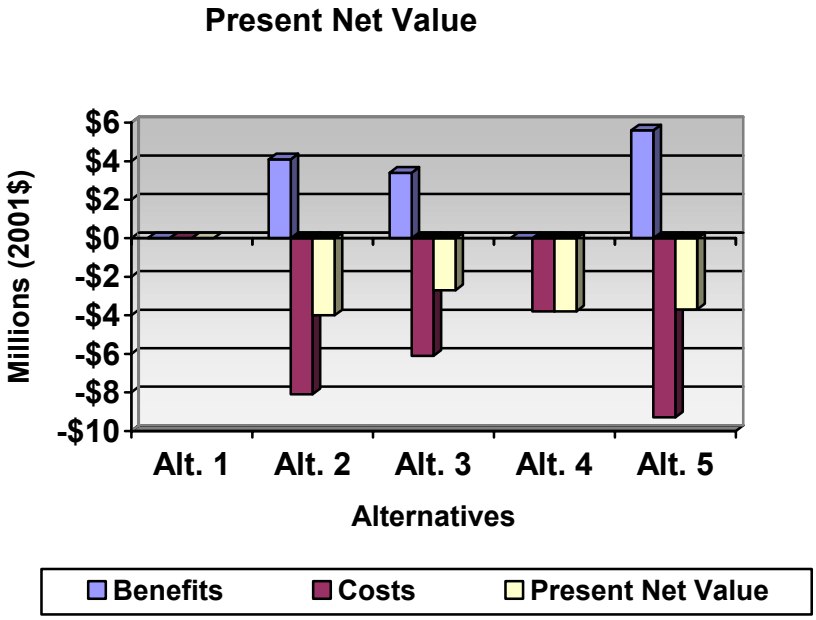

Table 221 Present Net Value

	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Benefits	$0	$4.1 million	$3.4 million	$0	$5.6 million
Costs	$0	$8.1 million	$6.1 million	$3.8 million	$9.3 million
Present Net Value	$0	-$4.0 million	-$2.7 million	-$3.8 million	-$3.7 million
Per cent change	0%	0%	+32%	+5%	+7%

Alternative 5 has the highest discounted costs of the action alternatives due primarily to the larger amount of volume harvested and associated sale preparation and harvest administration costs (25 percent) and higher (18 percent) road costs associated with harvested volume compared to Alternative 2. Alternative 3 discounted costs would be 24 percent lower than Alternative 2 due to the lower amounts of volume harvested and associated sale preparation and harvest administration costs (25 percent) and elimination of the channel floodplain rehabilitation and new instream structures (approximately $250,000). Alternative 4 would have the lowest costs of the action alternatives due to no timber harvesting and no associated sale preparation and harvest administration costs ($3 million in Alternative 2), elimination of the channel floodplain rehabilitation and new instream structures, and reduction of approximately $300,000 costs for

prescribed burning and precommercial thinning costs. Alternative 1 would have no project-associated costs for comparison to the action 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 include improvements to soil productivity, reduced erosion, water quality improvements in temperature, 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 $55 for salmon and $160 (1999$) 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 Aquatics section of this DEIS 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 Terrestrial sections of this DEIS for further discussion of effects to these resources.

Other opportunity 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 social, economic and environmental consequences sections in this DEIS for a discussion of effects to ecological and human elements for a relative comparison between alternatives.

4.4.15 Farmlands, Wetland, and Floodplains

There are no prime farmlands within the project area on National Forest System Lands. All alternatives are in keeping with the intent of Secretary of Agriculture Memorandum 1927 for prime farmland, rangeland, and forestland.

Impacts on wetlands and floodplains from projects described in Chapters 1 and 2 are anticipated to have short-term adverse impacts with expected long-term benefits as described throughout this chapter. Design and measures recommended in the alternatives would minimize risk of flood loss; restore, enhance, and preserve floodplain values; and protect and enhance wetlands. Subsequently, recommended projects identified in the alternatives meet the intent of Executive Order 11990-Protection of wetlands and Executive Order 11988-Floodplain management. Those areas discovered during project activities would be protected as directed by Forest-Wide Standard #56.

4.5 SYNERGISTIC EFFECTS

Introduction

Effects of past, present, and foreseeable future actions for individual resources are discussed earlier in this chapter. The resource and human use trends and assumptions made in this analysis have also been discussed earlier. Those sections also disclose the pertinent direct/indirect, cumulative, irreversible/irretrievable effects anticipated in varying degrees and depending upon the magnitude and intensity of each effect.

