Chapter 4
Environmental Consequences

Introduction

This chapter describes the environmental consequences of implementing the seven alternatives described in Chapter 2. The chapter is organized according to the issue categories identified in Chapter 1, describing the effects of each of the alternatives within each issue category. Under each issue category is a description of the assumptions used in the analysis, general relationships of the decisions made in this RMP to environmental effects, and a description of the effects of each of the alternatives. Each section starts with a summary of the environmental consequences for that issue category.

Relationship of Decisions to Environmental Consequences

The Upper Deschutes Resource Management Plan is a land use plan that guides future management actions. Decisions made within this plan are primarily land use decisions as described by the BLM Land Use Planning Handbook (Handbook 1601-1). These are decisions about allocations and allowable uses or conditions under which future activities will be conducted, rather than site-specific decisions that authorize an activity. Land use decisions as provided for here generally do not make irreversible or irretrievable commitments of resources, and will require subsequent analysis as required under the National Environmental Policy Act before they are implemented.

Direct, Indirect, and Cumulative Effects

The Council on Environmental Quality directs federal agencies to examine three types of effects of their decisions: direct, indirect, and cumulative. Direct effects occur at the same time and place as the federal action or decision; indirect effects are caused by the decision, but take place at a later time or are farther removed in distance, but are still reasonably foreseeable; and cumulative effects are the combination of direct and indirect effects of the decisions made here, combined with other continued trends or anticipated effects that are outside of the scope of the RMP decisions, but may affect the resources discussed here. For instance, projected population growth rates within the planning area are not affected by the decisions made in this plan, but are likely to continue to affect the resources analyzed here.

Land use decisions generally fall into the “adoption of formal plans” category as described by CEQ regulations[1]. These kinds of decisions have limited direct effects on the natural and physical environment because they do not make irreversible and irretrievable commitments of resources, but rather make decisions about the availability of lands for certain uses or the conditions under which future uses may or may not occur. Consequently, most of the environmental effects discussed in this chapter are based on indirect or reasonably foreseeable future actions that are a likely outcome of implementing the land use plan. These reasonably foreseeable or probable actions are primarily represented by assumptions or general relationships of the decisions to the environmental effects and are described in the beginning of each section.

Critical Elements of the Human Environment

The BLM requires consideration of certain elements that are identified as critical elements of the human environment. These include effects to air and water quality (ground and surface), energy resources, cultural resources, hazardous and solid waste, invasive and non-native species, floodplains, wetlands and riparian zones, prime and unique farmlands and threatened and endangered species. Critical elements also include effects to special designations such as suitable or designated Wild and Scenic Rivers, Areas of Critical Environmental Concern (ACEC), National Natural Landmarks or National Landscape Conservation Areas, Wilderness and Instant Study Areas, significant caves (in accordance with the Federal Cave Resources Protection Act); and effects on native American religious concerns, the Environmental Justice Act, and the national energy policy.

The planning area does not include any designated Wilderness areas. Prime or unique farmlands exist within the area (see Chapter 3), but are not affected by the decisions made in this plan. Other critical elements are discussed in this chapter under each of the issue categories.

Environmental Consequences of the Alternatives

General Assumptions

Throughout this analysis, assumptions about expected future actions or conditions, or general relationships between the decisions being made and expected environmental consequences, are used to facilitate the analysis. Some basic assumptions used for all resources are described below.

Decision Authority

All decisions made by the RMP would be in accordance with national policy and direction, and would be in force until a revised or amended land use plan changes those decisions. All RMP decisions anticipate continuation of all valid existing rights. Currently authorized permits would be brought into compliance with new requirements as soon as is reasonably practicable following the Record of Decision, and in accordance with legal authorities that guide those permits.

Duration of the Plan

The RMP is expected to guide land use activities for the next 10-20 years.

Implementing the Alternatives

All of alternatives anticipate future actions needed to implement management direction that will require funding and personnel. For many program areas past funding has been insufficient to meet demands, and future funding levels are uncertain, but are not likely to show substantial increases. For the purposes of this analysis, we have assumed that existing resources and personnel would be redistributed to respond to new priorities set by this plan, although the amount of work accomplished annually to meet plan direction would continue to be dependent upon annual budgets and overall BLM priorities. Full plan implementation assumes increased cooperation with other agencies, supplemental funding and resources supplied through grants, and an active volunteer program.

Mitigation

Mitigation measures that would avoid, minimize, rectify, reduce, or compensate for adverse environmental effects of implementing the alternatives are included in the allocations, allowable uses, objectives, and guidelines for each of the alternatives. These are summarized in Chapter 2, and described in detail in Appendix A. All analyses presented here incorporate those requirements.

Acreage

Acreage figures and other numbers used in this analysis are approximate projections for comparison and analytic purposes only. They do not reflect exact measurements or precise calculations.