This section presents the "synergistic interaction of different effects,"[71] disclosed under the resource sections that quantitatively and, where necessary, qualitatively interact with each other, using benchmark dates of approximately 5, 10, 50, and 125 years from project completion. While the physical character of resources and management direction may change—these changes would be speculative at best, therefore are not discussed.

Examination of the cumulative impacts of the recommended and alternative projects, show that the two greatest influences on most of the resources and uses of the project area are:

- The **transportation system**, due to amount and location of roads needed for the management of the resources and access for forest users, and
- **Vegetation condition**, due to existing composition, structure, and density being out of sync with historic ranges primarily influence by past harvest, fire suppression, and grazing.

Transportation System

The recommended projects of decommissioning roads, relocation of roads, reconstruction of roads, and closures of roads within the project area, all have a direct influence on recreational uses, as well as the protection of resources. About 18% of the total transportation system would be reduced in action Alternatives 2 and 3, with Alternatives 4 and 5 reducing total miles by 24% and 15% respectively. The majority of these projects would be completed in the next 5 to 10 years from the time of project initiation. Some reconstruction and decommissioning in Alternative 4 would probably have some work remaining beyond 10 years. In Alternative 1, roads would contine to degrade due to lack of monies to maintain the amount of roads left open.

Socio/Recreation

Recreation and the related transportation system uses are expected to increase slightly as people continue to discover the beauty of this area's resources and the offered solitude of Dixie-Butte and Greenhorn Roadless Areas, which includes the Vinegar Hill-Indian Rock Scenic Area. Demands for a safe, accessible transportation system will increase as demands for public and management uses continue.

Fewer dispersed campsites would be available in all action alternatives due to the decommissioning of roads within RHCAs, possibly reducing direct road access to favorite, traditional camping sites and fishing opportunities. However, in each alternative, a network of roads would remain open for recreation and management uses. The major difference among the alternatives is that Alternatives 2, 3, and 4 would decommission the transportation system located in the Little Butte and Deerhorn Subwatersheds, whereas Alternative 5 these subwatersheds would be reopened. The increase in open road miles in Alternative 5 would increase access for recreational uses, land management activities, and fire fighting response time over Alternatives 2, 3, and 4.

[71] Footnote to CEQ 1997 "Considering Cumulative Effects Under the National Environmental Policy Act" p.8.

Roadless Character

Because of decommissioning projects, Alternatives 2, 3, and 4, could potentially add about 1200 acres in Little Butte and Deerhorn Creeks to the northeast boundary of Dixie Butte Roadless Area in the next round of Forest planning. Roadless character would be enhanced due to the decommissioning of the transportation system. Under Alternative 5, this area would remain roaded. Likewise, in the Placer Gulch drainage, as roads are decommissioned under Alternatives 2, 3, 4, and 5, roadless character would be enhanced and could potentially be added to the east side of the Dixie Butte Roadless Area. Both of these areas have been substantially modified due to past activities such as placer mining and railroad logging, but despite the substantial alteration of these areas, road access to these areas would be reduced, enhancing a sense of solitude.

Some concerns have been expressed that by implementing recommended infrastructure projects of road closures and decommissioning, more traffic would be concentrated on fewer open road miles increasing road bed impacts. It's understood that more use on fewer miles in itself may be detrimental, but the expected dollars can be expected to better cover maintenance needs due to less miles remaining open in Alternatives 2, 3, and 4. Alternative 5 would leave an additional 50 miles open compared to the previous action alternatives.