Ecosystem Health and Diversity

The goal for this issue is to restore and support healthy ecosystems in conjunction with expected human population levels and uses, vegetation and wildlife habitat needs, riparian conservation strategies, watershed restoration methods, and economic reliance of the population on public lands. Land uses and activities would emphasize ecosystem sustainability and health throughout the planning area. In addition, the agency recognizes fire's role in the ecosystem and establishes risk classes that provide guidance for fire suppression and fuels treatments, particularly in the wildland urban interface areas. Ecosystems would be managed to re-introduce an approximation of natural disturbance cycles through the use of prescribed fire and mechanical methods.

Vegetation

Summary

Alternative 1 (the current situation), would have the greatest effects on vegetation in terms of uncontrolled motorized recreation and travel in "open" areas. Direct effects on vegetation by motorized vehicles would be more widespread, occurring on more acres off roads and trails. In terms of acreage, this effect has occurred, or has the potential of occurring, on 38 percent (154,000 acres) of the planning area.

Common to Alternatives 2-7, a designated road and trail system is proposed. As a result, motorized recreation and travel effects on vegetation would only occur within the area determined by the width and length of existing or new roads or trails. This would minimize the effect on plant communities, although some illegal travel and access would occur. The potential for spread of noxious weeds or other undesirable invasive plant species by motorized travel (and travel by any means) would continue to be present. Of the action alternatives, the alternative with the least effect would be Alternative 7 because it closes the greatest amount (23 percent) of area to motorized travel (91,000 acres). The action alternative with the most effect to vegetation would be Alternative 2 because it closes only 5 percent (20,370 acres) of the planning area to motorized travel.

Alternatives 3, 6 and 7 would have the greatest ecological benefit to vegetation since they would treat the greatest amount of acreage with restoration and fuels reduction treatments (230,250 acres). Alternatives 2, 4 and 5 would have less ecological benefit since they treat 168,310 acres. Alternative 1 would have the least ecological benefit because it proposed to treat only 71,000 acres.

The "historic" vegetation management strategy implemented under Alternatives 3, 6, and 7 would restore ecosystems and reduce wildfire potential faster and over a broader area than other alternatives. Treatments using this strategy would return ecosystems to their historic condition and distribution for major vegetative types. While the exact vegetative condition and distribution would never again exactly match the past, this "historic" baseline could be used as a guideline for formulating project plans and prescriptions. Historic condition and distribution is chosen as a management strategy based on the assumption that ecosystems were in equilibrium and functioning as they were intended based on evolution and adaptations that occurred under the influence of natural disturbances and geologic, climatic, and ecological processes. Therefore, ecosystems restored using this strategy would be more resistant to disturbances such as fire, drought, insects, disease, erosion, and wind. It could reasonably be expected that ecosystems cared for in this way would be healthier and more productive in the long-term from all perspectives, including social, economic, and ecological.

Vegetation restoration treatments are displayed by alternative on Maps 5 and 6 and in Table 4-1 below. Table acreages are the maximum potential treatments by treatment priority and by vegetation type by alternative in the planning area within the next 15 years. The total prescribed fire, mechanical, and treatment acres represent the net potential treatment acres within projects located in priority treatment areas. These totals exclude the overlap between priority treatment areas.

Table 4-1 - Vegetation Restoration Alternatives Summary

Vegetation Priority Restoration Areas

Alternatives 2, 4, and 5	
Wildland Urban Interface (WUI)	83,727
Verified High Priority Restoration (Upper Crooked River Subbasin)	40,746
Aquatic Stronghold Restoration	29,772
Canyon Treatments	5,833
Priority Old-Growth Juniper Restoration	12,317
Ponderosa Pine	5,766
Peck's Milkvetch Treatment Area	323
Priority Sage Grouse Restoration	94,412
Mule Deer Winter Range Restoration	15,684
Alternatives 3, 6, and 7	
Wildland Urban Interface (WUI)	83,727
Verified High Priority Restoration (Upper Crooked River Subbasin)	40,746
Verified High Priority Restoration (Lower Crooked River Subbasin)	45,098
Aquatic Stronghold Restoration	29,772
Priority Old-Growth Juniper Rest.	56,611
Ponderosa Pine	5,766
Priority Sage Grouse Restoration	127,276

Vegetation Treatments by Vegetative Type (acres/year)

Alternatives 2, 4, and 5	Year 1-5	Year 6-15
Shrub-Steppe (includes young juniper)	1,464	6,605
Old-growth Juniper	2,106	821
Lodgepole Pine	7,849	2,605
Ponderosa Pine	1,131	375
Riparian/wetland/meadow	100	100
Total Mechanical	11,385	5,253
Total Prescribed Fire	1,265	5,253
Total Treatment	12,650	10,506

Alternatives 3, 6, and 7	Year 1-5	Year 6-15
Shrub-Steppe (includes young juniper)	4,074	8,642
Old-growth Juniper	2,196	3,628
Lodgepole Pine	7,849	2,605
Ponderosa Pine	1,131	375
Riparian/wetland/meadow	100	100
Total Mechanical	11,512	6,140
Total Prescribed Fire	3,838	9,210
Total Treatment	15,350	15,350

Differences in effects between the alternatives, in most cases, are directly proportional to the number of acres treated, or miles of motorized roads and trails allowed in each alternative. Where there are differences in treatment strategy between the alternatives, differing effects produced by those strategies will also be described.

The description of direct and indirect effects on vegetation in this section will focus on five major categories of activities affecting vegetation: mechanized operations, motorized recreation/travel, non-motorized recreation, prescribed fire, and site rehabilitation (including management of noxious weeds). Direct and indirect effects will be followed by a discussion of cumulative effects of all of these activities on vegetation.

Assumptions

Plant communities are naturally dynamic. While change is inevitable, human influences would have direct, indirect and cumulative effects on vegetation. The extent of these effects depends on the specific type, scale, location, timing and duration of management activities or land uses. Active vegetation management activities such as cutting, burning, planting, seeding, fertilizing, and livestock grazing tend have more direct effects on vegetation. Other management activities and land uses including, but not limited to, recreation, mining, and land ownership transfers have direct and indirect effects on vegetation. Humans have also interrupted or exacerbated natural disturbance processes such as fire, insects, and disease.

Because of complex ecosystem interactions, management activities and land uses that affect vegetation would also have indirect and off-site effects on many other biological and physical components of the environment. For example, cutting juniper trees would change the composition and structure of shrub-steppe communities, which, in turn, results in changes in the composition and distribution of certain wildlife species and changes in downstream water quality. Vegetation treatments would impact many other resources such as soils, visual quality, air, and fish. Due to these interrelationships between different resources, some of the direct, indirect, and cumulative effects of vegetation management are discussed in other sections of this chapter.

Treatment priorities and acreages are based on ecosystem and fuels management objectives and assume budget is not a major limiting factor. Because of the high fire danger in portions of the planning area, the proximity of homes and urban centers, and funding priorities within the National Fire Plan, vegetation treatment emphasis in the first five years of implementation would be within WUI areas.

Special Status Plants: It is the policy of the BLM to protect and enhance special status species and their habitats. The Endangered Species Act mandates that the BLM ensures that actions authorized or carried out by the BLM are consistent with the needs of special status species and do not contribute to the need to list any of these species as Threatened or Endangered. In addition, according to the basic provisions of FLPMA and the Interior Columbia Basin Strategy, the BLM is also committed to promoting biodiversity and assuring the survival of rare or sensitive plants through active management and habitat restoration. Therefore, all alternatives would strive to protect and enhance special status species habitat.

The greatest threat to special status plants is direct loss of habitat. Development on private land, land exchanges, high motorized recreation use levels, livestock grazing, fire exclusion, exotic weeds, and other uses and activities have all contributed to a loss of habitat in the last 150 years. All alternatives would consider the presence of special status species habitat before decisions are made on whether or not to allow certain activities or uses. If a use or activity is authorized in habitat or potential habitat, protection and mitigation measures would be applied. All alternatives would also consider the occurrence of special status plant species in land ownership transfer and land exchange decisions. Acquisition of special status species habitat would be a priority in decisions on which parcels to bring into public ownership.

Alternatives that would designate ACECs and other Special Management Area designations would be better able to provide protection for special status species inhabiting these areas. For example, an additional burden of justification would be required to allow a new or expanded right-of-way or new mineral development within an ACEC as compared to outside of an ACEC.

Cross-country OHV traffic, trampling by livestock, and direct application of mechanical treatments or fire would damage or destroy individual plants or groups of plants, at least in the short-term. Known plant populations would generally be protected from ground-disturbing effects. However, some limited mechanical treatment or prescribed burning may be prescribed within some special status plant populations or potential habitats when overall restoration is a primary objective.

Some special status plants are tolerant, or even dependent, on a natural fire regime for regeneration. For example, pumice grapefern appears to favor open sandy areas with a minimal duff layer over heavily wooded areas with abundant shade and organic matter. Species such as the variegated desert dragonhead lily repopulate quite aggressively and actually thrive after the occurrence of fire. On the other hand, green tinged paintbrush is extremely sensitive to fire and burning would be detrimental. Therefore, a vegetation management strategy that would promote habitat diversity and transition toward historic native vegetative condition and structure would likely benefit special status species as well.

Direct short-term loss of some plants from the treatment would likely occur but the net effect to the population would be beneficial because of expected improvement in the condition of the species habitat in the long-term.

Livestock Grazing: affects vegetation by direct removal (grazing) of vegetation, and through compaction of soils from hoof traffic or from concentrated use (such as near salt blocks, shade and watering areas). Grazing effects on vegetation depend on: AUMs (the number of animals grazed), intensity (number of animals per acre), duration (length of grazing period), and season. Other than some proposed allotment closures, these grazing variables would not specifically be modified by any of the alternatives for the planning area.