Aquatic/Fisheries

Many roads affect hydrologic function and fish habitat across the project area. Hydrologic function, particularly stream channel morphology, is slowly improving, which correlates to the slow improvement of fish habitat. Projects recommended to accelerate this improving trend include decommissioning of roads, reconstruction of roads, relocation of roads, and the closure of roads along with improved fish passage by replacing or removing culverts that are impassible by fish. These projects would have long-term impacts of stabilizing old roadbeds reducing sediment delivery to nearby drainages. Risk of erosion, sedimentation, channel alteration, intensified peak flows, and reduced base (summer) flows would gradually decrease in about 5 to 10 years. Greater improvements would be noticed within 50 years primarily due to established riparian and conifer vegetation. This trend would result in the long-term benefit of providing habitat, which supports viable fish populations. Riparian areas that are currently occupied by a road to be decommissioned would be re-vegetated creating more shade helping maintain cooler water, creating hiding cover protecting fish from predation, and stabilized stream banks reducing sediment delivery for fish. Concentrated water flows caused by roads would be reduced in all action alternatives allowing overland flows to absorb into the local water tables improving late season flows. Alternative 1 would see continued degradation of the transportation system increasing sediments being delivered to near by drainages degrading fish habitat and continuing to intercept overland flows reducing water infiltration to local aquifers reducing the availability of water for late season flows.

Terrestrial Wildlife

Due to the many RHCA enhancements and improvements previously discussed, a benefiting resource is the wildlife that uses this area. Hiding cover would be increased and potential fawning/calving areas would be better dispersed across the project area. Improving riparian vegetation would also provide increased opportunity for migratory bird use for their protection from predation. Miles of open road, correlated to big game disturbance, would be reduced in Alternatives 2, 3, and 4 by about 31% over the current condition with Alternative 5 increasing open roads by about 20%. This change would occur in about 10 years from the time of the decision to implement these projects.

In Alternatives 2, 3, and 4, the decrease in open road densities would decrease access compared to Alternatives 1 and 5 decreasing possible wildlife harassment. Alternative 5 would keep about 73 miles more roads open than Alternatives 2, 3, and 4. The Little Butte and Deerhorn Subwatershed transportation system would be reopened with Alternative 5 improving access to this area, unlike Alternatives 1, 2, 3, or 4.

Vegetation Conditions

A key component of most of the restoration projects are to manage vegetation toward a more sustainable, resilient condition. Vegetation has a far-reaching influence on other resource and human needs and therefore has an important role in the ecosystem across the entirety of the landscape. Part of the purpose of this analysis is to show how shifting forested stands toward the historical Range of Variation (HRV) would reduce the risk of infestations, infections, and large-scale uncharacteristically severe wildfire, such as the Summit Fire (see Appendix E, Map 2—Large Fire History). The Summit Fire occurred adjacent to this project area, which is a part of the same greater watershed. The recommended mechanical and prescribed fire projects would reduce the risk of infestation, infections, and another uncharacteristically severe wildfire and would have short- and long-term impacts on wildlife habitat, hydrologic function, and socio/economic impacts.

Watershed Function

In determining watershed concerns and how the alternatives differ in responding to those concerns a model to identify potential watershed concerns was used. An equivalent roaded area (ERA) model displaying cumulative effects of the watershed resource conditions helped to accomplish *Land and Resource Management Plan* direction in that a model will be applied to identify potential situations. (*Land and Resource Management Plan* pp. IV-48). This model is intended to show trends and not to be interpreted as an absolute for potential significant impacts.

The ERA model incorporates possible impacts from roads, logging, upland cattle grazing, and fires. Values applied to these potential impacts are compared to a threshold of concern (TOC), which is an index of the potential hazard that ground disturbing activities may adversely affect streams.

It is recognized that there would be some short-term increases in disturbance even with mitigation reducing that risk from the recovery project activities in the first 1 to 5 years. Reversal of some adverse watershed condition trends and escalated recovery of others are expected to start overall watershed improvement within 5 to 10 years. Establishment of riparian vegetation and development of functional pools are two key improvements in this recovery effort that includes the additional recovery of beaver habitat. Once vegetation is recovered, opportunity to re-introduce beaver would exist, setting the foundation for long-term maintenance in pool structure that the beaver population would provide. Rehabilitation is likely to take 25 or more years to be fully effective with the establishment of vegetation on the eroded areas. Long-term benefits establishing fish and wildlife uses and late season availability of water across the landscape is expected in 50 to 125 years.

Vincent drainage is the one exception where the results peak over the TOC in both Alternatives 2 and 5 primarily due to the amount of tractor skidding. However, Alternative 2 would once again recover below the TOC about two years with Alternative 5 recovering in about five years. Long-term recovery and improvement of riparian vegetation and stream meander is anticipated.

Hydrologically, a number of isolated areas of accelerated surface erosion caused from past activities would be reduced, following initial project implementation in all action alternatives. Risks of events similar to the Lemon Creek debris torrent would be reduced in a manner proportional to the percentage of the area treated, and would gradually decline over time and is expected to be recovered in 125 or more years with the restoration of vegetation on these areas. Subsequently, the risk of reducing quality or quantity of fish habitat including pools, riffles, and shade, due to debris torrents would be reduced.

Vegetative recovery across the uplands coupled with the road recovery project previously discussed, is expected to reduce runoff and concentrated flows, which would limit sediment movement. As concentrated flows decrease, sediment accumulates over time, and then vegetation recovers resulting in long-term water storage increase improving late season flows for fish and wildlife habitat.

HRV

Currently, forest stand structural balance is not meeting the desired condition of a resilient, sustainable, fire adapted condition. The largest discrepancy in the project area's forest structural stages exist in the OFSS.

In Alternative 2, development of old forest stand structures in recommended thinned stands, with the increased growth rates, would take about 50 years. The modified thinning prescriptions would take an additional 20 to 40 years to develop old growth characteristics. This compares with the 110 years that a stand without treatment is expected to take to develop old growth characteristics. Species conversion treatments are expected to result in old forest structural stages in 20 years, compared with 60 years with not treatment. Due to these recommended treatments, there is a decreased risk of large-scale disturbances such as insect defoliators, disease infections, or stand-replacing fires that would set back structural stage development, both for the treated stands and surrounding stands. This lowers the risk of loosing wildlife habitat and preserves recreational values and out year product potential.

In Alternative 3, approximately 75% of the stands would be treated compared to that treated by Alternative 2. Development of old forest stand structures in the commercially thinned stands would be the same as in Alternative 2. There is also a proportionate decreased risk of uncharacteristically severe wildfire that would set back structural stage development, both for the treated stands and surrounding stands.

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. Only a small portion of the stands treated by Alternative 2 would be treated by Alternative 4, and those that are treated would be only pre-commercially thinned rather than treating the medium sized trees. Development of old forest stand structures in the thinned stands would realize only a slight increase in growth rates over a short time. It would take about 100 years for old growth to be developed in this alternative, very similar to Alternative 1 – No Action. There is a slightly decreasing risk of large-scale stand-replacing fires that would set back structural stage development, but it is essentially the same as the No Action alternative.

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. In Alternative 5, development of old forest stand structures in the thinned stands, with the increased growth rates would take about 50 years as displayed under Alternative 2. There is a decreasing risk of large-scale stand-replacing fires that would set back structural stage development, both for the treated stands and surrounding stands.

Stands treated would be, or would be growing toward, the expected range of variation (ERV) for stand structure.

Table 222 Expected Dry Forest % Structural Stage in 125 years per Alternative

ALTERNATIVE	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
1 Existing	5	42	35	7	30	1	12
2	5	20	2	7	24	34	9
3	5	25	3	7	26	23	11
4	5	42	3	7	28	3	12
5	5	19	2	7	20	38	8

NOTE: *This table is for comparison only* and only shows the future effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.

Table 223 Expected Moist Forest % Structural Stage in 125 years per Alternative

ALTERNATIVE	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	10-30%	5-10%	10-20%	10-20%	15-20%	5-15%	15-40%
1 Existing	6	6	4	6	39	5	34
2	6	3	4	6	35	11	34
3	6	5	4	6	36	8	34
4	6	6	4	6	38	6	34
5	6	4	4	6	34	12	34

Beyond the acres mechanically treated, small tree thinning, and fuel reduction of harvest and thinning produced slash, prescribed fire would be applied to an additional 11,0370 acres in Alternative 2, 10,640 acres in Alternative 3, 17,230 acres in Alternative 4, and 10,780 acres in Alternative 5. The acres varied due to amount of areas treated mechanically prior to applying prescribed fire, and lack of accessibility to safely burn in the Little Butte and Deerhorn drainages.

Prescribed fire would also benefit the project area by reducing the number of smaller trees, removing many of the less tolerable trees to fire, and reducing fuel accumulations all of which reduce the ladder fuels that allow ground fire to climb into the crowns of the over story.

A forest stand's crown-fire hazard rating is assigned by evaluating their current uncharacteristic condition of species mix (species less resistant to fire), smaller age class (more ladder fuels), and overstocking (more fuel to burn). In this project area, 66% of the forested acres have a high rating. The changes displayed on the following table are primarily in response to the recommended mechanical treatments.