Fire: Periodic natural fire cycles have been a major factor in shaping the composition, structure and distribution of all plant communities within the planning area. Today, in an effort to protect human life and property, most fire starts are suppressed. Most researchers agree that reintroduction of fire into ecosystems is essential to help maintain bio-diversity and ecological integrity of fire adapted systems. Prescribed fire includes pile burning, broadcast burning, jackpot burning, underburning, and prescribed natural fire. A prescription is written that specifies the parameters within which the burning would occur. Some of these parameters are fuel moisture, wind velocity and direction, relative humidity, and expected weather conditions. Prescribed burning is done for: reduction of natural and activity fuels, restoring proper ecological and hydrologic function, site preparation for planting or seeding, and controlling certain noxious weeds.

Agee (1993) estimates that fire burned in juniper communities approximately every 15-25 years. Today juniper may need to be cut prior to burning in areas that are deficient in fine fuels. Cutting alone may not be practical for juniper control due to the high numbers of seedlings and small saplings, and prescribed burning may be required. Fire intensity would have to be high enough to kill the standing juniper seedlings and small trees; however, localized high fire intensities may cause mortality in the perennial grasses such as Idaho fescue and bluebunch wheatgrass (Bunting, 1987). Indirect mortality from fire on juniper may also occur from weakening the tree and causing it to become susceptible to insect attack and drought stress. Microbiotic crust cover may be reduced by fire but studies indicate that it can recover within twenty years in xeric communities and within 8 years in mesic communities (Quinsey, 1984). Maintenance burning in shrub-steppe at regular intervals of 20-30 years may be required to maintain a bitterbrush/grass or big sagebrush/grass community in a mosaic arrangement across the landscape. The required two growing seasons of rest from livestock grazing would allow better establishment of new plants following burning.

Agee (1993) estimates that fire burned in ponderosa pine communities approximately every 5-12 years. Pre-burn thinning and removal of small trees would be required in many ponderosa pine stands due to decades of fire exclusion and the current high tree density and ladder fuel arrangement. Whereas, wildfire occurring in these stand conditions would tend to be large, severe, and stand-replacing events, prescribed fire would thin additional seedlings, saplings, and intermediate sized trees through direct mortality. Growth of residual trees would accelerate within a few years with a reduction in competition. Understory grass and forb density and diversity would be greatly enhanced following light underburning. Idaho fescue, bottlebrush squirreltail, and antelope bitterbrush on many sites would respond well within 2-3 years after fire.

Site Rehabilitation: Methods of site rehabilitation of damaged sites in terms of acreage would include manual, chemical, and biological methods. Manual and biological effects on vegetation will not be discussed because they are relatively minor compared to motorized/mechanical effects. Chemical effects are already fully described in the Prineville District Integrated Weed Management Environmental Assessment (OR-053-3-062). Site rehabilitation and management of noxious weeds is commonly needed where ground disturbance such as mining, logging, road, powerline, and pipeline construction (ROWs), trespass/illegal activities, OHV cross-country travel, and user-created roads/trails has occurred. Natural events such as wildfire, soil erosion, and windthrow may also require rehabilitation. Rehabilitation of disturbed sites and management of noxious weeds restores overall ecosystem and watershed health with spin-off benefits to all other resources including soils, water quality, vegetation, wildlife, and visual quality.

Site rehabilitation and noxious weed management is often needed where a ground disturbance has occurred. Rehabilitation of disturbed sites and management of noxious weeds restores overall ecosystem and watershed health with spin-off benefits to all other resources including soils, water quality, vegetation, wildlife, and visual quality.

Shrub-Steppe (including young juniper): The most common treatments implemented in the shrub-steppe and young juniper community types would be prescribed burning and cutting juniper and shrubs by chainsaw or other mechanical means. Because mechanical treatments are more expensive, and because ecological effects are generally less desirable than those produced by fire, mechanical treatments would usually occur when prescribed fire is too risky, where fuel conditions would not allow effective use of fire, or where there is an economically viable product to harvest. On some sites, pre-burn cutting may be required to modify fuels in preparation for a more effective prescribed burn.

Most of the published literature concerning juniper ecology generally supports an inverse relationship between overstory juniper canopy cover and understory plant cover. Closed juniper stands may virtually exclude all herbaceous vegetation (Tausch and Tueller, 1990). However, effects on the understory of juniper dominated sites vary across a wide variety of sites. Increases in western juniper density appear to have the greatest effect on plant community composition and structure on sites with shallow soils or south facing slopes. On these drier sites, canopy cover of fully developed juniper woodlands frequently ranges from 20 to 30 percent with less than five percent cover of shrubs, grasses, and forbs, and nearly 70 percent bare ground (Miller and Wigand, 1994). Dramatic declines in understory vegetation and diversity are observed when canopy cover reaches 30-35 percent, especially when there is a hardpan 12 to 24 inches below the surface (Borman, 1996). Most of the literature attributes the low understory cover on these sites to competition with juniper for limited water and nutrients. Plant species richness and seed reserves also decline as juniper dominance increases on a site (Koniak and Everett, 1982). Overall productivity of a site may be decreased when bare ground allows overland flow of water and erosion to carry away topsoil nutrients.