Table 224 Percent of Fire Hazard per Alternative

CROWN HAZARD	ALT. 1 EXISTING	ALT. 2	ALT. 3	ALT. 4	ALT. 5
DRY FOREST					
High	66%	44%	50%	61%	40%
MOIST FOREST					
High	60%	55%	56%	59%	54%
LODGEPOLE PINE					
High	98%	No Change	No Change	No Change	No Change
COLD FOREST					
High	84%	No Change	No Change	No Change	No Change

NOTE: Crown hazards were determined by using stand densities based on the following assumptions:

- For the Dry Forest and Moist Forest Type's, the stands indicated for treatment plus dense stands that were not recommended for treatment due to other resource objectives such as Dedicated Old Growth stands. However, information was not available on all stands and these stands were not put in the high level. Therefore, the crown fire hazard may be underestimated.
- For the Lodgepole Pine and Cold Forest Type's, the stand initiation stage was rated as low. All other stages were rated as high due to the high densities of the stands based on field observations and aerial photo interpretations.

These mechanical and prescribed fire projects are designed to reduce chance of fire reaching tree crowns; however, the results of this effort is not enough to slow down a crown fire once fire has reached the overstory crowns. An exception may be the HSH mechanical treatments, which substantially reduces the forest stand crown cover.

The more overstocked forest stands treated equates to less risk of losing habitat to large uncharacteristic severe wildfire and the more the area would embrace periodic fire without experiencing the devastating results such as experienced with the Summit fire (see Appendix E, Map 2—Large Fire History). In addition, specifically in the Dry Forest types, areas of open park like conditions, the more forest stands treated within a given alternative, the less fuel there would be to burn. Therefore, when a fire does occur, there would be

less fuel to burn proportionately with the given alternative, which equates to less particulates being released into the air resulting in reduced impacts visually to our air sheds and for people with breathing problems.

In applying a combination of mechanical and prescribe fire help to reduce the risk of fire, which equates to less chance of adverse affects occurring on other resource needs across the project area. Wildlife habitat would be more resilient and better balanced for multiple species needs. Recreation opportunities would continue to be available and uses enhanced for roaded and unroaded experiences. However, there would still exist a high risk for an uncharacteristic large event in occurring to the majority of forest stands located in the wildlife emphasis area, Vinegar Hill/Indian Rock Scenic Area, and both the Dixie-Butte and Greenhorn Roadless Areas, as expressed under Alternative 1.

Aspen

Quaking aspen stands under Alternative 1 would continue to be encroached on by conifers, leading to decline in vigor and numbers. Lack of protection from grazing by cattle and wildlife would reduce the numbers of suckers that are able to grow into trees, in many cases almost eliminating reproduction. The few stands presently remaining would continue to decline and disappear.

Under all action Alternatives, aspen stands would be released from competition by conifers, leading to an increase in vigor and numbers. The only difference among the alternatives is that in Alternative 4, the encroaching conifer would be dropped and not removed. Protection from grazing by cattle and wildlife would increase the numbers of suckers that are able to grow into trees, increasing the size of aspen patches.

After about 5 years, most aspen stands would be fenced, and suckers would be growing without being browsed. Some may be up to 1 inch diameter and 8 to 12 feet tall. The genetic diversity of aspen clones across the landscape would be maintained. In about 10 years, regeneration would be well established, and many stems would be large enough to resist ungulate browsing as fences deteriorate. If the stand is regenerating vigorously, there may hundreds to thousands of stems present. In 25 to 50 years, on most of the aspen sites stems would have self-thinned and survivors exhibit rapid growth making them relatively immune to ungulate damage and contain root systems capable of sustaining vigorous re-growth of suckers. The established stands would be 30 to 60 feet tall and showing expansion of the stand.

The establishment of these aspen stands have benefits for wildlife dependent on this diverse environment, recognized by the *LRMP* as a unique habitat, and for the casual recreationists enjoying the intrinsic values that aspen provides over the project area.

Wildlife

The spectrum of harvest treatments across the range of alternatives has varying impacts on the vegetation, which has direct shot-term impacts and long-term benefits on wildlife habitat. This includes the improvement of forest structure particularly moving forest stands toward the old growth structure, of old forest single story (OFSS) character. This old forest type is lacking in the project area, which typically are open park like, with large ponderosa pine and western larch dominating the overstory. Keying in on Alternative 2 and on OFSS, the recommended mechanical treatments would increase this structure from the existing 2% to 4% in 10 years; up to 15% by year 50, 18% by year 75, and 22% by year 125. Wildlife would benefit by having a more historically balanced fire adapted forest regime across the project area. Habitat for wildlife species dependent on OFSS would increase while habitat on a short-term basis would decrease for species that are dependent on old growth multi-story (OFMS) structure, however, OFMS would still be within HRV. Viable populations would reside in a more historic condition across the project area.

The table below displays specifically the expected % change of the OFSS and OFMS structure. For a perspective across all structural stages, see HRV above.

Table 225—Project Percentage of Change for OFSS and OFMS in Dry Forest Types in 125 Years:

STRUCTURE	HRV	ALT. 1 EXISTING	ALT. 2	ALT. 3	ALT. 4	ALT. 5
OFSS	30-55	1	+33	+22	0	+37
OFMS	5-15	12	-3	-1	0	-7

Table 226—Project Percentage of Change for OFSS and OFMS in Moist Forest Types in 125 Years:

STRUCTURE	HRV	ALT. 1 EXISTING	ALT. 2	ALT. 3	ALT. 4	ALT. 5
OFSS	5-15	5	+6	+3	0	+7
OFMS	15-40	34	0	0	0	0

Alternatives 2, 3, and 5 would benefit wildlife by year 50 due to large trees being more available for potential large snags that are currently lacking predominantly in the Dry Forest types across the project area. Many species would benefit by this increase, especially snag dependent woodpeckers for cavity nesting and foraging.

Under Alternative 1 and to a lesser extent Alternative 4, other wildlife preferred vegetation such as mountain mahogany would continue to be encroached on by conifers, leading to decline in vigor and numbers. Other shrubs, which were adapted to sprout after frequent fires and need sunlight, would continue to decline as the stands become more closed. Pinegrass, and other ground vegetation, would continue to decrease in vigor and forage quality with increasing shade and lack of nutrient cycling provided by burning. Under Alternative 4, pre-commercial thinning would reduce the number of smaller conifers encroaching on mountain mahogany, slightly increasing the shrub vigor and numbers as compared to Alternative 1. Other shrubs, which were adapted to sprout after frequent fires and needing sunlight, would increase as the stands are burned and become more open. Pinegrass, and other ground vegetation, would slightly increase in vigor and forage quality with decreasing shade and increased nutrient cycling provided by burning. There would be no benefit in the Little Butte and Deerhorn drainages due to no burning recommended in these areas.

For stands recommended for treatment under Alternative 2, thinning prescriptions would reduce the conifers encroaching on mountain mahogany, increasing the vigor and numbers of plants. Other shrubs, which were adapted to sprout after frequent fires and needing sunlight, would increase as the stands become more open. Pinegrass, and other ground vegetation, would increase in vigor and forage quality with decreasing shade and increased nutrient cycling provided by burning. Alternative 3 would benefit shrubs and grasses to lesser degree than Alternative 2. There would be no benefit in the Little Butte and Deerhorn drainages due to no burning. The effects of Alternative 5 would be similar to Alternative 2, but to a proportionately larger degree since more stands would be treated.

Table 227—Percent of Areas Treated Per Alternative Needing Treatment

TREATMENT	ACRES NEEDING TREATMENT	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Commercial Thinning	9249	0%	75%	57%	0%	79%
Pre-commercial Thinning	3345	0%	93%	79%	82%	93%
Shelterwood	9322	0%	18%	13%	0%	28%
Understory Removal	1614	0%	54%	34%	0%	75%

This improved understory vegetation would benefit the range program as well by having more browse in the uplands, dispersing ungulates more evenly across the project area taking pressure off RHCAs. Subsequently, RHCA habitat would improve due to reduced ungulate pressure on the riparian vegetation, which would benefit fish and other wildlife dependent upon this habitat. Cumulatively with other RHCA

improvements, fish populations and wildlife use would increase; consequently, human uses such as fishing and wildlife viewing and hunting would improve.