On sites with deeper soils and greater available soil moisture, understory vegetation seems to be better able to co-exist with fully developed juniper stands. Examples of these soil types (pumice zone) and plant associations occur in the area roughly bounded by the triangle of Bend, Sisters, and Prineville. This is the center of the area where western juniper attains its maximum development in terms of density and extent of old and large trees. In the pumice zone, as site condition decreases from late seral to early seral, late seral perennial bunchgrasses decrease while early seral species such as squirreltail and western wheatgrass increase. Rock gilia and green rabbitbrush also increase with a decline in condition. Poor condition sites are dominated by introduced annual grasses, annual forbs and rabbitbrush. Both cutting and burning on these sites appear to result in an increase in undesirable shrubs and exotic annuals.

Equipment designed to move logs and process wood products would be used on commercial forestland and woodlands where operationally and economically feasible. In general, use of this type of equipment in juniper woodlands has been very minor. Difficulties in handling and processing juniper and its inherent low value for traditional wood products have limited its commercial harvest. However, if markets, product development, or harvesting and processing technologies improve, use of this type of equipment in the juniper woodlands could increase substantially. The need to pile or remove material off-site for fuels reduction in the WUIs may also require increased use of this equipment.

Old-Growth Juniper: Mechanical treatments would be used to maintain and restore old juniper woodlands. Treatments would be less intense than those in the shrub-steppe or young juniper types. Cutting juniper would be primarily limited to younger trees (generally less than 150 years old) occupying the interspace areas between the larger, older trees. Understory vegetative response would be more subdued due to the less intensive treatments, the deeper soils and type of plant communities involved. Thinning juniper would be expected to increase the health and longevity of the remaining trees. Mechanical treatments would mimic natural processes that historically maintained these juniper woodlands in their late seral condition. Many old-growth woodland sites are close to urban centers and are occupied by exotic annuals and noxious weeds. Evaluation of sites and application of treatments to minimize the spread of noxious weeds and other exotic annuals would be integral to management of old-growth woodlands.

Each alternative designates various combinations and sizes of ACECs (see Map 7, Special Management Areas, and old-growth juniper range on Map 4, Vegetation). All proposed and existing ACECs contain some amount of old-growth juniper woodlands. In addition, alternatives that propose restricted road access and less motorized activity would reduce effects of illegal activities and ground-disturbance on old-growth juniper woodlands. Alternatives that would designate ACECs and other Special Management Areas would be better able to provide protection for old-growth juniper woodlands located within these areas. Old-growth woodlands values (and other natural/cultural ACEC values) within ACECs would have a higher priority for protection within ACECs than they would outside ACECs. Alternatives 3 and 4 designate ACECs (Juniper Woodland ACEC and Alfalfa Market Road ACEC) specifically to protect old-growth woodlands. New VRM Classifications would also favor retention of old-growth trees and improved vegetative condition.

Evaluations for the presence of old-growth woodlands and the relative quality of habitat compared with the proposed activity, use or land transfer action would be required before any decision is implemented that could effect old-growth values. If old-growth values are involved, appropriate protection, mitigation, or avoidance measures would be provided on a case-by-case basis. Some decisions involving old-growth value trade-offs may be allowed if the proposed activity or use is determined to have an overall net benefit to public land resources.

Lodgepole and Ponderosa Pine Forest: The vast majority of vegetative treatments in lodgepole and ponderosa pine forest types in the planning area would be mechanical. Because these forest types may contain an economically viable product, equipment designed for timber harvest and subsequent slash treatment would be used. Heavy fuels would be removed rather than left on site to minimize visual impacts and fire hazards. Site productivity would be maintained by leaving fine fuels scattered on-site for organic matter and nutrient soil input.

Sites selected for restoration within the pumice zone present special challenges. Cutting juniper trees in this area is usually followed by a decline in Idaho fescue, which occurs beneath the tree canopy, and is replaced by green rabbitbrush, cheatgrass, and introduced annual mustards (Miller, 2000). Priority treatment sites would be evaluated for occurrence of noxious weeds and exotic annuals to minimize potential for introduction and spread.

Forest Thinning

The predominant mechanical treatment within lodgepole and ponderosa pine forests would be thinning (cutting and/or removing only a portion of the stand). Due to the fuels reduction and restoration emphasis in the Upper Deschutes Planning Area during this planning cycle, a majority of the thinning would be in the smaller diameter size classes.

Forest Patch Cutting

Small patch cuts or "even-aged management" removes all or nearly the entire forest tree component with the goal of regenerating a new stand. Seed trees and habitat trees would be designated for reserve in the larger openings and would not be cut. Seed trees may or may not be removed later after satisfactory regeneration has become established, depending on habitat values and presence of disease. Currently, patch cuts are not needed for diversity. This silvicultural prescription would only begin to be implemented toward the end of the planning period (and beyond) and amount to a total of less than 1,000 acres over 15 years across the entire La Pine block.

Regeneration harvests result in alterations in plant community composition and structure. Removal of trees and ground disturbance from regeneration harvest and the associated microclimatic site changes causes the plant community to revert back to an earlier successional stage. When overstory trees are removed, competition is greatly reduced for sunlight, nutrients, water and growing space. These resources are then available to the understory vegetation and the next generation of trees. Early seral stage species would colonize and increase, while species preferring shade or later seral species would decrease. In some areas, increases in noxious or non-native plant species may occur. Shrubs would also increase in relative abundance and vigor. With a sequence of patch cuts over a long period of time, the forest would achieve a mosaic of stands with varying ages, canopy levels, and successional stages. The stand structure of the residual older stands in-between patch cuts would be more complex with variable tree densities, multiple canopy levels, uneven-age classes, and abundant snags and downed logs.

Effects on Insect and Disease

Management of forest insects and disease would occur primarily through silvicultural cutting and prescribed burning treatments, which alter vegetative condition. Thinning and patch cutting can improve stand health directly by removing infected trees. Thinning can also leave the healthiest trees, which are more resistant to attack. Insects and disease can rarely be eradicated from the forest because most of these organisms evolved with the plant community and are an integral part of the ecosystem. Treatments for insects and disease would be prescribed to control outbreaks and reduce infections to endemic levels. Endemic populations of these organisms would normally cause some mortality in individual and small groups of trees. The insects and diseases of most consequence within the planning area are: dwarf mistletoe, western gall rust, root diseases and bark beetles.

Dwarf Mistletoe: In stands where the occurrence of dwarf mistletoe is low, thinning and salvage can directly remove a high percentage of this parasite by removing infected trees. Thinning can also indirectly decrease the spread of dwarf mistletoe by increasing growth rates, which enables trees to grow faster than mistletoe can spread. While infection rate could increase through improper use of thinning, this situation can be avoided by prescribing an even-aged treatment for the most severely infected stands. Large patch cuts would be the most effective means of controlling severe dwarf mistletoe infections.

Western Gall Rust and Root Diseases: Thinning and salvage treatments reduce these diseases by removing infected host trees. Thinning, however, results in some damage to the roots, stem, and branches of residual trees, and may allow infection from airborne spores. Specialized equipment, designated skid trails and strict adherence to contract specifications would limit this damage.

Bark Beetles: Thinning for density management would provide the greatest benefit in managing bark beetle population levels. The mountain pine beetle favors large, contiguous, dense stands of low vigor trees with a minimum tree diameter of 6 inches. Thinning would alter stand conditions by removing the weak and low vigor trees and increasing the vigor of the remaining stand. Patch cutting would break up large stands and introduce horizontal diversity, which would reduce the conditions conducive to a large-scale beetle epidemic.

Incomplete or Unavailable Information

There is little documentation regarding the effects of vegetative treatments and other ground-disturbing activities on the four special status plant species known to exist within the planning area. Data from studies on the effects of various simulated treatments is currently being collected for pumice grapefern and Peck's milkvetch.

Analysis of the Alternatives

Common to All Alternatives

Mechanized Operations
Mechanized equipment, regardless of the specific project, would all produce similar short-term effects on vegetation. The degree and extent of these effects, however, would vary based on type of equipment and resource objectives.

Non-motorized Use
Grazing would be guided by "Standards for Rangeland Health and Guidelines for Grazing Management," which were incorporated into the B/LP RMP in 1997. Individual grazing allotments would be evaluated for several Standards & Guidelines ecosystem and watershed health criteria. If grazing is not meeting these criteria, then livestock management such as AUMs, season of use, and grazing intensity would be adjusted.

Prescribed Fire

Specific effects of prescribed fire on vegetation include:

1. Immediate reductions in the total amount of vegetation, followed by rapid re-growth increases in density and vigor of vegetation, especially grasses and forbs. Species composition and proportions may change in the long term. Recolonization begins with a high proportion of herbaceous species. Later, over a period of years, woody species (shrubs and trees) emerge as increasingly dominant through the process of succession.
2. Reduction of some fire intolerant species and increases of some fire-tolerant or fire-dependant species. Shade intolerant species replace shade tolerant species in the short-term.
3. Changes in nutritional and physical characteristics of the soil and corresponding effects on plant growth due to a potential nutrient "flush," particularly phosphorus and potassium. Long-term net losses of nutrients and organic matter may occur with fire.
4. Reduction in the potential for intense wildfire. Prescribed burning reduces surface and ladder fuels in a controlled fashion. Wildfire in unmanaged or fire excluded areas may have severe and long-term effects on vegetation and soils.
5. Potential for introduction or spread of noxious weeds and other invasive early seral or non-native species. Examples would be knapweed, cheatgrass, mustards, thistles, and rabbitbrush. Site evaluations and application of precautionary measures such as avoidance, proper timing, weed control, native seeding, etc. would minimize this risk.
6. Changes in livestock and wildlife use patterns and distribution that would affect vegetation. Succulent plant growth after burning increases grazing. More open habitats attract pocket gophers, which increases effects on soils and plants.

Site Rehabilitation

Rehabilitation treatments and management of noxious weeds would not vary between any of the alternatives.