Socio-economic

Of the approximate 50,000 acre Southeast Galena Restoration Project Area, about 21,500 acres of forested stands were identified as in need of treatment, due primarily to stand structure (size variance), composition (species mix), and density (stocking). Of the 21,500 acres, 51% would be treated in Alternative 2, 36% in Alternative 3, 13% in Alternative 4, and 59% in Alternative 5. These treatments would provide numerous wood products including timber products estimated at about 44 million board feet (MMBF) from Alternative 2, 33 MMBF from Alternative 3, 0 MMBF from Alternative 4, and 55 MMBF from Alternative 5. Within these recommended tractor harvest units, other wood products that may be utilized include post and poles, fire wood, and chips that could add an additional 69 MBF from Alternative 2, 14 MBF from Alternative 3, 0 MBF from Alternative 4, and over 100 MBF from Alternative 5. These various projects would help to provide numerous opportunities for large and small contracts including mills that process merchantable material for dimension lumber to the treatment of slash that would be available for chipping for fiber or as fuel for cogeneration plants. All of these opportunities help to accomplish the desired outcomes of many of these restoration projects.

Many of the 21,500 acres identified as needing to be managed are not being mechanically treated due other management objectives and standards for roadless areas, scenic areas, wildlife winter range, RHCAs, and strategies for lynx. These objectives, standards, and strategies do not necessarily maximize forest stand resiliency and sustainability. Depending on the situation and need, an area may be better off leaving in its current condition while other surrounding conditions are allowed to recover..

Under Alternative 1, existing dwellings and the small communities of Austin, Bates, and Greenhorn are in an interface with forestlands. These areas are vulnerable to loss of life and property from wildfire. Suppression efforts could be increasingly hazardous and expensive depending on the extent of the fire, whereas, under the action alternatives, this risk is lowered proportionately depending on the amount of both mechanical and prescribed fire recommended .

Demographic changes in terms of total numbers of people would continue to directly and indirectly affect the ecosystem. As a result of expected national population growth along with higher standards of living, demand for wood products, minerals, and water to support larger houses, increasing use of technology and energy demands would continue.

Effects may negatively or positively affect private property values depending on the event and the location. In examples where forest management activities benefited the environment, and improved the local natural amenities, property values increased (Niemi and Whitelaw 1997). Adjustments in terms of local or regional effects to forest products businesses from private and industrial lands would depend on timing and local employment conditions. For example, wildfires would potentially benefit certain species such as wild edible mushrooms that are commercially harvested in large quantities following fires thereby providing increased employment locally. Effects to tourism and recreation employment that relies on amenity values and scenic values produced in the area would likely decrease in the short-term until recovery or activities mitigated negative effects.

Economic changes in terms of the types of industries supporting the economy in the region would continue to evolve due to greater national and global demands for resources. Changes in definitions and composition of ecosystem management industries, pricing structures and market mechanisms that reward certification of sustainable products would affect the economic diversity and socioeconomic resiliency. Changes in environmental and economic policy and law would continue although predictions about possibilities for change are speculative.

Demographic changes would also influence employment skills needed for the future. The Hispanic ethnic group in Oregon more than doubled from 1990 to 2000, and demonstrates the reason a quarter of Oregon's

private sector employers were not satisfied with the Spanish language skills of a majority of their current workers (Oregon Employment Department 2000).

Changes in ecological and social values would continue to emphasize restoration of aquatic, terrestrial and botanical habitats and species. Increased opportunities for stewardship activities would support non-commodity values and mitigate negative socio-economic effects with increased opportunities in restoration. Subsequently, social values that prefer protection of clean water, air quality, and scenic integrity for example would increase relative to economic values for commodities such as timber and forage production. Cumulative effects to local communities as a result of broader scale changes would potentially cause the need for greater adaptability at the local scale. The ability of local communities to adapt fast enough to change would be difficult without new employment opportunities for rural communities with a low potential for diversity.

Cultural changes in involvement by local communities, growing use of partnerships and collaborative efforts between local, state, federal agencies, tribal governments, partners and the public would continue to be emphasized in the future. Public perceptions about the efficacy of these efforts and results would continue to be subject to controversy and debate. Tribal governments will increasingly seek to exercise their treaty rights on public lands and elevate awareness of the United State's trust obligations for meaningful consultation with the tribes to provide for natural resources that are important to tribal self-government.

Cumulatively, greater numbers of people would increasingly exert adverse pressure and effects on the biophysical environment, therefore, these greater numbers would cumulatively affect the social and economic environment.