Prescribed fire can be an effective tool for control of noxious weeds. Fire would be used on specific sites and under situations where certain noxious weeds and other vegetation would respond according to overall restoration objectives.

Chemical herbicides could be applied on certain species of noxious weeds when other methods of control proved ineffective or prohibitively expensive. Herbicides would generally be applied in localized areas and on a relatively small acreage in any alternative. Specific treatment areas and acreages vary over time and are identified during priority setting for annual noxious weed control programs. Noxious weed treatments would generally be confined to transportation corridors such as roads, canals and utility lines. Refer to Prineville District Integrated Weed Management Environmental Assessment (OR-053-3-062) for a complete analysis of the effects of herbicide application.

General effects of chemical treatments on vegetation would include:

- Helps control growth and spread of noxious weeds and other undesirable species.
- Improves growth, survival, and condition of desirable species.
- May kill or displace some non-targeted plants and animals.

Off-site and non-target effects of chemicals would be minimized through very selective and limited use and strict compliance with District guidelines concerning handling and use of chemicals, label precautions, mitigation, stipulations, terms and conditions specified in EA #OR-053-3-062. Due to the wide variety of plant associations, ecological site conditions, and social factors, some rehabilitation treatments in some areas may be experimental and small in scope in order to assess their effects and gain site-specific knowledge of response.

Alternative 1

Mechanized Operations

Direct Effects

Approximately 50,000 acres of young juniper would be cut within the Upper Deschutes Planning Area. Approximately 30 percent of this amount has already been accomplished with prescribed burning and/or mechanized treatments in the last 15 years. The B/LP RMP does not specifically address the health and maintenance of old-growth juniper values and does not identify any treatments specifically designed to restore or enhance these woodlands.

Alternative 1 would be less successful in enhancing habitat for special status plant species because there would be fewer acres restored and more potential ground-disturbing activities allowed.

Indirect Effects

If permitted harvest of old-growth juniper were allowed to resume, or if illegal harvest continues to occur at present levels, there would be consequences to many components of the ecosystem. Even current relatively low levels of permitted or illegal harvest far exceed the capacity for replacement growth, and considering that many of the harvested trees are in the 500 to 1,000 year old range these would not be replaced in the near future. As important components of these old woodlands are removed or altered, the structure and functioning of this ecosystem changes. Large, old trees with their cavities, nesting and perching platforms, thermal cover, and other habitat characteristics are important for a variety of wildlife species. In general, removal of large and old trees reduces overall habitat diversity.

Harvest vehicles traveling off-road to gain access may cause soil displacement, compaction, and introduction or spread of exotic annuals. Soil disturbance and removal of old trees would generally result in a transition from late seral toward early seral condition. Some perennial bunchgrasses (e.g. Idaho fescue) and sagebrush would be replaced by exotic annual weeds such as cheatgrass and mustards. Rabbitbrush increases with disturbance and juniper seedlings would eventually move in to occupy space vacated by removal of older trees. Microbiotic crusts would be damaged and micro-site conditions changed to prevent recolonization.

Motorized Recreation/Travel

Direct Effects

Alternative 1 allows motorized cross-country travel in 38 percent of the planning area. Repeated use of cross-country paths where allowed, and illegally in closed areas, has resulted in the creation of hundreds of miles of unauthorized roads/trails in the planning area and a corresponding loss of vegetation in these areas.

Common to Alternatives 2 – 7

Mechanized Operations

Direct Effects

In addition to thinning, mechanized treatments would be used in the La Pine area to produce stand openings ranging in size from ¼ to 10 acres. Silviculturally, openings of ¼ to 3 acres are more properly termed "group selection." The extent of the effects would, in some cases, be proportional to the size, number, and total acreage of this type of treatment.

Due to the intensive salvage and even-aged timber management that has already occurred in the La Pine block over the last 20 years, additional even-aged management would be minor in the next 15 years. Even-age treatments (patch cuts) would be used sparingly compared to the amount of proposed thinning in all action alternatives and is intended to be phased in over a longer period of time to maintain diversity for fuels management, wildlife habitat, insect and disease management, and visual quality.

Indirect Effects

Indirect effects to vegetation would include damage and reduction by direct contact with equipment. Logging, in particular, can damage residual vegetation in a broader area. Logging equipment used for falling and skidding operations can crush understory vegetation, break branches and tops and damage stems of residual trees. These effects would be moderated by specifying low-impact equipment, logging over snow, closely monitoring operations, and by seasonal restrictions.

Heavy equipment used in thinning would cause some soil compaction and displacement with corresponding effects on plant survival and growth. Compaction and displacement could be minimized by designating skid trails, specifying low-impact equipment, logging over snow and/or frozen ground, suspending operations during periods of high soil moisture content, and closely monitoring operations. Compaction could also be reversed on some sites by scarifying skid trails, temporary roads and landings. Compaction also diminishes gradually over time through natural processes such as freeze and thaw action, root penetration and other biotic activity. For some early successional plant species, soil disturbance during mechanized harvest activities would have the effect of preparing a receptive seed bed by exposing mineral soil and reducing plant competition. For these species, disturbance aids in seed germination and survival.

Reduced shade and protective cover from removal of trees and shrubs, logs, organic matter and rocks would alter the physical and micro-climatic characteristics of the site that affects plant habitat. Wildlife and micro-biota (plant and animal) composition would also change, which would further affect plant communities. The response of the understory plant community to juniper cutting varies across a variety of sites and treatment techniques. Selected areas for juniper cutting within the planning area would be expected to show an increase in perennial forbs and grasses. If perennials are sparse or if annual weeds were abundant before treatment, juniper reduction and associated ground disturbance may open the site to increased dominance by annual grasses and forbs (Evans and Young, 1985, 1987).

Some mechanized projects are designed to produce long-term positive ecological effects. Mechanical vegetation treatments are implemented to achieve three main objectives: 1) restoration of plant communities, habitats, and watersheds; 2) reduction of natural fuels for protection of life and property; and 3) harvest of wood products. Depending on the specific treatment, equipment used, site conditions, and plant community involved, these activities have the potential to improve long-term condition, composition, and structure of vegetation. Most of the long-term vegetation changes occur with a response to a reduction of plant competition for a limited supply of sunlight, water, nutrients, and physical space. Specific vegetative response for each major community is described below.

Effects of Forest Thinning: Thinning removes surplus trees (surplus according to whatever treatment objectives are applied) that compete for space, sunlight, water and nutrients. These newly available resources are then reallocated to the fewer remaining trees in the stand. Thinning would generally target the smaller suppressed trees and trees infected with insects or disease. A few trees with severe disease or other "defects" that provide good perching or nesting habitat would be left for wildlife. Trees remaining in the stand would generally be those with the greatest vigor and least amount of disease. Improved stand health would increase long-term resistance to insect and disease attack.

Leave trees left in patch cuts or fire salvage treatments would include the healthiest available ponderosa pine, regardless of size or age. In such treatment areas, ponderosa pine would gradually increase in stand composition, extent, and vigor.

Stand structure would be changed by reducing tree density and increasing the average diameter. Vertical structural diversity may be reduced in some stands when thinning from below by removing some of the lower canopy layer. However, diversity across the landscape would be increased by applying a series of intermediate thinnings, which over time, would promote the growth of large trees.

Thinning for restoration of late and old structure ponderosa pine would be a primary purpose of forest mechanical treatments in ponderosa pine. Smaller trees would be thinned out around the larger trees to maintain or increase the stand diversity provided by this relatively scarce large tree component. Intensive radius thinning (usually at least 30 feet from the bole) around large and old legacy trees would provide a high level of protection from insects, disease and fire. Mechanical treatments for juniper and shrub reduction using other types of equipment such as brush-busters, mowers, and feller-bunchers would generally be limited to areas with slopes of zero to 30 percent or within the wildland urban interface. Direct effects and response of residual vegetation to treatments with heavy equipment would be similar to chainsaw use with the following differences:

- Track and wheel-based equipment has greater ground disturbance. See Soil effects described in this Chapter.
- Reduction of vegetation, especially using a brush-buster or mower, is greater for all types of vegetation within the path of the machine. However, mowing and other brush and tree reduction treatments in portions of the WUIs would reduce layering (ladder fuels) and convert vegetation to an earlier seral stage. In order to maintain a long-term effective fuel break within WUIs, a primary objective for WUI treatments would be to keep the understory within the first 500 to 1,000 feet adjacent to homes and major roads in perennial grasses, forbs, and low shrub.

Pre-commercial thinning would be done in areas of dense seedlings and saplings greater than 2 feet in height. Some commercial removal would be done where marketable material occurs in thinning of trees, mostly in the 4 to 12 inch DBH size class. Additional larger trees would be removed, generally where they pose a hazard to life or property; where they occur within an approved development, such as a new right-of-way; or where they are competing with other desirable species such as ponderosa pine or riparian hardwoods.

Restoration of old forest structure in ponderosa pine would be accomplished incrementally over a period of decades. As competing lodgepole pine, juniper, and smaller ponderosa pine are thinned out, the remaining ponderosa pine would respond with accelerated growth. Large diameter trees would be the first component of old forest structure to be restored. Large snags, downed logs, tree bole decay, and other more complex physical attributes and processes of an old forest would take much longer to develop. Each treatment entry would be designed to incrementally work toward restoration of ponderosa pine ecosystems more representative of those occurring historically.

Salvage treatments cut and/or remove dead, dying, diseased, damaged, or deteriorating trees, as well as those susceptible to attack by insects and pathogens. Salvage can reduce the rate of spread of forest pests and recover some economic value. This type of harvest can decrease stand diversity by removing dead standing and down woody material and defective trees, which provide habitat for some wildlife species. This effect would be mitigated by retaining some dead, defective and dying trees to serve as snags, replacement snags, and downed log habitat for wildlife. Retaining some diseased and